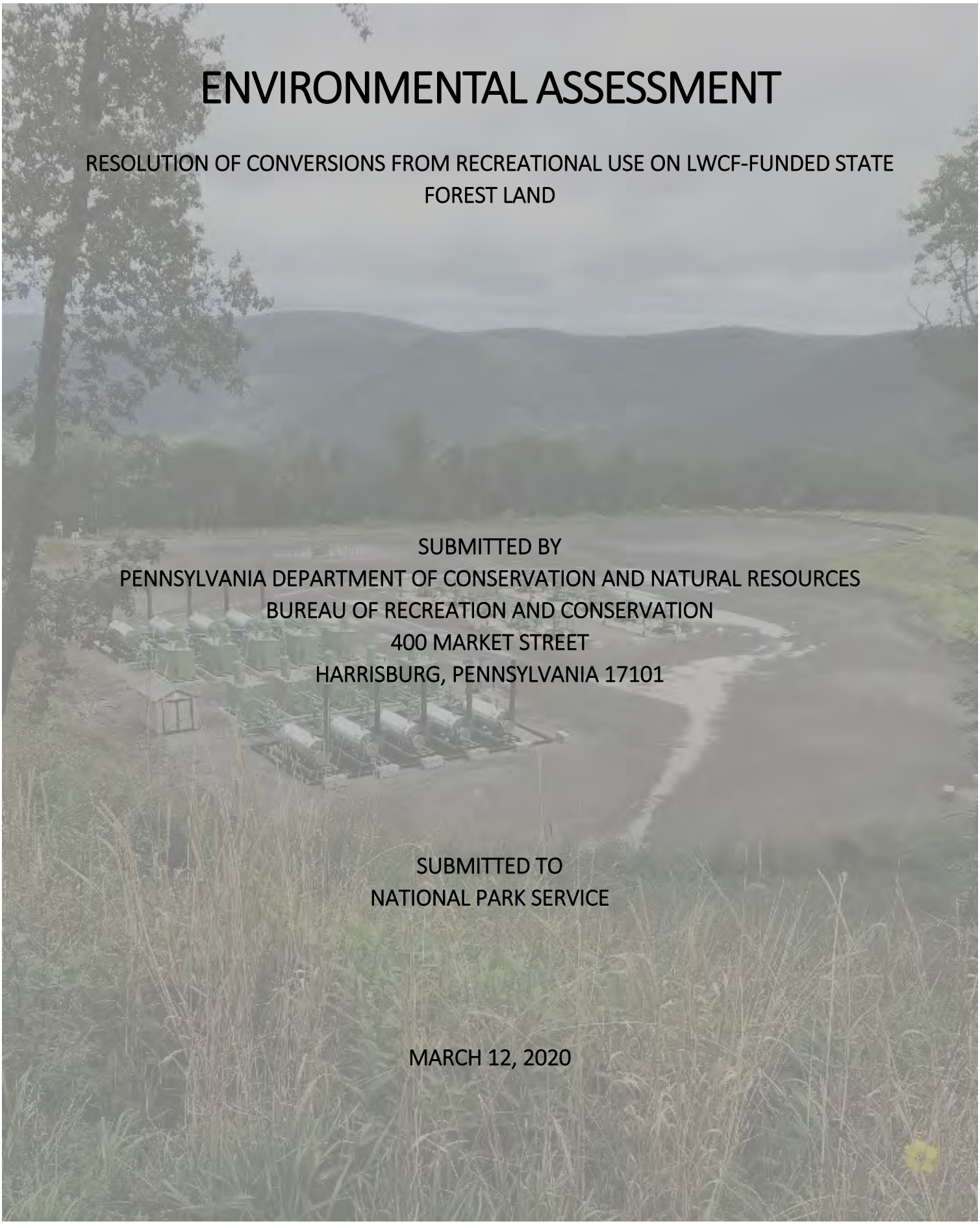


ENVIRONMENTAL ASSESSMENT

RESOLUTION OF CONVERSIONS FROM RECREATIONAL USE ON LWCF-FUNDED STATE FOREST LAND

SUBMITTED BY
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
BUREAU OF RECREATION AND CONSERVATION
400 MARKET STREET
HARRISBURG, PENNSYLVANIA 17101

SUBMITTED TO
NATIONAL PARK SERVICE

MARCH 12, 2020

Table of Contents

1. Introduction 1

I. **Proposed Action** 5

2. Purpose and Need 5

3. Alternatives Considered 5

4. Environmental Impacts – Converted Sites 5

I. **Recreation** 6

II. Natural 7

a. *Wetlands and Watercourses* 7

b. Floodplains 8

c. Threatened and/or Endangered Species 8

d. Geologic Resources: Soils, Bedrock, Slopes, Streambeds, Landforms, etc. 9

e. Land Use/Ownership Patterns 9

f. Hazardous, Residual, or Municipal Waste Sites 10

g. Forest/Vegetation 10

h. Air Quality 10

i. Noise 11

j. Lighting 11

III. Cultural 12

a. Aboveground Historic Resources 12

b. Archaeological Resources 12

IV. **Socioeconomic** 12

a. Environmental Justice Populations 12

5. Cumulative Impacts 14

6. Coordination and Outreach 14

I. Agency Coordination 14

II. Public Outreach 14

7. LWCF Mitigation Site – Replacement Land 15

REFERENCES

REPRESENTATIVE PHOTOS

APPENDICES

Appendix A – 2018 Shale Gas Monitoring Report
Appendix B – Location Maps and LWCF 6(f) Boundary Maps
Appendix C – Conversion Appraisal
Appendix D – Recreational Utility Table
Appendix E – PDESFs
Appendix F – Strawbridge 2 Replacement Property Environmental Assessment
Appendix G – State Forest Visitor Use Monitoring Reports
Appendix H – State Forest Oil and Gas Guidelines

Appendix I – State Forest Environmental Reviews and Leases
Appendix J – Wetland/Watercourse Studies
Appendix K – DEP Permits, Waivers, Remediation Report
Appendix L – PNDIs
Appendix M – Tribal Consultation
Appendix N – Forest Management 2011 Annual Audit
Appendix O – Public Outreach
Appendix P – Response to Public Comments

BACKGROUND DISCLOSURE STATEMENT

This environmental assessment document addresses conversions from recreational use of Land and Water Conservation Fund ("LWCF")-protected state forest land that occurred in 2008-2011. After consideration and careful analysis of the data assembled by the Pennsylvania Department of Conservation and Natural Resources ("DCNR") Bureau of Forestry ("BOF") in the 2018 Gas Monitoring Report (see Appendix A), the DCNR modified its prior position related to conversion from recreational use of these lands. Prior to 2018, the DCNR did not consider development of well pads, compressor stations, or freshwater impoundments constituted conversions from recreational use of the state forest, because state forests are multi-use forests. The DCNR now takes the position that the development of well pads, compressor stations, and freshwater impoundments in the period from 2008-2011 on LWCF-protected lands is a conversion from recreational use since the surface use changed to something other than recreation.

Even though a formal National Environmental Policy Act ("NEPA") process was not followed at the time of the conversions, the DCNR followed an environmental review process that was designed to avoid, minimize, and mitigate for surface impacts related to oil and gas development. The leases and approvals issued by the DCNR to gas operators addressed many of NEPA type environmental issues and required all lessees to comply with all Department of Environmental Protection ("DEP") permitting requirements.

The DCNR's staff worked diligently to avoid and minimize natural resource impacts. Best management practices ("BMPs") were developed concurrent with the early development of the unconventional/shale gas out of necessity as shale gas development was brand new to Pennsylvania, and even the nation. DCNR used BMPs for conventional gas development targeting the deep natural gas formations as a basis for shale gas guidelines and BMPs; however, the guidelines have been substantially updated to reflect the unconventional natural gas development targeting the Marcellus and Utica formations. In fact, the guidelines continue to be revised on an as-needed basis to reflect changes spurred by advancements in unconventional gas development and production technologies, lessons learned from monitoring the effects, and the application of adaptive natural resource management approaches.

The DCNR desires to resolve the decades-old conversions of LWCF-protected state forest land and is seeking a federal action to approve the conversions. The conversions are in accordance with the comprehensive statewide outdoor recreation plan, and the DCNR's proposed substitution of another recreation property (the Strawbridge 2 replacement property) is of at least equal fair market value and of reasonably equivalent usefulness and location.

1. INTRODUCTION

The Land and Water Conservation Fund Act ("the Act") (Public Law 88-578; currently codified at 54 U.S.C. §200304 et seq.) aims to expand and protect a public recreation estate from backyard to backcountry for the health and vitality of the American people and our visitors. The LWCF grant program is administered by the National Park Service ("NPS") in cooperation with a Governor-designated agency for each state and territory and provides matching grants for the acquisition, development, or renovation of tribal, state, and local outdoor recreation properties. In accepting grant funding, applicants commit to managing funded properties for public outdoor recreation purposes in perpetuity or to provide replacement property to which their LWCF responsibilities can be converted (36 C.F.R. 59).

The DCNR has historically leased gas rights within state forests for conventional gas development. During the Marcellus Shale natural gas boom in Pennsylvania (2007-2013), the DCNR leased gas rights within the state forests. Some of these leased tracts are located within areas that received LWCF

assistance (see location maps in Appendix B and Table 1). As such, the DCNR has sought guidance from the NPS on a resolution of the conversions due to the recreational loss that this subsequent gas infrastructure created. The provisions of LWCF state that all project areas that have received LWCF assistance must remain in recreational use in perpetuity.

The surface infrastructure of unconventional natural gas wells, compressor stations, and freshwater impoundments constitute a conversion from recreational use of LWCF-funded land which must be resolved in accordance with the NPS's guidelines. In accordance with 54 U.S.C. §200305(f)(3), the Secretary of the NPS shall approve a conversion only if the Secretary finds it to be in accordance with the then-existing comprehensive statewide outdoor recreation plan and only on such conditions as the Secretary considers necessary to ensure the substitution of other recreation properties of at least fair market value and of reasonably equivalent usefulness and location. This proposed conversion and substitution are in accordance with the comprehensive statewide outdoor recreation plan and will be replaced by recreational property of greater fair market value and of reasonably equivalent usefulness and location.

Table 1. The following table contains the three LWCF grants received by the DCNR for Bureau of Forestry that have been impacted by natural gas development addressed in this document.

LWCF Grant ID	Year Approved	Type	Project Description
42-00580	1978	Rehab	State forest Road Rehab
42-01235	1984	Rehab	State forest Road Rehab
42-01351	1986	Rehab	State forest Road Rehab

Table 2 shows how the three LWCF grants were used to rehabilitate state forest roads, drainage structures, culverts, and a bridge due to severe deterioration. Many of the roads were constructed during the Civilian Conservation Corps ("CCC") era and were in need of repair or did not provide adequate widths and surfaces for modern cars and recreational users. Appendix B contains the official LWCF 6(f) boundaries determined by the NPS in 1990 based on what it identified as the recreational units served by each road that was improved.

Table 2. The following table identifies the specific roads funded with LWCF grant money for improvements by forest district as well as the grant amounts and length (miles) of roads improved.

LWCF Grant	Miles of Road Improved	Forest District	Roads Funded	Rehab Activities (if known)	Total Grant Amount
42-00580 42-01235 42-01351	132 255 162	9	Lost Run Rd		$97,878.05
			Saunders Rd		
			Nolan Rd	• Installation of 3 drainage structures	
			Tyler Rd	• Installation of 6 drainage structures • Replacement of wood deck on Bridge No. 4R with 4" steel wedlock	
			Dubec Rd	• Installation of drainage structures, tail ditching, side ditching, and topping with 4 to 6 inches of 2RC limestone aggregate	
			Billotte Rd	• Widening of roadway to 18' • Installation of 32 drainage structures	
		10	Pfoutz Valley Rd	• Replacement of 98 metal culverts • Build road base with 3A stone where required 2RC stone on 9.9 miles of road	$174,256.74
			Dry Run Rd		
			Hyner View Rd	• Replacement of 18 culverts • Installation of 1 new culvert • Build road base with 3A stone on 0.10 mile of road and 2RC stone on 2.45 miles of road	
			Ritchie Rd	• Replacement of 12 culverts • Installation of 1 new culvert pipe • Build road base with 3A stone on 0.5 mile of road • Build road base with 2RC stone on 2.35 miles of road	
			State Line Rd	• Replacement of 105 culvert pipes • Installation of 13 new culvert pipes • Build road base with 3A stone and spread surface stone of 2RC on 10 miles of road	
			Eddy Ridge Rd	• Replacement of 12 culvert pipes • Installation of 3 new culvert pipes • Installation of geotextile fabric on 1,200' long by 14' wide roadway • Build road base with 3A stone on 2 miles of road	
			Sandy Run Rd		
			Montour Rd		
		15	Billy Lewis Rd		$90,531.33
			Thompson Rd		
			McConnell Rd		
			Joerge Rd		
			Portage Rd		
			Wild Boy Rd		
			Rock Ridge Rd		
			Red Ridge Rd		
			Junction Rd		
			Black Diamond Rd	• Replacement of bridge deck with pressure-treated 2x6" boards • Clean rust and scale off four 14" steel I-beams • Paint with rust-preventative paint • Repair/reinforce stone and masonry abutments • Installation of new wheel guards	

LWCF Grant	Miles of Road Improved	Forest District	Roads Funded	Rehab Activities (if known)	Total Grant Amount
			Rock Run Rd		
			Horton Run Rd	• Replacement of 32 culverts • Application of crushed gravel to 5.16 miles of road	
			McConnell Rd	• Replacement of 4 drainage structures • Application of 2RC crushed gravel to 0.49 mile of road	
			Twelve Mile Rd	• Replacement of 11 drainage pipes • Application of 2CR crushed limestone to running surface of road	
			Lebo Rd	• Application of 2RC crushed limestone to 3.25 miles of road	
		16	Asaph Rd	• 3R Bridge - Replacement of concrete deck with treated 6" wooden deck	$92,109.07
			Left Asaph Rd	• 5R Bridge - Replacement of deck with treated 6" wooden deck	
			Old Possessions Rd	• Replacement of 5 culverts • Building of new bridge deck with treated 6x6" boards • Application of 2RC for 1.339 miles of road	
			Landrus Rd	Application of 2RC for 7.7 miles of road	
			Gamble Run - Reynolds Spring Rd		
			Colton Rd		
			West Rim Rd	• Replacement of 22 culverts • Application of 2RC for 11.792 miles of road	
		20	Cascade Rd	• Application of 2RC	$47,178.15
			Hagerman Rd	• 1R bridge replacement	

The DCNR satisfies the requirements for the NPS Secretary to approve the conversions. The Pennsylvania statewide comprehensive outdoor recreation plan ("SCORP") has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The SCORP specifically identifies a recommendation to "develop and implement shale-gas best practices for recreation and pursue new recreation opportunities." Ongoing coordination has occurred among the DCNR, shale operating gas companies, engineers, and permitting agencies to reduce the footprint of gas development from upstream, mid-stream, and downstream facilities. Ongoing coordination and further development of BMPs and guidelines will continue to enhance how gas-related drilling will be accomplished in accordance with the SCORP.

Second, the DCNR is proposing to acquire a 978.05-acre property, referred to as the Strawbridge 2 property, in Chester County as replacement land for the 138.37 acres of natural gas-related conversions on state forest land (see location maps in Appendix B). A Yellow Book appraisal determined that the state forest land impacted by the conversions has a total market value of $625,000 (see appraisal in Appendix C). The Strawbridge 2 property was appraised at more than $13,000,000 and, therefore, will adequately provide more than enough value. The Strawbridge 2 property will be an addition to the Commonwealth-owned and DCNR managed White Clay Creek Preserve and will provide passive recreation such as hunting, hiking, and wildlife watching activities allowed on state forest land. While the Strawbridge 2 property is not in the immediate region where the conversions occurred, it is located in a region with a higher population density and more limited publicly accessible lands. The property will be maintained by the DCNR Bureau of State Parks.

I. PROPOSED ACTION

The DCNR is proposing to convert multiple portions of LWCF properties within state forests and replace them with the Strawbridge 2 property. A comprehensive table listing the conversion sites, converted acreage, and recreation loss is included in Appendix D. The proposed federal action is to approve this conversion after consideration of its compliance with the Pennsylvania SCORP and the recreational usefulness, location, and appraised fair market value of the conversion properties and their proposed replacement.

2. PURPOSE AND NEED

The purpose of the proposed action is to resolve the LWCF conversions of 17 natural gas sites and 2 associated roads on state forest land with the acquisition of the Strawbridge 2 property in Chester County. The proposed action is needed to comply with NPS guidelines for LWCF-funded sites in which land converted to non-recreational uses must be replaced with land of equal or greater value and recreational usefulness. Failure to resolve the conversions would put DCNR out of compliance with federal program requirements and make it potentially ineligible to receive additional LWCF funding.

3. ALTERNATIVES CONSIDERED

The DCNR considered three alternatives in assessing the conversions from recreational use of LWCF land. The first alternative was the "no action" alternative in which the sites with conversions would remain out of compliance with LWCF guidelines. The second alternative was to remove the infrastructure that caused the conversions to make the sites non-compliant. The third, preferred, alternative was to replace the converted land and its recreational usefulness.

The "no action" approach would not resolve the state's outstanding conversions and therefore not meet the purpose and need of the proposed action. Removing infrastructure would not be a prudent or feasible alternative considering the DCNR's oil and gas leases grant its lessees the right to place structures on the leased premises for the purpose of exploring, drilling, operating, producing, and extracting natural gas. The removal of infrastructure would necessarily require the DCNR to breach the terms of its existing oil and gas leases as said leases grant the DCNR the right to demand the removal of infrastructure only when the lease has terminated. Accordingly, the DCNR has chosen to replace the converted land and its recreational usefulness by purchasing the Strawbridge 2 property as replacement land.

4. ENVIRONMENTAL IMPACTS – CONVERTED SITES

The converted sites are referenced in Table 3. The NPS' Proposal Description and Environmental Screening Forms ("PDESF") for the conversion sites are provided in Appendix E. The environmental impacts for the Strawbridge 2 property can be found in the Environmental Assessment document prepared for the acquisition of the Strawbridge 2 property (Appendix F).

Table 3. This table presents the conversion sites from recreational use on LWCF-funded state forest land. Total state forest acreages and LWCF state forest acreages below are the totals for the five LWCF areas that contain conversions.

Converted Site	Acreage Converted	State Forest	State Forest Acreage Remaining (by Forest District)	LWCF State Forest Acreage Remaining (by Forest District)	% LWCF State Forest Acreage Converted (by Forest District)
Tract 324 Pad A	6.25	Moshannon	190,024.75	60,049.32	<1%
Tract 259 Pad B	3.88	Sproul	305,433.61	208,957.31	<1%
Tract 706 Pad 10	8.07				
Tract 284 Pad A	4.44				
Tract 100 Pad N	7.54	Loyalsock	114,450.33	54,396.85	<1%
Tract 100 Neuman Field Impoundment	(included with Neuman Field Compressor)				
Tract 100 Pad G	5.22				
Tract 100 Pad P	12.39				
Tract 100 Neuman Field Compressor	18.20				
Tract 100 Pad T	20.13				
Tract 100 Pad P Impoundment	(Included with Pad P)				
Tract 100 Pad R	8.65				
Tract 154 Pine Hill Impoundment	0.48	Susquehannock	264,985.91	212,656.51	<1%
Tract 154 Pad A	1.47				
Tract 997 Pine Hill Compressor	0.77				
Tract 154 Impoundment A	2.05				
Tract 594 Pad 3	9.32	Tioga	161,880.68	63,751.33	<1%
New or relocated roads associated with the above sites (DEP permits and environmental screenings were not conducted for these; therefore, limited information is available)					
Brown Road Relocation	0.85	Loyalsock	114,450.33	54,396.85	<1%
New Tract 100 Road to Pad N	28.66				
Total	**138.37**		**1,036,775.28**	**599,811.32**	**<1%**
			1,036,913.65	599,949.69	
			Total State Forest Acreage Before Conversions	Total State Forest LWCF Acreage Before Conversions	

I. Recreation

Recreational activities and opportunities at the converted sites included hunting, hiking, and wildlife watching. Impacts to recreational activities such as scenic driving, hunting, hiking, and primitive backpacking experienced the greatest temporary impacts from natural gas exploration in state forests due to restricted roads and access to certain areas of the forest where gas development occurred. Impacts depended on the visitors' activity and location within the state forest as well as their expectation of a particular experience.

The BOF conducted surveys of forest users following natural gas development to determine impacts to recreational users. The surveys concluded that the majority of recreational forest users reported that natural gas activity had not affected their use of the forest (see Visitor Use Monitoring Reports in Appendix G). Recreational forest users who indicated that natural gas activity did impact their use of the forests identified closed roads, limited access to certain areas, and truck traffic as the most common concerns.

Temporary road closures occurred solely for the safety of the public. Road access limitations were assessed, and action was taken on a case-by-case basis by the District Forester. Drilling periods on any given well site were estimated to last three to four weeks under normal conditions. If roads were temporarily closed to vehicle traffic during the active drilling period, they were reopened upon completion. Access roads to well pads are considered gated administrative roads; however, these roads are always open to foot travel.

Prior to natural gas infrastructure construction, DCNR implemented buffers to protect trails and recreational features, including a 200-foot setback from leased forest camps (now 500 feet according to Act 13, effective 2012). Details pertaining to these avoidance measures can be found in the BOF's Guidelines for Administering Oil and Gas Activity on State forest lands in Appendix H.

State Forest Hiking Trails were subject to a 300-foot "non-development" buffer on both sides of the trail. Any proposed disturbance activity within a State Forest Hiking Trail buffer zone required written approval from the District Forester prior to commencement. Waivers were also required for impacts to District Hiking Trails. Tract 594, Pad 3, was granted a waiver to the operator for use of the Fisher Trail (a District Hiking Trail). The access road to the well pad was constructed to utilize a portion (450 feet) of the existing trail. This was done to avoid greater impacts to the forest for the appropriate road geometry and the required tie-in placement on a Pennsylvania Department of Transportation ("PennDOT") road. The Fisher Trail was relocated just below the well pad access road during construction, which maintained a vegetative buffer between the road and trail. When the pipeline was constructed to the pad adjacent to the access road, the Fisher Trail was relocated in the pipeline right-of-way, thereby allowing the trail to be relocated almost exactly to its original location.

Historically, the BOF designated relevant areas of special concern, in addition to non-development areas, in oil and gas leases. Additional areas of special concern were identified within state forests and were mapped with the use of Geographic Information Systems ("GIS") based on ecological resources, aesthetics, steepness, high timber values, important viewsheds, and recreation. This mapping was part of the State forest Environmental Review ("SFER") process implemented by the BOF when leasing tracts of state forest lands for oil and gas extraction (see SFERs, leases, and mapping in Appendix I).

BOF also utilizes the Recreational Opportunity Spectrum ("ROS") to make and communicate management decisions that are transparent, credible, and compatible with state forest management goals. The ROS delineates certain recreational experiences available to a forest user based on current, existing surface use. Two such delineations exist with those areas designated by ROS as Semi-Primitive Non-Motorized. Areas designated as primitive or semi-primitive non-motorized have been zoned "non-development" (2,856 acres) or "area of special consideration" (7,546 acres), thereby protecting these unique recreational experiences (see Appendix H, Oil and Gas Guidelines 2016). These areas were avoided when siting natural gas infrastructure; therefore, none of the gas development sites impacted these unique recreational experiences.

II. Natural

a. Wetlands and Watercourses

Table 4 shows the wetlands and watercourses that were identified at each site prior to natural gas development (see wetland and watercourse reports in Appendix J). For sites that did not have a formal wetland/watercourse identification and delineation report provided, the approved DEP permits (Appendix K) and National Wetlands Inventory (NWI) were used as reference in this report. Wetland and

watercourse delineations were conducted by the gas operators. For some sites where the gas industry lessees did not conduct formal wetland and watercourse identifications, a presence/absence field view method was used to complete the DEP permits.

The DCNR required all infrastructure to be constructed beyond 200 feet of any watercourses and wetlands; however, waivers could be requested for unavoidable impacts. Wetland mitigation in the form of replacement wetlands was required for any unavoidable on-site wetland impacts, in accordance with Pennsylvania Code Title 25, Chapter 105, Dam Safety and Waterway Management Regulations (25 Pa. Code § 105 and 40 CFR § 230 – Section 404(b)(1) – Guidelines for specifications of Disposal Sites for Dredged or Fill Material. Tract 324 Pad A required the construction of a new wetland adjacent to the well pad to mitigate for permanent impacts to four wetlands on the pad site.

Table 4. Wetlands and watercourses present at each natural gas conversion site and impacts.

Site	Wetlands	Wetland Impacts	Watercourses	Watercourse Impacts
Tract 324 Pad A	Four PEM wetlands - 0.035 acre total	All 4 wetlands were permanently impacted. Mitigation was required. A new wetland of equal size was constructed adjacent to the well pad.	None	N/A
Tract 259 Pad B	None	N/A	None	N/A
Tract 706 Pad 10	None	N/A	None	N/A
Tract 284 Pad A	None	N/A	None	N/A
Tract 100 Pad N	One 0.01-acre POW	No impacts	None	N/A
Tract 100 Neuman Field Impoundment	None	N/A	None	N/A
Tract 100 Pad G	None	N/A	None	N/A
Tract 100 Pad P	None	N/A	None	N/A
Tract 100 Neuman Field Compressor	None	N/A	None	N/A
Tract 100 Pad T	None	N/A	None	N/A
Tract 100 Pad P Impoundment	None	N/A	None	N/A
Tract 100 Pad R	None	N/A	None	N/A
Tract 154 Pine Hill Impoundment	None	N/A	None	N/A
Tract 154 Pad A	None	N/A	None	N/A
Tract 997 Pine Hill Compressor	None	N/A	None	N/A
Tract 154 Impoundment A	None	N/A	None	N/A
Tract 594 Pad 3	None	N/A	None	N/A
Brown Road Relocation	None	N/A	None	N/A
New Tract 100 Road to Pad N	None	N/A	Haggerman Run	Unknown

b. *Floodplains*

There were/are no Federal Emergency Management Agency ("FEMA")-regulated 100-year floodplains within any of the conversion sites or within 300 feet thereof; therefore, there were no impacts to floodplains.

c. *Threatened and/or Endangered Species*

Pennsylvania Natural Diversity Inventory ("PNDI") reviews were conducted for each site prior to construction (Appendix L). Table 5 presents any potential threatened and/or endangered species conflicts that were identified. Impacts to threatened and/or endangered species were avoided by conducting species presence/absence studies as well as by implementing time-of-year restrictions and avoidance measures.

Table 5. PNDI results for each natural gas conversion site and measures taken.

Site	PNDI	Measures	Impacts
Tract 324 Pad A	PFBC – Timber Rattlesnake (PA candidate)	Field assessment and presence-absence survey conducted – no snakes or denning habitat	None
Tract 259 Pad B	PFBC – Timber Rattlesnake	Avoidance measures implemented	None
Tract 706 Pad 10	No potential impacts	N/A	None
Tract 284 Pad A	PFBC – Timber Rattlesnake	Avoidance measures implemented	None
Tract 100 Pad N	PFBC – Timber Rattlesnake	Avoidance measures and timing restrictions implemented	None
Tract 100 Neuman Field Impoundment	No potential impacts	N/A	None
Tract 100 Pad G	No potential impacts	N/A	None
Tract 100 Pad P	PFBC – Timber Rattlesnake	Avoidance measures and timing restrictions implemented	None
Tract 100 Neuman Field Compressor	No potential impacts	N/A	None
Tract 100 Pad T	PFBC – Timber Rattlesnake	Avoidance measures and timing restrictions implemented	None
Tract 100 Pad P Impoundment	PFBC – Timber Rattlesnake	Avoidance measures and timing restrictions implemented	None
Tract 100 Pad R	PFBC – Timber Rattlesnake	Avoidance measures and timing restrictions implemented	None
Tract 154 Pine Hill Impoundment	No potential impacts	N/A	None
Tract 154 Pad A	No potential impacts	N/A	None
Tract 997 Pine Hill Compressor	No data		
Tract 154 Impoundment A	No potential impacts	N/A	None
Tract 594 Pad 3	No potential impacts	N/A	None
Brown Road Relocation	No data		
New Tract 100 Road to Pad N	(included with Pad N PNDI)		

d. *Geologic Resources: Soils, Bedrock, Slopes, Streambeds, Landforms, etc.*

Secondary source data were referenced to determine the presence of any Outstanding Scenic Geologic Features of Pennsylvania. The PNDI system incorporates all Outstanding Scenic Geologic Features of Pennsylvania in the database search. No Outstanding Scenic Geologic Features were present at the conversion sites.

Steep slopes were avoided to further minimize impacts to erosion and sedimentation of soils. There were no permanent or temporary impacts to scenic geologic resources or steep slopes at the conversion sites. The compaction of soil and relocation of topsoil occurred on 138.37 acres as part of gas development on the conversion sites. Further disturbance from erosion and sedimentation was avoided through the approved Erosion and Sedimentation Control Plans.

One site, Tract 100 Pad N, had a documented diesel fuel spill during construction of the well pad. Approximately 67 tons of contaminated soil were excavated to remediate soil impacts from the spill. The DEP issued a remediation clean-up approval for this site following the remediation efforts (Appendix K).

e. *Land Use/Ownership Patterns*

The converted land is owned by the Commonwealth of Pennsylvania, acting by and through the DCNR. The state has not given up ownership of the surface; it has leased the sites for natural gas extraction. For the duration of time that gas infrastructure remains on the converted sites, they are less conducive to traditional, forest-based, and non-motorized recreational use. Most of the conversion sites were

previously forested prior to the construction of the natural gas infrastructure. Some sites were previously cleared due to historic uses such as farming, timbering, and conventional gas extraction, which occurred prior to LWCF assistance. Surrounding land is still used for forestry purposes and recreation.

f. *Hazardous, Residual, or Municipal Waste Sites*

There were no historical uses identified at any of the sites that would require any waste studies. The land at these sites was previously undeveloped forest land or historically farmed, timbered, or used for conventional gas wells. There were no identified waste sites or concerns at any of the sites prior to construction; therefore, there were no impacts. DEP files disclosed that Tract 100 Pad N had a documented diesel fuel spill during construction of the well pad. Approximately 67 tons of material were excavated to remediate soil impacts from the spill. The spill was properly remediated, and the DEP issued a remediation clean-up approval (Appendix K).

g. *Forest/Vegetation*

The majority of the converted sites were previously forested. Species identified included white oak, red maple, red oak, mountain laurel, chestnut oak, sassafras, tulip poplar, aspen, sumac, ferns, walnut, hickory, beech, and cherry. When possible, the BOF encouraged siting gas infrastructure in less productive forest areas with lower-quality vegetation. The BOF strategically chose the leased areas to concentrate existing infrastructure and minimize environmental impacts by avoiding wild and natural areas, important ecosystems, water bodies, areas with significant recreational opportunities, or visual impacts from vistas and trails (see SFERs and leases in Appendix I).

The 138.37 acres of areas cleared for well pads impacted trees and other vegetation. Some areas have been revegetated with grasses and wetland plants in stormwater-control facilities. Restoration plans will be implemented on pad sites when the productive life of the well, as defined by the lease, is reached. Specific lease terms describe the Lessee's responsibility to restore these sites (see lease agreements in Appendix I).

In certain instances, forest mitigation efforts were requested by the District Foresters. For example, at Tract 100 Pad T, the District Forester requested that restoration measures include tree and shrub plantings on the extensive cut and fill slopes.

h. *Air Quality*

Given the rural location of the conversion sites, they do not exist within counties identified as non-attainment areas for criteria air pollutants; meaning that the Clean Air Act standards established by the U.S. Environmental Protection Agency ("EPA") are met in all counties where the conversion sites are located.

The use of machinery and/or heavy equipment produces emissions such as carbon monoxide, nitrogen oxide, and sulfur dioxide. Equipment operated or transported along dirt/gravel roads and/or pad sites may have resulted in temporary increases in dust and/or particulate matter. Temporary air quality impacts most likely resulted during gas well pad construction and drilling.

The Tract 100 Neuman Field Compressor Station and Tract 997 Pine Hill Compressor Station are both powered by electricity, natural gas, or a combination thereof (e.g., gas-powered generators) as operating fuel. These compressors are housed within a shed-like structure and estimated by DEP to meet the required Clean Air Act of 1963 (42 U.S.C. § 7401) and Pennsylvania Air Pollution Control Act (35 P.S. § 4005) regulations.

The potential emissions resulting from all phases of natural gas exploration, development, and production were assumed to not cause non-attainment status for those counties. Forest District procedures required the use of water and/or other similar suppression mechanisms/treatments on a periodic basis to greatly reduce dust levels (Oil and Gas Guidelines, Appendix H).

i. *Noise*

The BOF has applied the Federal Energy Regulatory Commission's ("FERC") concept of "Noise Sensitive Areas" to state forest lands to maintain the recreational expectations and experiences of forest users. Noise from construction could have temporarily impacted people recreating in the state forests, which is considered a Noise-Sensitive Area ("NSA") and may have altered their recreational experience.

Through standard practice, construction and well drilling were restricted during peak use times for holidays, select hunting seasons, select fishing seasons, and other special use activities on state forest lands to avoid adverse impacts (Oil and Gas Guidelines, Appendix H). Once the well drilling was completed, noise generation on well pads most likely ceased. Temporary impacts most likely included increases in noise levels as a result of construction of well sites, roads, pipelines, well drilling, seismic surveys, and truck traffic. Adverse impacts from an increase in noise levels depended on distance from the noise source, weather, topography, vegetation, and the tolerance level of a state forest user. Compressor stations permanently impact noise levels within the forest given the infrastructure is permanent and the generators are constantly running.

The BOF implemented noise abatement procedures based on the FERC noise guidelines which are based on the EPA's determination that an L_{dn} ("day-night sound level) of 55 dB(A) (decibels on the A-weighted scale) protects the public from indoor and outdoor activity noise interference. Therefore, the threshold for noise within NSAs was an L_{dn} of 55 dB(A). The L_{dn} is measured as the 24-hour-equivalent sound level (L_{eq}) plus 10 decibels on the A-weighted scale added to nighttime levels to account for people's greater sensitivity to nighttime sound levels (between 10 pm and 7 am). The A-weighted scale is used because human hearing is less sensitive to low and high frequencies than mid-range frequencies.

Noise levels were considered throughout the well location approval process by the appropriate program area(s) within the BOF. Wherever possible, wells were located in a manner to alleviate temporary increases in background noise levels in high-use areas such as state forest picnic areas (see SFERs in Appendix I).

A recent study conducted by the Pennsylvania State University concluded that recreational users of state forests consider noise levels from compressor stations and other natural gas activities of less than 54.99 dB(A) as not adversely impacting their recreational activity. The Shale Gas Monitoring Report, July 2018 documents the quantitative noise monitoring studies conducted for post-construction conditions associated with the Tract 997 Pine Hill Compressor and the 100 Nueman Field Compressor referred to as 100-Hagerman in the Shale Gas Monitoring Report (see Appendix A).

j. *Lighting*

Prior to natural gas exploration, no lighting sources existed within the state forest boundaries except from nearby towns or cabins/camps. State forest recreational users were likely minimally impacted by temporary lighting during the drilling process. Permanent exterior lighting was not permitted at pad sites per DCNR guidelines. Natural gas drilling is a 24-hour per day activity that requires proper illumination for the health and safety of the drilling crews. However, on state forest lands, gas operators were required to use downward-directed fixtures, advanced lighting technologies, and on/off switches or motion

detectors that activate light only when needed to reduce temporary impacts (Oil and Gas Guidelines, Appendix H).

Well flaring was used occasionally as part of the production process, and the BOF determined that flaring was minimal at the conversion sites. During a flare, a vertical stack is placed away from the wellhead, and any produced gas is burned. Flares produce a flame which can be visible for miles, depending on the location, and are burned for a period of up to two weeks. Coordination with the operator(s) was required to minimize or eliminate light-induced impacts during programmed Dark Sky events (SFER, Appendix I).

III. Cultural

a. *Aboveground Historic Resources*

The "Guidelines for Administering Oil and Gas Activity on State Forest Lands, 2016" clearly states DCNR's approach to well pad site selection, including the review of cultural resources. Background research for known cultural sites was completed through the review of the Pennsylvania Historic and Museum Commission's (PHMC) Cultural Resource Geographic Information System (CRGIS) data as well as the National Register of Historic Places' database. Furthermore, a field view was completed by the project applicant's design team to identify potential cultural sites. Any potential resources were coordinated with the PHMC to identify potential impacts.

The well pad site permit application packages as authorized by the DEP, contain the documentation as provided in Appendix K. Within the permit package, applicants completed the "Coordination of a Well Location with Public Resources" page. This page documents, "Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places." There are no aboveground historic resources present; therefore, there are no impacts.

b. *Archaeological Resources*

A similar screening process was implemented to determine the potential for archaeological resources when leasing tracts of land. All-natural gas infrastructure was sited in areas determined to have no or low probability for archaeological resources. Clearance for archaeological resources was obtained for each site by the operators during the DEP permitting process (Appendix K). There are no archaeological resources present; therefore, there are no impacts. Preliminary investigation was completed under state law requirements, and NPS will be initiating section 106 consultation separately. The 106 process will be concluded prior to NPS issuing a NEPA decision document, see Appendix M.

IV. Socioeconomic

a. *Environmental Justice Populations*

Analysis of the DEP's eMap PA application did not identify any environmental justice populations in proximity of any of the conversion sites. There are no environmental justice populations present; therefore, there are no impacts.

5. CUMULATIVE IMPACTS

Cumulative impacts are direct and indirect environmental impacts caused by the combined results of past, current, and future activities. Past activities at the converted sites included active forest

management and passive recreation such as hunting, hiking, and wildlife watching. Current activities at the sites include natural gas extraction. Natural gas extraction is also a planned future use for these sites over the productive life of the gas wells.

Cumulative impacts due to natural gas extraction may include the loss of recreation land, fragmentation of core forest, and loss of habitat. By BOF guidelines, passive recreation (such as hiking, hunting, and wildlife watching) can still occur in areas of natural gas development with the exception of areas from which the public is restricted due to valid operational or public safety concerns. These relatively limited areas are often signed and/or fenced or locked. However, anything outside of these restricted areas is accessible to the public**.**

Prior to natural gas infrastructure construction, the DCNR implemented buffers to protect trails and recreational features, including a 200-foot setback from leased forest camps (now 500 feet according to Act 13 of 2012). In addition, state forest roads and trails were subject to a 300-foot "non-development" buffer on each side. Any proposed disturbance activity within a State Forest Hiking Trail buffer zone required written approval from the District Forester prior to commencement. While the recreational experience may have changed due to gas development, these activities also gave rise to alternate uses which may enhance the experience of some recreational users. For example, wildlife watchers and hunters may experience an increase in the frequency and diversity of the wildlife present in newly created herbaceous openings. Through proper planning and site management, efforts are made to maintain – or even increase – the level of biodiversity located in Pennsylvania's state forests. Overall, the impact to recreational use of state forests is minimal. The total State Forest acreage lost due to natural gas extraction is <1% of the total forest acreage within each forest district. Compared with the overall size of the state forests, the recreational opportunity areas of the state forests have been minimally impacted.

The BOF also promotes core forest conditions across the entire state forest system while balancing other uses and values. Core forests can be defined as large tracts of intact forests with minimal fragmenting features. An analytical tool, the Connecticut Center for Land Use Education and Research ("CLEAR"), is used by the DCNR to examine landscape fragmentation. The CLEAR tool uses a 100-meter distance to delineate edge effect. According to the CLEAR tool, core forest designations have decreased by less than one percent from pre-Marcellus conditions to December 2016. The BOF also currently utilizes a Core Forest Analysis Tool to delineate landscape units, which represent the most extensive and exceptional core forests and unfragmented areas in the state forest system. These designations assist in the inventory, management, maintenance, and monitoring of the most significant core forest lands in the state forest system conserving the ecological values associated with interior forest conditions and unfragmented landscapes. These designated areas serve as a means to ensure the appropriate balancing of these ecological values in landscape-level forest management decisions. The utilization of these tools helps to ensure that there are still many core forest areas within the state forests where the public can recreate and not encounter natural gas infrastructure.

Despite the Marcellus Shale gas development activity, the DCNR has maintained its national and world-wide recognition as a sustainably managed forest. In review of the 2011 Forest Management Audit Report prepared by the Rain Forest Alliance – SmartWood Program, a corrective action recommendation ("CAR") was suggested for the BOF to "evaluate short term environmental impacts and their cumulative effects prior to commencement of management activities in the 2011 audit" (Forest Management 2011 Annual Audit, Appendix N). The Forest Stewardship Council ("FSC") sets standards for responsible forest management. The 2011 FSC audit determined the 2008, 2009, and 2010 cumulative impact assessment to be insufficient in regard to non-listed species, as related to forest loss and fragmentation on the subject

leases. The reference is specific to species that depend on large, non-fragmented blocks of forest (Forest Management 2011 Annual Audit, Appendix N). Short-term and cumulative impacts to groundwater were also identified as insufficient as they only focused on preventive measures in the BOF Environmental Review. In response to the FSC's Comments for Corrective Action Requests, the DCNR noted that the state forest environmental review ("SFER") was developed as an early planning tool which considers/ incorporates data which are useful at larger scales. More detailed evaluations are conducted by BOF staff for individual project sites prior to commencement. Considering the SFER process, on-the-ground reviews and assessments, research, and the BOF's monitoring program, the CAR was resolved and the DCNR's FSC certificate was renewed. Ultimately, cumulative impacts to the state forests as a result of natural gas activity were determined by the FSC to be de minimis.

Moreover, the BOF attempts to decrease forest fragmentation by co-locating facilities, utilizing existing roads, and utilizing previously cleared areas; however, when looking at an aerial image of the forests, some fragmentation due to gas development has occurred. Likewise, the BOF avoided critical habitat areas when siting gas infrastructure, but cleared areas that are multiple acres in size still greatly reduced habitat for some species. Conversely, forest clearing has also provided more fringe and edge habitat for other species. In some cases, rocks, tree stumps and other vegetation removed from well pad sites were pushed to the edges of the pads to create habitat primarily for timber rattlesnakes. The edge effects do benefit songbird species (including the golden-winged warbler) that live in shrubby vegetation associated with edge habitat (Brittingham 2019).

Continued planning efforts by the DCNR through geographic analysis of specific forest and wildlife habitat will be the best approach to continue to reduce forest fragmentation, where additional pad sites are permitted. Coordination with forest district staff for gas pad site locations and utilization of existing travel corridors will be the BMPs available to further reduce impacts to core forests.

An increase in forest disturbance, fragmentation and traffic on state forest roads has increased the potential spread of non-native invasive plant species into interior forest or wetland habitats that were once less likely to be invaded. The BOF has been actively monitoring and managing the spread of invasive species as outlined in the Shale Gas Monitoring Report (Appendix A). Invasive plant species management has been, and will continue to be, a priority for monitoring and eradication of invasive species on the converted gas pads. An aggressive strategy has been developed between the lessee of the gas infrastructure and DCNR Bureau of Forestry District staff to inventory, survey, document, and report the invasive species. In the event an invasive species is identified on a site, the process to treat and eradicate the species will begin, with continued monitoring for up to 12 years. Eradication is considered complete when the invasive species has been successfully removed for three consecutive years.

6. COORDINATION AND OUTREACH

I. Agency Coordination

Agency coordination was completed with the U.S. Fish and Wildlife Service ("USFWS"), Pennsylvania Fish and Boat Commission ("PFBC"), Pennsylvania Game Commission ("PGC"), DCNR, and the State Historic Preservation Office ("SHPO") as part of the gas site permitting process with DEP during development of the gas infrastructure. In addition, extensive coordination with the NPS has occurred throughout the development of this environmental assessment.

II. Public Outreach

Between 2009 and 2013, the DCNR BOF conducted extensive public outreach and education related to unconventional natural gas well development on state forest lands. This included presentations, meetings, and tours. Tours of the natural gas development were given for interested parties. Approximately 20 tours per year were conducted between 2009 and 2013 (Appendix O).

The Environmental Assessment (EA) document was posted on the PA Bulletin for review and public comment from May 4 to June 18, 2019. Thirty-eight (38) comments emails and letters were received from the public during the public comment period. All comments received are documented in Appendix P. No members of the public requested a public hearing. The responses to the public comments are included in Appendix P.

7. LWCF MITIGATION SITE – REPLACEMENT LAND

The Strawbridge 2 property in Chester County, Pennsylvania, is comprised of 978.05 acres of forest, agricultural fields, wetlands, and streams and will be utilized as mitigation for the 138.37 acres of conversion from recreational use on LWCF land within state forests. The Environmental Assessment document completed for the Strawbridge 2 property is included in Appendix F.

The Strawbridge 2 property was valued at just over $13,000,000. The total value of the 138.37 acres of natural gas conversion sites was appraised at $625,000 (Appendix C). The Strawbridge 2 property provides more than enough replacement land and fair market value for the lost recreational use areas of LWCF land within state forests. It also provides equivalent recreational usefulness. The recreational uses that will be replaced at the Strawbridge 2 property include hunting, hiking, and wildlife watching.

While the Strawbridge 2 property is not in the immediate region where the conversions occurred, it is located in a region that has experienced extensive deforestation and has a limited amount of publicly accessible land. By contrast, the counties where the conversions occurred have the highest concentration of both forestland cover and publicly accessible recreational lands in the Commonwealth.

References

Brittingham, Margaret. 2019. Marcellus Shale Electronic Field Guide, Ecological Concepts. Retrieved from the Internet [September 2019]. http://www.marcellusfieldguide.org/index.php/guide/ecological_concepts/

Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, Bureau of Forestry. 2016. Guidelines for Administering Oil and Gas Activity on State Forest Lands.

Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, Bureau of Forestry. 2018. Shale Gas Monitoring Report.

Federal Emergency Management Agency. 2018. Flood Map Service Center. Retrieved from the Internet [October 2018]. https://msc.fema.gov/portal/search.

Miller, Z.D., Ferguson, L.A., Newman, P., Ferguson, M., Tipton, N., Sparrow, V., & Taff, B.D. (2020). Developing visitor thresholds of sound from shale natural gas compressors for motorized and non-motorized recreation users in Pennsylvania State Forests. *Applied Acoustics*, 157, [107012]. http://doi.org/10.1016/j.apacoust.2019.107012

Rainforest Alliance, SmartWood Program. 2011. Forest Management 2011 Annual Audit Report for the Commonwealth of Pennsylvania, DCNR Bureau of Forestry.

Pennsylvania Department of Conservation and Natural Resources. 2018. Pennsylvania Geology. Retrieved from the Internet [October 2018]. http://www.gis.dcnr.state.pa.us/geology/.

Pennsylvania Department of Environmental Protection. 2018. eMap PA. Retrieved from the Internet [October 2018]. http://www.depgis.state.pa.us/emappa/.

Pennsylvania Fish and Boat Commission. 2018. Pennsylvania Trout Streams. Retrieved from the Internet [October 2018]. http://pfbc.maps.arcgis.com/apps/webappviewer/index.html?id=65a89f6592234019bdc5f095eaf5c6ac.

U.S. Fish and Wildlife Service. 2018. National Wetlands Inventory, Wetlands Mapper. Retrieved from the Internet [September 2018]. https://www.fws.gov/wetlands/data/Mapper.html.

REPRESENTATIVE PHOTOS FOR TRACT 324, PAD A

Photo 1 - View of Tract 324, Pad A facing northwest.

Photo 2 - View of Tract 324, Pad A.

REPRESENTATIVE PHOTOS OF TRACT 259, PAD B

Photo 3 - Tract 259, Pad B facing north.

Photo 4 - Existing view of two non-conventional wells.

REPRESENTATIVE PHOTOS OF TRACT 706, PAD 10

Photo 5 - View of access road.

Photo 6 - Undeveloped Tract 706, Pad 10 as of August 2018 with an access road leading to a private camp.

REPRESENTATIVE PHOTOS OF TRACT 284, PAD A

Photo 7 – Facing west at Tract 284, Pad A. The site did not contain any drilled wells as of August 2018.

Photo 8 – Overall view of cleared pad site and soil storage facing southwest.

REPRESENTATIVE PHOTOS OF TRACT 100, PAD N

Photo 9 - View of Tract 100, Pad N.

Photo 10 – Tract 100, Pad N well heads.

REPRESENTATIVE PHOTOS OF TRACT 100, NEUMAN FIELD HOLDING POND

Photo 11 - View of Neuman Field holding pond, facing southeast.

Photo 12 - Neuman Field holding pond from within the compressor station fenced area.

REPRESENTATIVE PHOTOS of TRACT 100, PAD G

Photo 13 – Facing southeast at Tract 100, Pad G.

Photo 14 – Tract 100, Pad G well heads.

REPRESENTATIVE PHOTOS of TRACT 100, PAD P

Photo 15 – View of well heads on Tract 100, Pad P.

Photo 16 – Gas related infrastructure on Tract 100, Pad P.

REPRESENTATIVE PHOTOS OF TRACT 100, NEUMAN FIELD COMPRESSOR STATION

Photo 17 – View of Neuman Field compressor station.

Photo 18 - View of access road to compressors, facing southwest.

REPRESENTATIVE PHOTOS OF TRACT 100, Pad T

Photo 19 – Overall view of Tract 100, Pad T from the access road.

Photo 20 – View of infrastructure on Tract 100, Pad T.

REPRESENTATIVE PHOTOS OF TRACT 100, PAD P IMPOUNDMENT

Photo 21 – Former location of the Tract 100, Pad P Impoundment. It is currently a stormwater basin.

Photo 22 – Former Tract 100, Pad P Impoundment facing southwest.

REPRESENTATIVE PHOTOS OF TRACT 100, PAD R

Photo 23 – View of Tract 100, Pad R facing southwest.

Photo 24 – Tract 100, Pad R facing west.

REPRESENTATIVE PHOTOS OF TRACT 154, PINE HILL IMPOUNDMENT

Photo 25 – Reclaimed area of former impoundment, adjacent to a hunting camp.

Photo 26 – Herbaceous golden rod field at reclaimed impoundment site.

REPRESENTATIVE PHOTOS OF TRACT 154, PINE HILL PAD A

Photo 27 – Tract 154, Pine Hill Pad A facing southwest.

Photo 28 – View of existing infrastructure, facing northeast.

REPRESENTATIVE PHOTOS OF TRACT 154, PINE HILL IMPOUNDMENT A

Photo 29 – Reclaimed area of former impoundment.

Photo 30 – Reclaimed access road to the former impoundment.

REPRESENTATIVE PHOTOS OF TRACT 997, PINE HILL COMPRESSOR STATION

Photo 31 – Pine Hill Compressor sign on the access road.

Photo 32 – The compressor building and storage tank looking north from the access road.

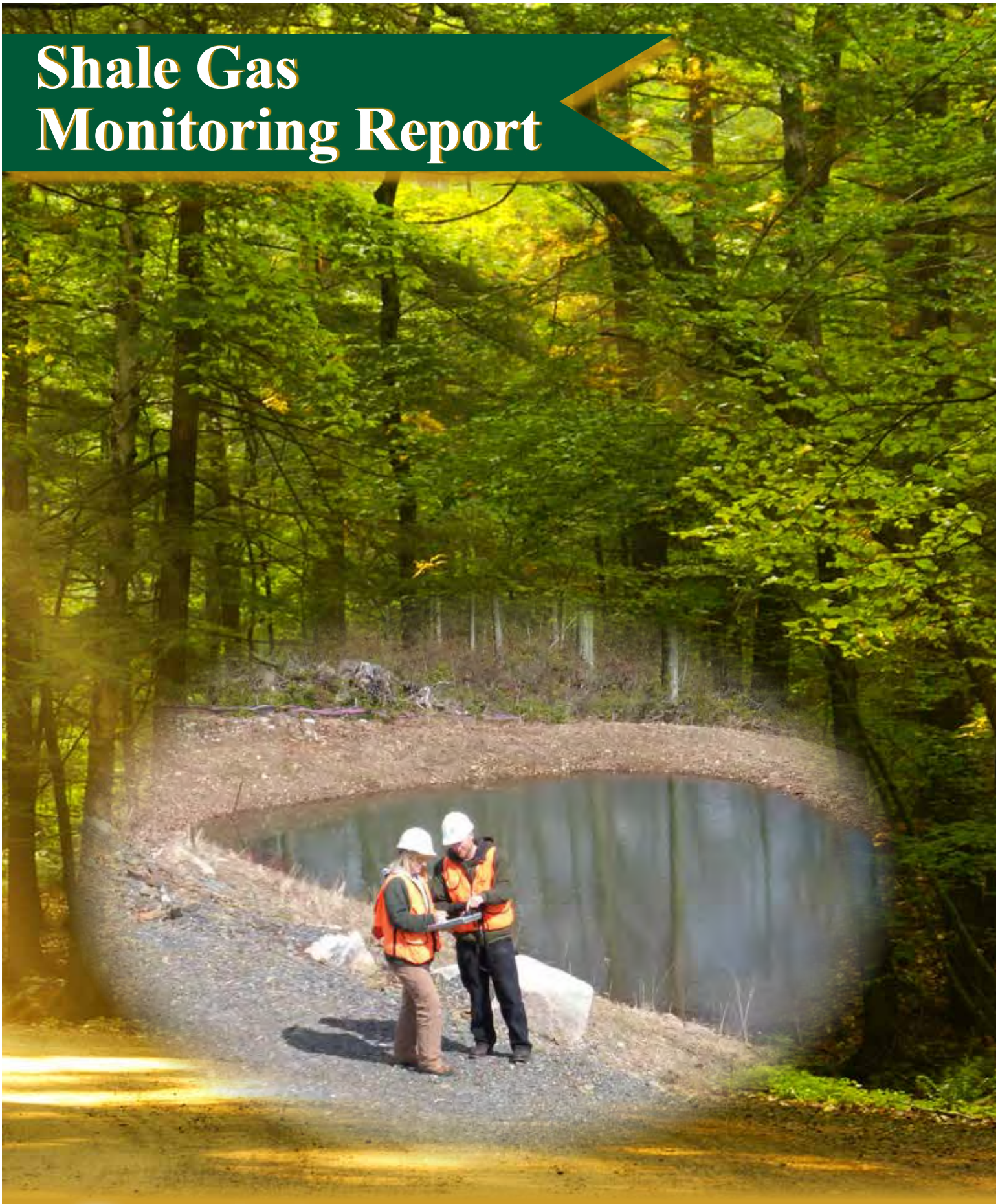
REPRESENTATIVE PHOTOS OF TRACT 594, PAD 3

Photo 33 – Pad 3 looking west from the access road.

Photo 34 – Pad 3 storage tank.

APPENDIX A
2018 Shale Gas Monitoring Report

Shale Gas Monitoring Report



pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

JULY 2018

Preface

Approximately eight years ago, DCNR Bureau of Forestry established a new program to monitor shale gas development activity on state forest lands. Monitoring, which can be defined as repeated measurements over time to determine trends or patterns, helps us as resource managers better understand the activity, how to best manage it, and its impact on other uses and values of the state forest system. Article 1 Section 27 of the Pennsylvania constitution affirms DCNR's role as a trustee of the commonwealth's public natural resources, charged with conserving and maintaining them for current and future generations.

Ensuring sound management of the natural resources on our state forests and park lands is one of the ways we carry out this responsibility. Using science to monitor how we manage our lands, specifically in the context of oil and natural gas development currently permitted on certain areas of our state forest lands, is an important way to assess the impacts of this activity and employ adaptive resource management to ensure natural gas is sustainably extracted and protections are in place to minimize impacts to our treasured state forests.

Since 2010, no new leases have been issued for natural gas development in state forests. In 2015, at the recommendation of the DCNR Secretary, this policy was formalized by Governor Wolf in an Executive Order. The Order stated that in order to protect the lands of the Commonwealth held in trust for its citizens and future generations no State Park and State Forest lands owned or managed by DCNR shall be leased for oil and gas development. None-the-less, significant tracts of state forest land remain subject to development due to severed mineral rights or leasing prior to 2011. Understanding the impacts of existing development, in order to inform our management approach going forward, is critical.

What follows is the second comprehensive shale gas monitoring report that represents significant efforts of Bureau of Forestry staff. The purpose of the report is to communicate our data and findings as objectively and credibly as possible to help our stakeholders and the public better understand the development that has taken place to date and target or adjust management accordingly.

This report builds off data and information from the 2014 Shale-Gas Monitoring Report. When possible, we compare the different time periods to illustrate changes and trends. While after more than eight years we can begin to see some trends, natural resource monitoring is a long-term endeavor, and it may take longer to discern other trends in resource change and conditions.

While we strive to report our data as objectively as possible, natural resource values are still a reflection of human values. How people view and interpret information can reflect their point-of-view. For example, people who value interior forest conditions or undeveloped recreational experiences might find an increase in road mileage troubling. However, people who value improved access might view the increase more positively. What we value reflects how we view information.

While each chapter contains a depth of information and data about the activity on state forest land, there are a few key learnings from the report that I'd like to highlight.

- Development has slowed considerably since the 2014 report, when we reported that approximately 1,425 acres had been converted for shale gas infrastructure. Since then, we are reporting a conversion of 334 acres. This is one of the primary indicators of development, and it demonstrates the decrease of activity on state forest land due largely to market forces and to a lesser extent the prohibition on new leasing.
- We need to continue to work to balance shale gas development with the full range of recreational experiences on state forest. While shale gas infrastructure can increase visitor access and improve roads and bridges, it can also have the potential to impact the recreational experiences of visitors who may seek more primitive, undeveloped recreational experiences.
- Invasive plants are of increasing concern as their presence and quantities are on the rise. Disturbed sites are ideal for the establishment of invasive plants that often emerge early in the spring and outcompete native plants through their rapid reproduction. The bureau is constantly on the look-out for invasive plants and prioritizing the control of these plants based on the species and population size.
- Water quality monitoring efforts by the bureau and its partners have not raised significant concerns on state forest headwater streams to date. However, these are still relatively short-term results and may not be indicative of long-term or cumulative effects that can only be detected through long-term monitoring efforts.
- We have thus far, through planning and careful siting, minimized forest fragmentation caused by additional shale gas infrastructure. Many areas of state forest subject to shale gas development are also valued from a statewide and regional level for interior forest conditions and habitat. As development proceeds under historic leases or where mineral rights are not owned by the commonwealth, we need to continue our efforts to minimize forest fragmentation.
- Shale gas development will be an activity on the state forest for many years to come. While there is currently a moratorium of the leasing of additional acres, many tracts of state forest are subject to gas activity through severed mineral rights ownership. Additionally, many state forest leased tracts are only built out by approximately 30 to 35 percent.

These are just a few observations from the report. There are many others, and I invite you to read the report and draw your own conclusions about how the activity affects the state forest system and the values or activities you care about most. We welcome your feedback and observations as we continue to adapt our management and monitoring practices to balance uses and values and sustain our forests for current and future generations.

Ellen M. Shultzabarger
Pennsylvania State Forester

Table of Contents

Executive Summary 3

Chapter I: Introduction 7

Chapter II: Gas Monitoring Program 20

Chapter III: Shale Gas Production and Administration 30

Chapter IV: Shale Gas Infrastructure and Shale Gas Development 43

Chapter V: Ecosystem Condition 78

Chapter VI: Forest Use: Wild Character, Recreation, and Community Engagement 147

Executive Summary

DCNR's mission is to conserve and sustain Pennsylvania's natural resources for present and future generations' use and enjoyment. DCNR's primary responsibility in managing state forest lands is to sustain their long-term health, viability, and productivity for current and future generations — maintaining what the public cherishes most about the forests of Pennsylvania; their natural beauty, serenity, and wildness that cannot be found in other residential, commercial, or industrial landscapes of the commonwealth. The DCNR Bureau of Forestry is broadly responsible for conserving the forests and native wild plants of the commonwealth. One of its most significant roles is to act, in the public trust, as stewards of the commonwealth's 2.2-million-acre state forest system. The bureau strives to balance and provide opportunities to experience the diverse, and often competing, uses and values of state forests.

The bureau strives to balance and provide opportunities to experience the diverse, and often competing, uses and values of state forests. The bureau's management is guided by its mission statement: *"...to ensure the long-term health, viability and productivity of the Commonwealth's forests and to conserve native wild plants."* Part of the bureau's mission is to accommodate the environmentally sound utilization of mineral resources on state forest land.

Shale gas development on state forest land in the Marcellus shale fairway began in 2008 with the lease of approximately 74,000 acres. The period between 2008-2012 was marked by the rapid exploration and development of Marcellus shale resources. Due to the quantity of natural gas being sent to market during this period, gas prices decreased leading to a marked slowdown in new development and infrastructure construction on state forest land during the 2013-2016 time period.

This second DCNR Shale Gas Monitoring Report summarizes the context, the extent, and the effects shale gas development has on the resources, uses, and values of state forest land.

Chapter I: Introduction

Oil and gas development has been part of state forest management since 1947.

- Since 1947, there have been 74 oil and gas lease sales resulting in more than 2,000 conventional and unconventional wells being drilled on state forest land.
- There are approximately 1,542,810 acres of state forest land in the Marcellus Shale fairway and some of this acreage has been leased for shale gas development.

- There are three types of oil and gas ownership on state forest lands: Severed Gas Rights (the commonwealth owns the surface rights, but a private interest(s) own the subsurface rights and the commonwealth must give reasonable access to exercise these rights); Leased Gas Rights (the commonwealth owns the subsurface rights and leases these rights to a private entity that is bound to the conditions of the lease agreement); and Non-leased Gas Rights (the commonwealth owns the subsurface rights and has not leased these areas to a private entity).
- The bureau uses a robust and comprehensive lease agreement along with its Guidelines for Administering Oil and Gas Activity on State Forest Land to manage gas activity on state forest land.
- As of 2016, current buildout of shale gas leases in the core forest districts is at approximately 30 to 35 percent.
- It is projected that at full buildout of current leased acreage for shale gas development in the core gas forest districts, there could be as many as 1,475 wells on state forest land.
- Since 2010, there has not been any additional leasing of state forest land for shale gas development.

Chapter II: Gas Monitoring Program

Monitoring is a long-term endeavor with a goal of tracking, detecting, and reporting on the effects of shale gas development on state forest lands in an integrated, comprehensive manner to provide credible information for improving management practices.

- DCNR put into place a shale gas monitoring program in 2011 that consists of an integrated monitoring team, on-the-ground management activities, and research and external partner collaborations.
- The program monitors a suite of values that were identified through the assistance of external advisory groups to identify the effects of oil and gas development on state forest land, inform management decisions, and develop best management practices for administering oil and gas development.
- The suite of 15 values include:

1 Water	9 Air
2 Plants	10 Revenue
3 Animals	11 Incidents
4 Invasives	12 Forest Landscapes
5 Soil	13 Forest Health
6 Recreation	14 Timber Products
7 Infrastructure	15 Energy
8 Community Engagement	

- In addition to the internal monitoring program, DCNR coordinates with the PA Department of Environmental Protection (DEP) for information regarding compliance with environmental regulations.

Chapter III: Shale Gas Production and Administration

Production of natural gas from state forest land has contributed to meeting energy demands of Pennsylvania and the U.S. and providing revenues to the commonwealth, but has placed a larger demand on the Bureau of Forestry in its administration of shale gas development.

- In 2016, Pennsylvania produced 5.26 Tcf of natural gas with 8.9 percent of that volume coming from state forest land.
- The revenues generated from gas development on state forest land is $1,162,510,774 between 1947 and 2016.
- Revenues are allocated to the Oil and Gas Lease Fund that is used to support numerous conservation programs and efforts within DCNR.

Chapter IV: Shale Gas Infrastructure and Landscape Effects

Accommodating shale gas development on state forest land has led to changes in the core gas forest districts (Moshannon, Sproul, Tiadaghton, Elk, Susquehannock, Tioga, and Loyalsock State Forests). Shale gas infrastructure is the most visible impact. Existing native vegetation is often cleared to build new roads, pipelines, and pads. Beyond the visual impact of clearing forest, shale gas infrastructure development can increase forest fragmentation, reduce the amount of core forest habitat, and alter the recreational experience of some forest users.

- Approximately 1,769.5 acres of state forest land have been converted from forest to shale gas infrastructure since 2008.
- Between 2013-2016, there were 333.9 acres converted from forest to shale gas infrastructure, 1,435.6 acres converted between 2008-2012.
- The reduction in conversion is attributed to the reduced amount of development activity from 2013-2016 as compared to the level of activity that occurred between 2008-2012.
- There has been an additional 9,913 acres of forest edge created, a reduction in the amount of large core forest blocks (forests greater than 200 hectares in size), and an increase in the amount of smaller forest blocks (forests 100-200 hectares and less than 100 hectares in size) from 2013-2016.
- Site rehabilitation has occurred on sites in the Moshannon, Sproul, Tiadaghton, Elk, Susquehannock, and Tioga State Forests.
- A demonstration site was constructed in the Tiadaghton State Forest through a partnership with researchers from Penn State to test and better understand how different site preparation techniques, seed mixes, and tree and shrub plantings influence site rehabilitation.

Chapter V: Ecosystem Condition

The bureau monitors for changes and impacts to state forest water, air, soil, flora, wildlife, and forest health related to gas development. Changes in each of these facets of forest ecosystems can provide indications of effects to forests due to natural gas development.

- The bureau implements a robust water quality monitoring program on state forest land and partners with DEP, the Susquehanna River Basin Commission (SRBC), and the U.S. Geological Survey (USGS).

- Over 85 percent of streams in the core gas forest districts are classified as Exceptional Value (EV) or High Quality (HQ).
- In response to stakeholder feedback and recommendations, Bureau of Forestry

monitoring staff has been certified to collect macroinvertebrates for monitoring water quality.

- Water chemistry analysis from continuous water monitoring and the widespread monitoring efforts do not suggest that at the monitored sites, shale gas development has impacted water quality.
- Follow-up surveys by DEP have been scheduled on streams where the bureau measured Index of Biological Integrity (IBI) score was outside of precision ranges.
- The number of invasive plant species found on High Gas Traffic roads that were monitored increased from eight species in 2012 to 13 species in 2016.
- On gas related rights-of-way in the core gas forest districts, the most abundant invasive plant species (based on average percent cover) were Japanese stiltgrass, crown-vetch, tall fescue, and Canada thistle.
- Of the 238 infrastructure pads monitored, only 29 (12.1 percent) were found to be free of invasive plants. The most common invasive plant species found on infrastructure pads were bull thistle, crown-vetch, and spotted knapweed. Once populations of these species are established, their seeds can rapidly spread to access roads and new pad sites.
- Implementation of the Early Detection and Rapid Response program has detected 71 populations of high-threat invasive plants.

Crown Vetch.

Chapter VI: Forest Use: Wild Character, Recreation, and Community Engagement

State forest land continues to provide a diverse range of uses and experiences for forest users. Because state forest land has many uses, the bureau strives to balance and manage the differing activities, values, and experiences. Recognizing that shale gas development has the potential to affect forest users, the bureau's shale gas monitoring program uses several metrics to quantify features that can serve as indicators.

- The bureau monitors the public's use and experiences on state forest land through the Visitor Use Monitoring survey. 15.5 percent of respondents reported that shale gas activities have affected their use of state forest land and 18.7 percent reported it affected their experience.
- Bureau of Forestry comment card responses indicate that traffic, dust, litter, and a general increase in activity on previously isolated/ uncrowded places is a concern.
- In the core gas forest districts, approximately 14.1 miles of non-motorized trails have been directly affected by the placement of gas infrastructure and 105.5 miles have infrastructure located within 400 feet.
- Between 2013-2016, approximately 140.5 miles of snowmobile trails have been closed due to plowing for gas related vehicular traffic.

These are but a few highlights of the information contained in this second comprehensive Shale Gas Monitoring Report. In the years to come, the bureau will continue to faithfully manage and monitor the resources, uses, and values of state forest lands in relation to shale gas development, and all other state forest land uses, and will continue to effectuate its mission in accordance with its trustee responsibilities for the benefit of present and future generations.

Chapter I. Introduction

Key Points

- Since 1947, there have been 74 oil and gas lease sales resulting in more than 2,000 wells being drilled on state forest land.
- The bureau's Position Statement addressing the July 29, 2015 Executive Order expresses that DCNR will not issue additional oil and natural gas leases on state forest lands where DCNR controls the subsurface rights.
- There are 1,542,810 acres of state forest land in twelve state forests in the Marcellus Shale fairway of Pennsylvania.
- There are 312,893 leased tract acres, 331,287 severed rights acres, and 68,483 gas storage leased acres on state forest lands.
- Since 2008, approximately 61,000 leased tract acres have been surrendered or terminated.
- The bureau utilizes a robust and comprehensive lease agreement along with its Guidelines for Administering Oil and Gas Activity on State Forest Land to manage gas development.
- Development of leased acres of state forest lands for unconventional shale gas development in the core gas forest districts is estimated at 30 to 35 percent with full buildout resulting in an estimated potential of 1,475 wells.

Introduction

The Department of Conservation and Natural Resources (DCNR) Bureau of Forestry (herein, "the bureau") is broadly responsible for conserving the forests of the commonwealth. While the bureau's forest conservation responsibility extends across all ownerships in Pennsylvania, one of its most significant roles is to act, in the public trust, as stewards of the commonwealth's 2.2-million-acre state forest system. The state forest system of Pennsylvania comprises approximately 13 percent of the forested area in the commonwealth and represents one of the largest expanses of public forest land in the eastern United States; making it a truly prized public asset.

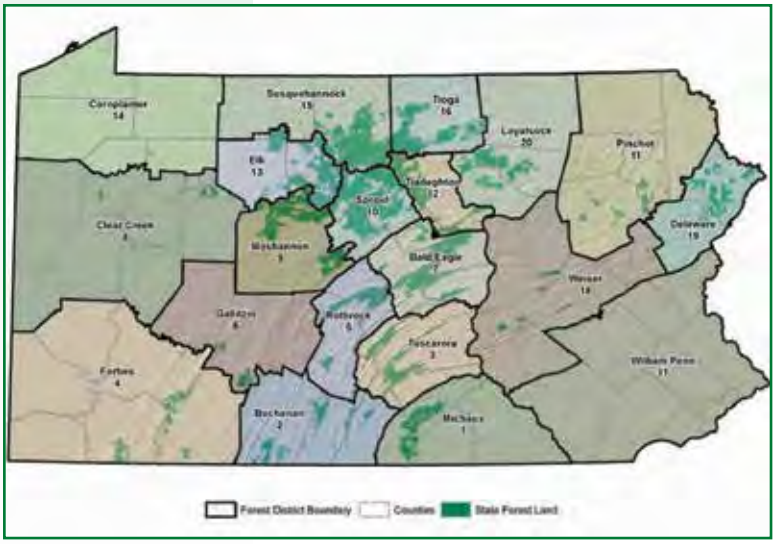


Figure 1.1 Map of state forest and state forest districts.

Pennsylvania's state forests are found in 49 of the state's 67 counties (Figure 1.1) and provide a multitude of resources, uses, and values. State forests provide

water and air purification, recreational opportunities, aesthetic beauty, plant and animal habitats, and economic benefits to society.

The bureau's management is guided by its mission "to ensure the long-term health, viability and productivity of the commonwealth's forests and to conserve native wild plants." The bureau will accomplish this mission, in part, through the "environmentally sound utilization of mineral resources." The details for accomplishing the components of the bureau's mission are found in its strategic plan, Penn's Woods[1]. The State Forest Resource Management Plan[2] (SFRMP) guides the management of the 2.2 million acre state forest system. A listing of pertinent goals and objectives related to shale gas development is in Table 1.1.

The bureau has a shale gas monitoring program to monitor, evaluate, and report on the effects of shale gas development to the state forest system and its stakeholders. This document represents the bureau's effort to report on these findings and to communicate to stakeholder's information about this activity on state forest land.

Natural Gas Development on State Forest Land

Oil and gas development has been part of state forest management since 1947. During this time, DCNR (or its predecessor agencies) has conducted 74 oil and gas lease sales (Figures 1.2 and 1.3), resulting in more than 2,000 wells being drilled on state forest lands. Prior to targeting the Marcellus Shale formation, operators targeted several geologic formations at various depths. Some of these formations have characteristics that enable them to be used as gas storage fields with many still in use today.

The bureau held its first lease sale targeting the Marcellus Shale in 2008. Approximately 74,000 acres were leased for $168 million. In 2010, there were two lease sales totaling 64,843 acres and generating approximately $128 million. There have been no other lease sales since 2010, when the department issued a study determining that further leasing of the state forest for gas development could compromise the mission of the bureau without assessing and understanding the impacts of existing development. In 2016, the 4th edition of the Guidelines for Administering Oil and Gas Activity on State Forest Lands was issued

Bureau of Forestry Mission

Contained in Article1, Section 27 of the Pennsylvania Constitution are these words: "Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people."

The mission of the Bureau of Forestry is to ensure the long-term health, viability and productivity of the Commonwealth's forests and to conserve native wild plants.

The Bureau of Forestry will accomplish this mission by:

Managing State Forests under sound ecosystem management, to retain their wild character and maintain biological diversity while providing pure water, opportunities for low density recreation, habitats for plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources.

Protecting forestlands, public and private, from damage and/or destruction by fires, insects, diseases and other agents.

Promoting forestry and the knowledge of forestry by advising and assisting other government agencies, communities, landowners, forest industry, and the general public in the wise stewardship and utilization of forest resources.

Protecting and managing native wild flora resources by determining status, classifying, and conserving native wild plants.

Goals	Objectives
1. To allow no new leasing for oil and gas development on state forest land subject to future advice and recommendations by DCNR.	1.1 Manage the ongoing extraction of oil and natural gas, from existing leases and severed lands, by implementing best management practices and careful oversight.
	1.2 Continue the shale-gas monitoring program to assess potential effects of shale-gas development on state forest resources, uses, and values.
	1.3 Gather and evaluate public input regarding past and ongoing effects of oil and gas development as well as public sentiment toward potential future leasing for oil and gas development.
2. To provide technical guidance and oversight when geologic resources are developed on state forest lands.	2.1 Monitor the effects of shale-gas development on state forest resources, uses, and values, and continuously adapt guidelines based on monitoring results and other experiences.
	2.2 Continuously adapt guidelines based on monitoring results and other experiences.
	2.3 Communicate and promote the use of current best management practices consistent with bureau guidelines.
	2.4 Enforce current lease terms and conditions.
	2.5 Collaborate with the DEP and other organizations on monitoring, training, and research.
3. To pursue opportunities for the bureau to cooperatively manage geologic resource development where the commonwealth is not the fee-simple land owner.	3.1 Endeavor to obtain a voluntary bonded surface-use agreement from the operator to conserve state forest resources in severed-rights situations.
	3.2 Pursue the strategic acquisition of privately owned oil, gas, coal, or hard mineral rights coincident with state forest surface ownership when funding is available.
	3.3 Give preference to fee-simple land purchases for new acquisitions, whenever possible.

Table 1.1. Partial listing of the goals and objectives for Geologic Resources Management from the SFRMP.

to provide consistent, reasonable, and appropriate direction for managing oil and gas activity on state forest lands in accordance with the bureau's mission.

On January 29, 2015, Governor Wolf issued an Executive Order that states: "As of the date of this Executive Order, to protect the lands of the commonwealth that are held in trust for its citizens and for future generations, and subject to future advice and recommendations made by DCNR, no State Park and State Forest lands owned and/or managed by DCNR shall be leased for oil and gas development."

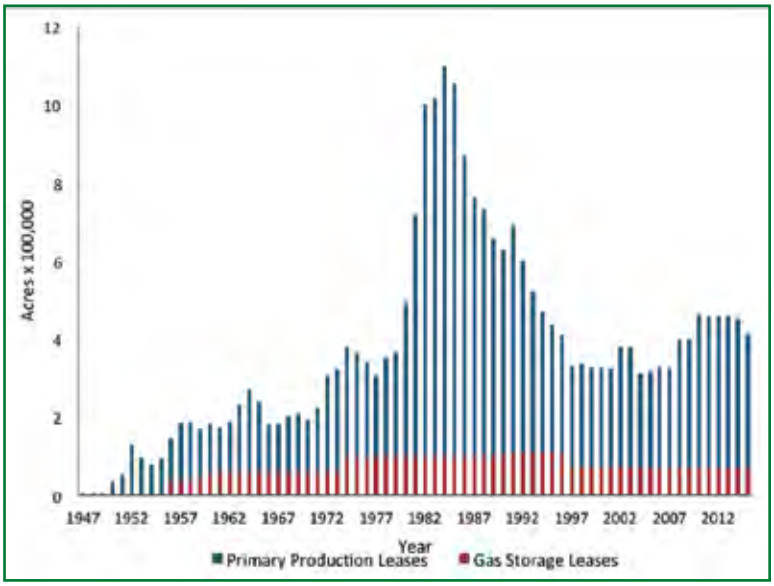


Figure 1.2. Acres under oil and gas lease since 1947.

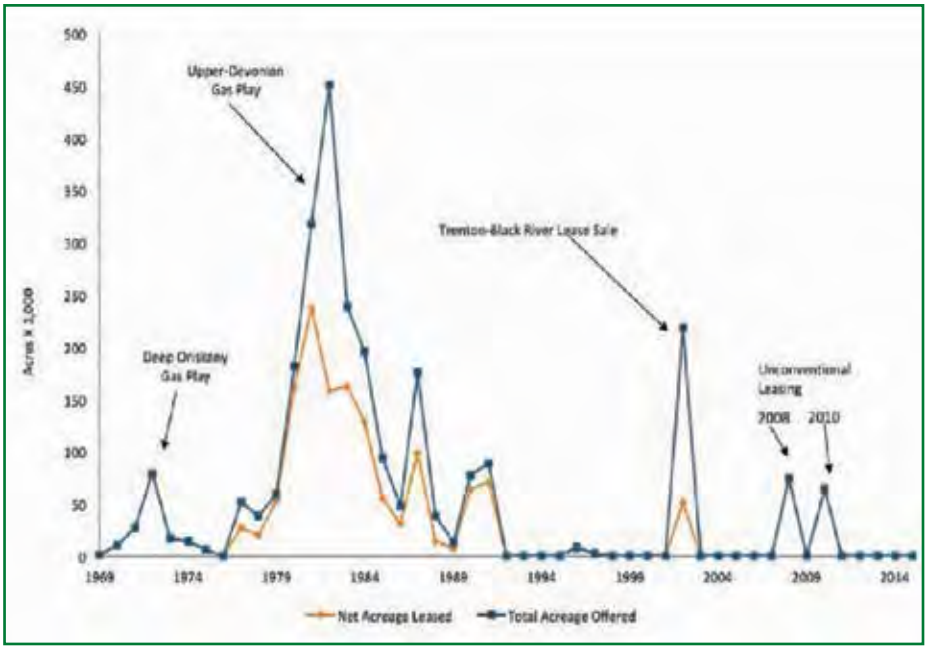


Figure 1.3. Historical oil and gas lease sale acreage offerings since 1969.

In support of the Executive Order, DCNR has developed a position statement[3] that outlines how DCNR addresses natural gas development on state forest and state park lands. The position statement reflects ongoing work by DCNR and incorporates public input received during SFRMP revision processes. The position statement expresses that DCNR will not issue additional oil and natural gas leases on state forest and park lands where DCNR controls the subsurface rights.

Gas Ownership Types

The shale gas play within Pennsylvania covers most of the northern and western portions of the commonwealth. While many state forests fall within the play, most of the gas development on state forests is occurring on the Moshannon, Sproul, Tiadaghton, Elk, Susquehannock, Tioga, and Loyalsock State Forests. These forests are referred to as the core gas forest districts. Mineral rights ownership types within these districts affect how much shale gas development will occur. Land ownership can include the rights to the surface acreage and the rights to subsurface minerals (limestone, sandstone, etc.) and various fluids (oil and gas). In Pennsylvania, the vesting owner can reserve those rights in a property sale resulting in a severance of the subsurface estate from the fee interest. Additionally, the owner of the subsurface rights can lease those rights to companies that will develop those resources. The subsurface owner must be given reasonable surface access to develop the minerals or fluids.

Pennsylvania's state forests have three categories of ownership in relation to ownership of gas rights:

- Severed Gas Rights – The commonwealth owns the surface rights, but a private entity owns all, or part, of the subsurface oil and gas rights. The bureau must allow reasonable surface access to extract the oil and gas for these acres. Reasonable surface access includes, but is not limited to, construction of well pads, roads, and pipelines on state forest property.
- Leased Gas Rights – The commonwealth owns the rights to oil and gas and a private company leases those rights. The lessee can extract oil and gas from the acres they lease in accordance with the provisions of the lease agreement.
- Non-leased Gas Rights - The commonwealth owns the rights to oil and gas and has not leased those rights.

Marcellus Gas

Overall, 1,542,810 acres of state forest land, in twelve state forests, are within the Marcellus fairway (Figure 1.4). The bureau owns the mineral rights on 1,211,523 acres within the fairway and leases 312,893 of those acres for gas development or gas storage (Table 1.2 and Figure 1.5). The bureau has gas storage leases on 68,483 acres with 36,470 acres of gas storage leases

Land & Water Conservation Fund (LWCF)

The LWCF was established to safeguard natural areas, water resources, and cultural heritage, and to provide recreation opportunities to all citizens. The LWCF is managed by the federal Department of the Interior, National Park Service (NPS). LWCF grants are provided to and through the states to local government units (counties, cities, townships, and other municipalities), on a matching basis for up to 50 percent of the total project-related allowable costs for the acquisition and/or development of land and facilities for public outdoor recreation.

The LWCF program has strict requirements in place to ensure that LWCF recreation areas remain protected for open public outdoor recreational use. Changes to other than public outdoor recreational use require the NPS approval and the substitution of replacement land.

State Forest and State Park lands, as well as lands governed by local municipalities, may be subject to a variety of non-recreational uses, including energy development. Energy development may include wind farms to produce electricity; oil and gas development; the installation of pipelines to accommodate the movement of natural gas and other products. The development of traditional and alternative forms of energy may not be consistent with the LWCF protection of land for public outdoor recreational use.

In cases where the development of energy on LWCF protected lands is proposed or being considered, the DCNR or LWCF assisted jurisdiction should evaluate whether it needs to undergo the conversion process with the NPS to remove the affected lands from LWCF protection and place those protections on new additions to the state forest, the state park system or local park.

More information on LWCF can be found on DCNR's webpage[4].

occurring on lands where the commonwealth does not own all subsurface rights. Most of the state forest land acreage in the Marcellus fairway (1,357,762, 88 percent) are within the seven core gas forest districts. The Sproul State Forest has the most acres within the fairway and the most leased acreage. The Elk and Susquehannock State Forests have the most severed rights acres (Figure 1.6).

Figure 1.4. Marcellus fairway in PA.

Table 1.2. District acreages in entire Marcellus fairway.

State Forest	District Acreage in Marcellus Shale Fairway	Leased Tract Acres	Severed Rights Acres*	Gas Storage Leases on Lands Where Commonwealth Owns Subsurface Rights	Gas Storage Leases on Severed Rights Ownerships	Total Acreage Subject to Gas Development	Non-leased Gas Rights
Forbes	59,498	8,846	9,604	0.4	911.0	18,449	41,049
Gallitzin	24,437	1,376	3,376	720	1,353	4,033	20,404
Clear Creek	16,103	463	12,844	0	0	13,306	2,797
Moshannon	190,802	33,612	42,404	0	24	76,016	114,787
Sproul	307,138	96,545	32,550	9,033	9,223	127,532	179,606
Tiadaghton	106,001	49,667	1,387	1,206	1,206	51,054	54,948
Elk	217,181	4,816	71,305	214	528	76,122	141,059
Cornplanter	1,491	0	1,362	0	0	1,362	129
Susquehannock	260,125	56,752	92,923	20,840	23,225	119,945	140,180
Tioga	161,904	40,704	17,747	0	0	58,451	103,453
Delaware	83,519	0	4,321	0	0	4,321	79,198
Loyalsock	114,611	20,113	41,462	0	0	61,575	53,036
Total	**1,542,810**	**312,893**	**331,287**	**32,013**	**36,470**	**612,166**	**930,644**

*** SFL where the commonwealth owns less than fee (100%) in the subsurface estate.**

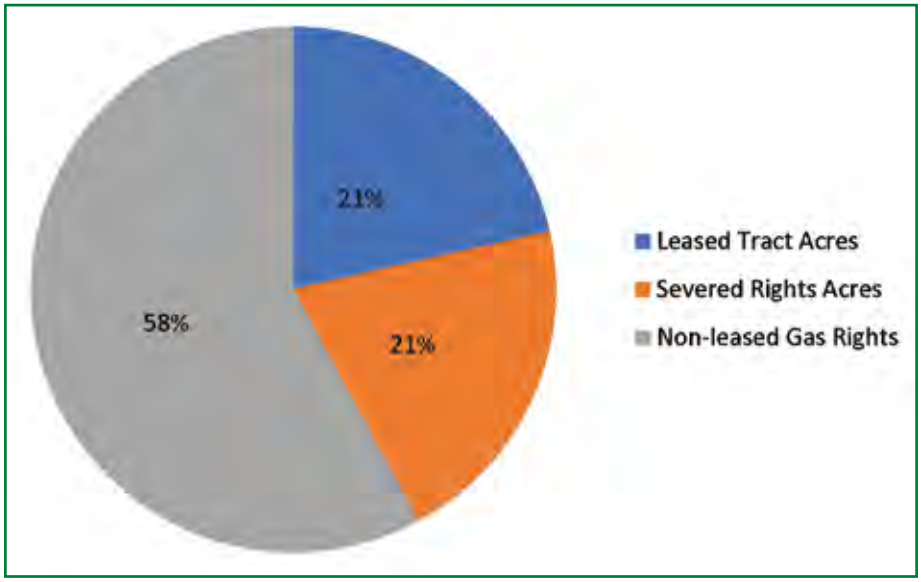
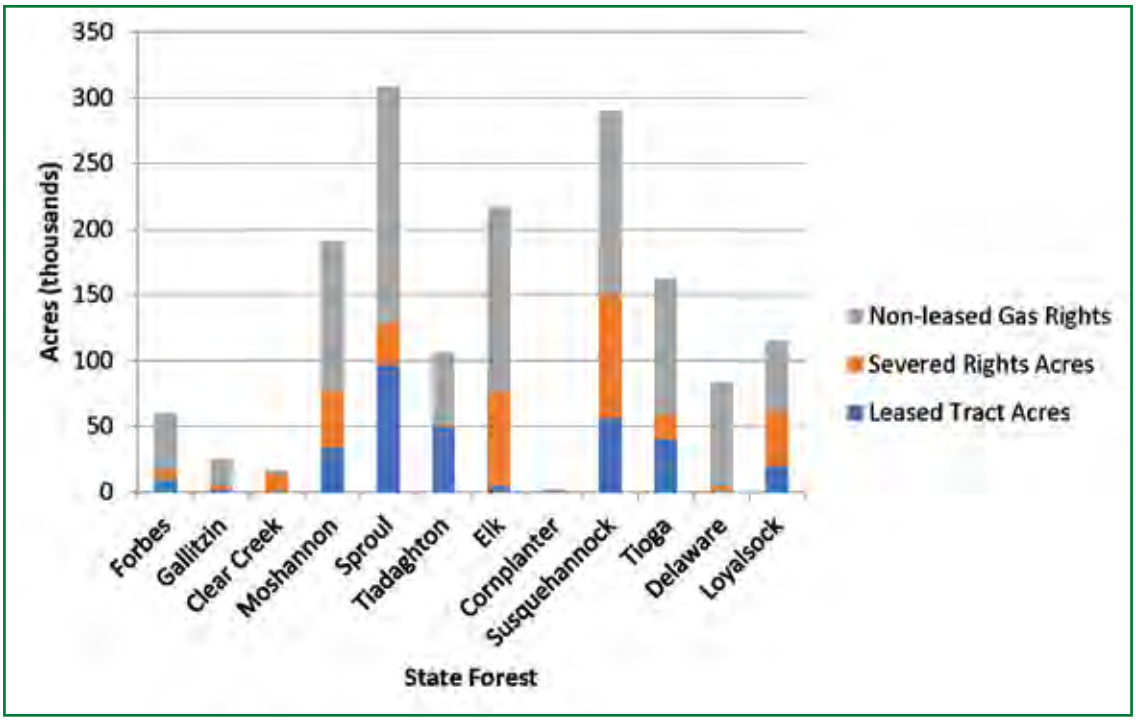
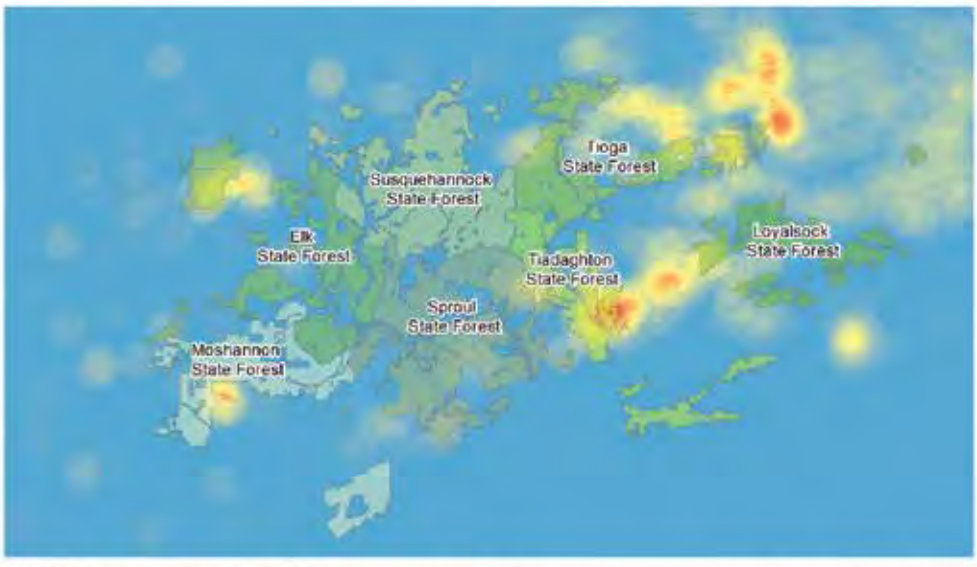


Figure 1.5. Percent of state forest land by mineral rights ownership within the Marcellus fairway.

Figure 1.6. Total acres by mineral rights ownership for each state forest within the Marcellus fairway.



There is a high density of shale gas wells on portions of the Moshannon, Tiadaghton, Elk, and Tioga State Forests (Figure 1.7). Over the shale gas region, shale gas well density was not consistent across state forests or within individual forests.



CITATION
Whitacre, J. V, and Slyder, J. B. 2016. Carnegie Museum of Natural History Pennsylvania Unconventional Natural Gas Wells Geodatabase (v.2016-Q3) [computer file]. Pittsburgh, PA: Carnegie Museum of Natural History.
Available download URL: http://maps.carnegiemnh.org/index.php/projects/unconventional-wells/. Accessed: 2016 Q3.

Figure 1.7. Shale gas well density.

Since 2008, approximately 61,000 acres of leased tracts were surrendered or terminated. This acreage is based on the deeded acres that are utilized in the legal agreements.

As of 2016, shale gas development can occur on less than half of the state forest acres that are within the Marcellus fairway. The total acreage subject to gas development in the Marcellus fairway is 612,166 acres (from Table 1.1, this is the 'Leased Tract Acres' + 'Severed Rights Acres' – 'Gas Storage Leases on Lands Where Commonwealth Owns Subsurface Rights'). The mineral rights on many of these acres are owned by a private entity, which reduces the control the bureau has on surface disturbances. However, the bureau actively negotiates with gas development companies to reduce, minimize, and mitigate impacts on those acres.

Oil and Gas Leasing

In the past, the department has engaged in lease offerings of state forest land. The most recent lease offering was in 2010. The department is currently under the Governor's Executive Order that places a moratorium on additional gas leasing of state forest.

When leasing did occur, the department followed a transparent process. Identified tracts went through an extensive State Forest Environmental Review (SFER). This bureau process is designed to assess impacts to a variety of forest resources for projects that may or will disrupt, alter, or otherwise change the environment. Tracts were evaluated by a diverse group of bureau staff from numerous perspectives to evaluate the benefits and potential cumulative effects of the development. Non-Development Areas and Areas of Special Consideration within the lease tract offerings were delineated. Non-Development Areas precluded disturbances where sensitive resources, uses, and values are known to exist; unless justified through a waiver request approved by the State Forester or designee. Areas of Special Consideration typically required additional planning, coordination, and inventory to substantiate sensitive resources and minimize potential adverse impacts.

Once the SFER was completed and the Non-Development Areas and Areas of Special Consideration were identified, the lease offerings underwent a public review. The public review for lease offerings occurred through the PA Bulletin.

The successful bidder of the lease offering then entered into a lease agreement. The oil and gas lease utilized by DCNR to manage the oil and gas exploration, development, and production on state forest lands was the result of experience and knowledge gained since the first leases were issued in 1947. DCNR developed this agreement in 2004 with advice from its Ecosystem Management Advisory Committee, along with discussion with the gas industry. This lease agreement is robust, comprehensive, and used numerous approaches to minimize surface impacts, e.g., maximum permissible disturbance thresholds within the lease tract. It contains strong environmental safe-guards, structured business protocols, and substantial measures intended to conserve state forest resources, uses, and values. In addition, the lease ensures the commonwealth is compensated correctly and on time. State forest oil and gas leases provide economic returns to the commonwealth through annual rental and monthly royalty payments.

Surface Use Agreements

On lands where the oil and gas rights have been previously severed from the surface, the deeded reservation language is used as the primary guidance for management of the lands by the bureau. In most cases, the reservations are such that the commonwealth has little to no ability to directly control gas management activities on the surface. In these cases, the bureau attempts to secure a voluntary surface use agreement (SUA) with the private owner or lessee, which has advantages to both parties. With an agreement in place, both parties know with certainty that operations can be scheduled and carried out with minimal difficulty prior to their commencement. The SUA typically includes environmental guidance, best management practices, and surface impact mitigation provisions. Participation in SUAs has been limited, but the bureau continues to

promote this type of mutually beneficial agreement.

Guidelines for Administering Oil and Gas Activity on State Forest Lands

The administration of oil and gas development on state forest lands is complicated by a myriad of existing ownership rights, the quantity and various vintages of existing lease agreements, the number of private operators involved, and the rapid advancements in oil and gas technologies. The objective of the guidelines document is to establish and communicate a set of "guidelines" and best management practices (BMP's) that provide consistent, reasonable, and appropriate direction for managing oil and gas activity on state forest lands in accordance with the bureau's mission.

Specifically, these guidelines provide information for:

Bureau staff: to manage oil and gas activities consistently across state forest districts.

Operators: to clearly communicate the bureau's mission, expectations, and protocols for managing natural gas development activities in an environmentally sound manner.

Public: to provide transparency in the management of their state forest lands.

The guidelines were developed by the bureau to provide consistency in gas lease administration across state forest districts and identifying deviations that require written waivers. The guidelines are not contractually binding or legally enforceable.

Guidelines for Administering Oil & Gas Activity on State Forest Lands[5]

Development Plan Review and Negotiation Process

On state forest land, it is the responsibility of the bureau to ensure that oil and gas exploration and development is conducted in a manner that minimizes impacts to water, soil, flora, and fauna resources while being compatible with other uses of state forest land; such as timber management, watershed protection, and recreational activities. As with other development on state forest lands, the bureau uses the general approach of avoidance, minimization, mitigation, and monitoring to manage any undesirable effects of natural gas development. Bureau staff is uniquely positioned to balance the needs of the gas industry and trustee responsibilities of the agency.

Exploration and development on state forest land leases begins with gas operators evaluating the subsurface geology. An infrastructure development plan is then proposed by the operator based on the evaluation of the geological constraints.

The following materials aid the bureau when reviewing development plans:

- Original conceptual development plans (includes pads, roads, pipelines, compression needs, laterals, and pad infrastructure and placement when possible).
- Water sourcing, storage, handling, and disposal plan.
- Erosion and sedimentation plans for all facilities as they become available.
- Completed ecological surveys.
- Permit applications.
- Geological or seismic data.

Areas of concern or potential conflicts are identified, along with avoidance and mitigation alternatives, and communicated with the operator.

Staff then coordinates with the operator to develop an infrastructure layout that satisfies the needs of both parties and serves as the framework for future tract development. Comprehensive site plans may be dynamic, but they afford the opportunity to consider potential effects from a landscape perspective and allow the application of best management practices found in the guidelines document.

The last portion of the review focuses on the on-the-ground siting of individual infrastructure components. These comprehensive reviews are performed by the forest district and central office program areas. The objectives of this review include: minimizing potential adverse impacts; balancing competing and sometimes conflicting state forest resources, uses, and values; confirming that well sites are geologically sound and in compliance with lease terms; and assuring the efficient extraction of gas resources.

The review process is interactive and dynamic. Original operator proposals are routinely modified to address bureau concerns and potential conflicts with state forest resources, uses, and values. These beneficial changes are often very difficult to quantify. For example, it is common during construction to disturb significantly more acreage than will be maintained once the infrastructure is built. This is very apparent during rights-of-way construction. Operators need room for the trench, spoil pile, pipe lay down area, and equipment travel lanes. It has also been a common industry practice for operators working on private lands to secure enough area to protect their interests and allow for additional future expansion. The bureau has worked diligently to minimize the limits of disturbance to the extent that workability and safety are not jeopardized while significantly reducing the operational footprint that will be maintained for the life of the infrastructure. Rights-of-way licenses specifically describe the as-built infrastructure while precluding the ability to add future infrastructure. Such requests require comprehensive review of the proposed project and the negotiation of a new license agreement.

Permitted Wells and Buildout Projections

The development of gas resources requires well bores to be constructed to produce the gas and move it to the market through pipelines. This critical construction activity drives the installation of all the infrastructure necessary to support the gas development. As wells are drilled, pipeline capacity is needed for fresh water delivery to stimulate the well and transport gas to market. Additionally, gas compression is needed for pressure maintenance and there must be sufficient leased acres available to efficiently drain the gas reserves in an economic and controlled manner.

Over the entire time frame of the gas program there have been approximately 2,400 wells drilled to all depths and horizons for both exploration and development on state forest lands. About 1,066 wells have been properly plugged and abandoned over time, leaving about 1,334 wells active on state forest lands. Approximately 250 are in gas storage operations, with 1,084 in gas production in all depths and horizons. The Marcellus play has about 640 horizontal wells drilled to the end of 2016, leaving approximately 444 vertical legacy wells producing from other horizons (Oriskany and Upper Devonian).

In general, there are two main drilling targets for shale gas in Pennsylvania; the Marcellus Shale and the Utica Shale (also known as the Point Pleasant or Antes Shale) (Figure 1.8), with a third minor target in the Burkett Shale. It is believed it is possible to drill all three targets from a single well pad if the pad is optimized before construction for the additional target zones. However, at present only the Marcellus is known to be pervasive and economic in nature over most of state forest land. The Utica is still in the exploration phase of investigation and may be limited in economic extent to just the northern reaches of state forest land in Elk, Cameron, Potter, and Tioga counties.

The average gas pad has six wells, but could host up to 24, that may be drilled to the Marcellus or Utica formations. Marcellus and Utica may be developed from the same well pad location and use the same gas production equipment, pipelines, and compressors. Wells are drilled vertically until they reach the target depth and then laterally between 4,000 and 10,000 feet from the pad. A pad with six wells will typically have three north and three south wells. Since the beginning of Marcellus development in 2008, the well laterals have greatly increased in length and the well pads have remained about the same size. Both these developments

Figure 1.8. Drilling targets (source: Marcellus Shale Coalition).

mean less surface conversion per well drilled. Refer to Figure 1.9 for a plan view and cross section view of a typical modern development plan for Marcellus/Utica. Each pad and its network of wells forms a unit. The unit concept is used to ensure the correct amount of lease land is committed to the development and each well has the appropriate area to drain.

Older shale gas wells were generally spaced 750 feet apart and drilled to a lateral length of 3,500 feet. These wells were set up to drain approximately 60 acres. However, newer wells are being drilled to an 8,000 feet lateral length, or greater, and are spaced at 1,000 feet apart as in Figure 1.9. These newer wells are designed to drain approximately 180 acres or more. Therefore, a current six well pad can drain approximately 1,100 acres or 1.7 square miles. Future wells will likely take advantage of longer laterals and be optimized for 1,000 feet spacing and may drain substantially greater areas from a single well pad.

Operators try to space the units and pads such that no area is left undrained on a lease. However, highway access, topographic limitations, and geologic constraints, e.g., faults and reservoir complications, may limit drainage efficiency. These factors and others place limits on the drainage efficiency the gas operator can expect when planning a development scheme for any given tract of lease land. State forest lands are no exception to these limitations with the main advantage being the typically large acreage sizes of the state forest tracts, which are usually many times larger than adjacent private tracts. It is estimated that 10 to 15 percent of the leased acreage is inaccessible by development drilling. Given that the distance gas can migrate in the subsurface is less than 500 feet to a well bore due to the extremely low native permeability of the shales, the "stranded" gas will likely never be economically extracted (Figure 1.10).

There are approximately 265,839 acres of state forest lands currently under leases, not including river and storage leases, issued by the commonwealth and subject to possible Marcellus/Utica development when tabulated from the written legal lease agreements. The following is the target shale analysis for potential future development on state forest leased lands. The possible wells on severed lands are not counted in this calculation, nor are gas storage and river lands leases.

Figure 1.9. Plan view and cross section view of typical modern development plan for Marcellus/Utica.

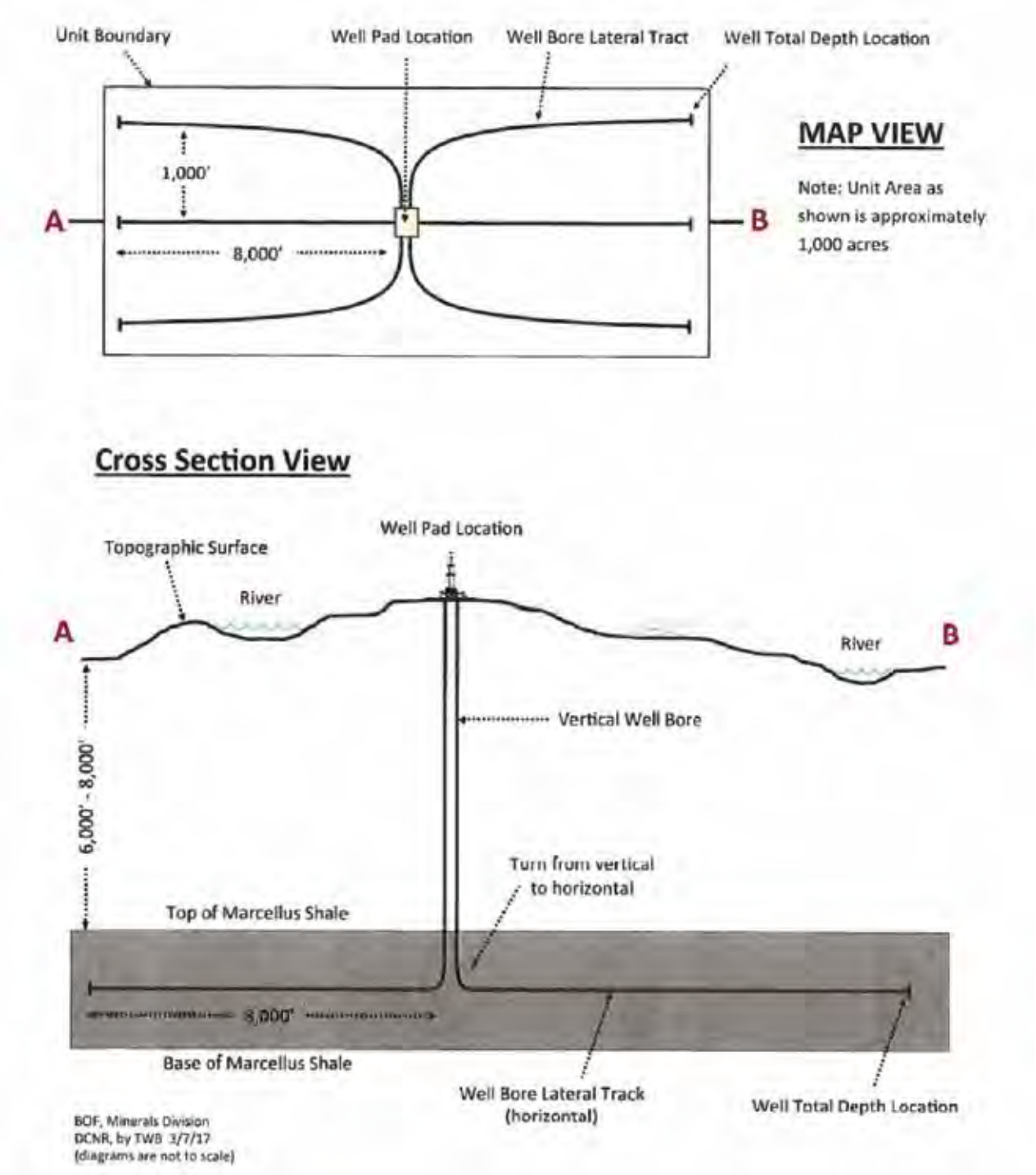
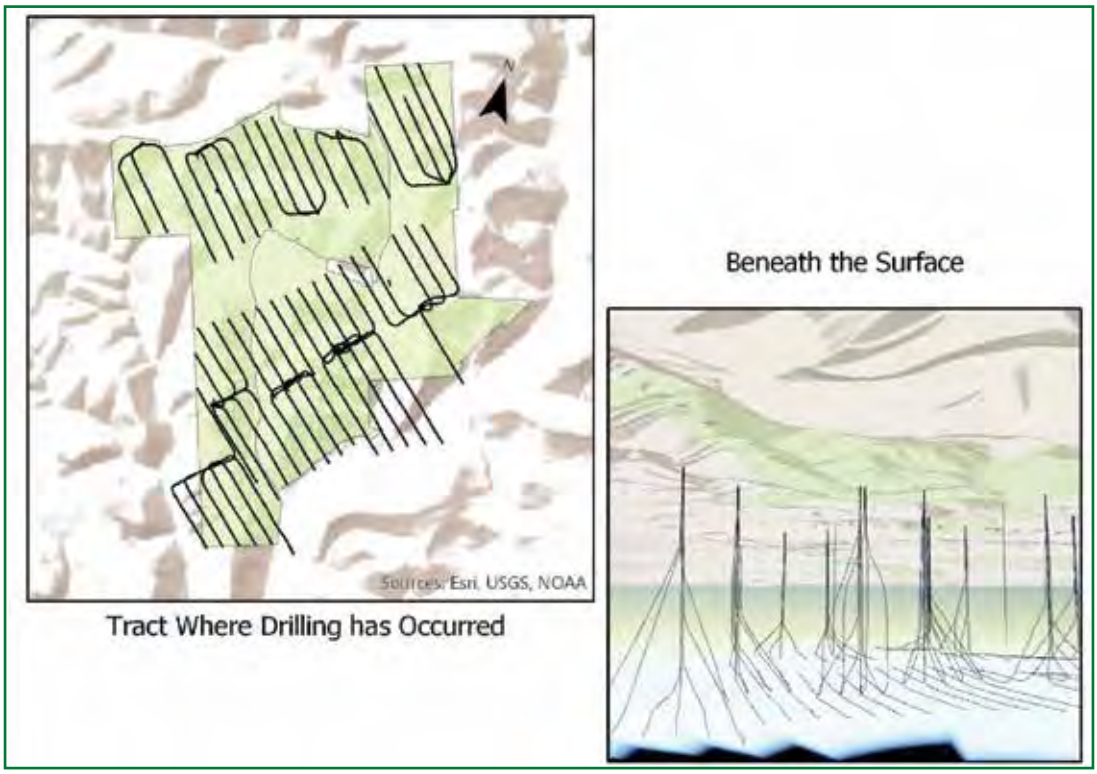


Figure 1.10. Plan view and cross section showing that not all gas from a tract can be captured.



For the Marcellus, the maximum number of wells that might be expected to be drilled going forward for 100 percent development of the 265,839 acres is approximately 1,475 wells using the 180 acre/well drainage area number. However, this estimate is an upper end estimate that does not include acreage that may be bypassed or undrilled due to geometric and topographic issues with the tracts configuration. Assuming about 10 percent of any given lease tract is inaccessible, the number may be as low as 1,327 wells in total. If the existing 473 wells already drilled on state forest issued leases is subtracted, the remaining wells to be drilled is approximately 854 wells. Essentially, full development of the existing lease acreage would involve more than twice the development activity that has occurred to date. In percentage terms, the range is from around 30 to 35 percent developed, depending on the efficiency in the development layout across the lease tracts on state forest land.

The Utica has been tested on state forest lands and found to be productive, but the limits of economic production are not currently identified closely enough for an accurate estimate to be made. Therefore, it is difficult with any confidence to project how many Utica wells might be drilled going forward, but it may be assumed some will be drilled. However, it is projected to be far less in total than the Marcellus play. Additionally, it is anticipated that the infrastructure put into place for the Marcellus play can be utilized for the Utica.

Website Links

[1] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20026631.pdf
[2] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20032045.pdf
[3] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20032020.pdf
[4] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031414.pdf
[5] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20032134.pdf

Chapter II. Gas Monitoring Program

Key Points

- DCNR put in place a shale gas monitoring program in 2011 that consists of an integrated monitoring team, on-the-ground management activities, and research and external partner collaborations.
- The bureau monitors for a suite of values (infrastructure, flora, forest health, invasive species, water, soil, air, incidents, fauna, recreation, community engagement, timber, energy, revenue, and the forest landscape) that was developed in 2010.
- Between 2013-2016, DEP has conducted 3,101 inspections of unconventional gas infrastructure on state forest land.
- Between 2013-2016, DEP has issued a total of 47 Notice of Violations related to unconventional gas infrastructure on state forest land.
- Between 2013-2016, DCNR Ranger recorded incident reports related to gas development activity totaled 141.

Introduction

Shale gas development necessitates consideration of effects to a wide range of environmental and social values of the state forest system. This includes water quality and quantity, integrity of plant and animal habitats, core forest areas, recreation and aesthetics, control of invasive plants, noise levels, and potential changes in air quality. Shale gas development involves the clearing of forests to construct well pads, roads, pipelines, and other infrastructure. This clearing directly affects forestland by increasing habitat fragmentation and reducing the overall amount of forest cover. Construction activities, and the resultant development, can affect plants and animals and their habitat, such as forest-interiors and early successional woodlands. Common bird species, reptiles, amphibians, and species of concern, e.g., timber rattlesnakes, bats, Allegheny woodrats, and an array of native plant species, can be affected by these habitat changes across the landscape.

In addition to environmental concerns, shale gas development can alter the character of northcentral Pennsylvania, an area known as the “Pennsylvania Wilds,” that abounds with scenic beauty and outdoor recreational opportunities. Understanding the effects of shale gas development to state forest visitors is critical to sustaining tourism and the ability to provide healthful outdoor recreation opportunities to Pennsylvanians.

Shale gas development has also provided benefits to some users of state forest lands.

Road improvements and construction associated with development has promoted increased access to state forest land for recreation activities and reduced maintenance where upgrades were made by the gas operator. The increased forest edge around well pads and pipeline corridors may provide additional habitat for edge-frequenting wildlife species and seeded pipeline corridors have the potential to increase sightings of popular wildlife species such as turkeys and white-tailed deer. Restoring cleared and disturbed forestlands may also bring additional opportunities to increase habitat diversity within large blocks of mature forest. In addition, there is a substantial income stream from gas development.

DCNR's Shale Gas Monitoring Program

Given the host of potential impacts of shale gas development to the state forest system and its associated uses and values, DCNR put into place a shale gas monitoring program to monitor, evaluate, and report on the effects of shale gas development to the state forest system in 2011. The program aims to inform and improve shale gas management efforts and provide objective and credible information to stakeholders.

Monitoring is defined as "…the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective" (Elzinga et al. 1998). A well-designed monitoring program can evaluate whether current management practices are working.

It is important to note that monitoring data are sometimes of limited value in conclusively identifying the exact cause of detected changes. Identifying the exact cause of change falls into the realm of "research," where great effort is made in isolating and testing the responses from potential change agents in a controlled environment through a rigorous experimental design. However, monitoring data and information remains an important part in identifying trends, guiding research, and the evaluation of management guidelines and practices.

Depending on the monitoring value and indicator, the amount of time and data necessary to detect change or trends varies significantly. Quantifying acres of cleared forest, fragmentation, visitor attitudes, and certain water quality parameters can be accomplished in a short time frame. However, other data related to invasive species spread, aquatic communities, tree mortality, soil impacts, and forest health – to name a few – may take longer for change to be noted or for any clear trends to emerge, which is why monitoring must be approached from a long-term perspective.

DCNR's Monitoring Approach

To help guide its monitoring program, DCNR identified a suite of "monitoring values." These values, developed in 2010 with input from its Ecosystem Management Advisory Committee, help focus monitoring efforts on values that relate to the sustainability of the state forest system; the effects of natural gas drilling on state forest to stakeholders and communities; and DCNR and the bureau's mission.

These values include:

- Water
- Wildlife
- Plants
- Invasive Species
- Incidents
- Air
- Land-use (Forest Landscapes)
- Soils
- Revenue
- Energy
- Recreation
- Local Communities (Community Engagement)
- Forest Health
- Timber Products
- Infrastructure

These monitoring values may change over time as more

is learned about the activity and its potential effects on state forest lands.

To systematically monitor these values, the bureau takes a three-tiered approach, recognizing that an effective, long-term monitoring program must be multi-faceted. These tiers include 1) An integrated monitoring team; 2) On-the-ground management activities; and 3) Research and external partner collaboration. These tiers form the foundation for its shale gas monitoring program.

An Integrated Monitoring Team

The core of the shale gas monitoring program consists of 15 staff positions embedded in various program areas of the bureau. Staff is in the Rachel Carson State Office Building in Harrisburg; Mira Lloyd Dock Resource Conservation Center in Spring Mills; and at the Tiadaghton Forest Resource Management Center in Waterville. Monitoring involvement is not; however, limited to these staff. Since monitoring is a bureau-wide program, staff at many levels – from field to central office – are actively engaged in the program.

The core monitoring staff positions and their program area are outlined below.

- Forest Assistant Manager – Resource Inventory and Monitoring Section
- Forester (3 positions) – Resource Inventory and Monitoring Section
- Forest Technician (3 positions) – Resource Inventory and Monitoring Section
- Biometrician – Resource Inventory and Monitoring Section
- Plant Specialist – Resource Inventory and Monitoring Section
- Plant Specialist – Ecological Services Section
- Wildlife Specialist – Ecological Services Section
- Water Specialist – Minerals Division
- Infrastructure Specialist – Recreation Section
- Social Specialist – Resource Planning Section
- GIS Specialist – Geospatial Applications Section

(As of 2017, the Water, Infrastructure and Social Specialist positions were vacant due to budgetary constraints.)

Coordination of monitoring personnel efforts are the responsibility of the forest program manager for the Forest Resource Inventory and Monitoring Section. The organizational structure is shown in Figure 2.1.

The shale gas monitoring program has compiled and/or developed numerous monitoring protocols to address specific monitoring values. These protocols undergo a rigorous development process prior to becoming operational. Details regarding each protocol can be found in the Shale Gas Monitoring Manual[1].

Monitoring data used in this report are not limited to these targeted protocols. The bureau and its partners regularly collect data and compile information on forest resources that are useful in discerning trends and analyzing potential effects. Where appropriate, these data sources are used to support the monitoring of values outlined in this report.

While the shale gas region in Pennsylvania covers almost two-thirds of the state and many state forest districts, the bureau currently focuses its monitoring efforts on what it refers to as the "core gas forest districts" (Figure 2.2). While conventional gas activity has occurred outside these defined districts, and shale gas activity may occur outside the region in the future, the region consisting of the Moshannon, Sproul, Tiadaghton, Elk, Susquehannock, Tioga, and Loyalsock State Forests are currently the area of concentration for most shale gas activity. Monitoring efforts, data collection, and reporting are focused on this seven-district region. The composition of this core area may change over time if there are changes in the patterns of gas exploration and development.

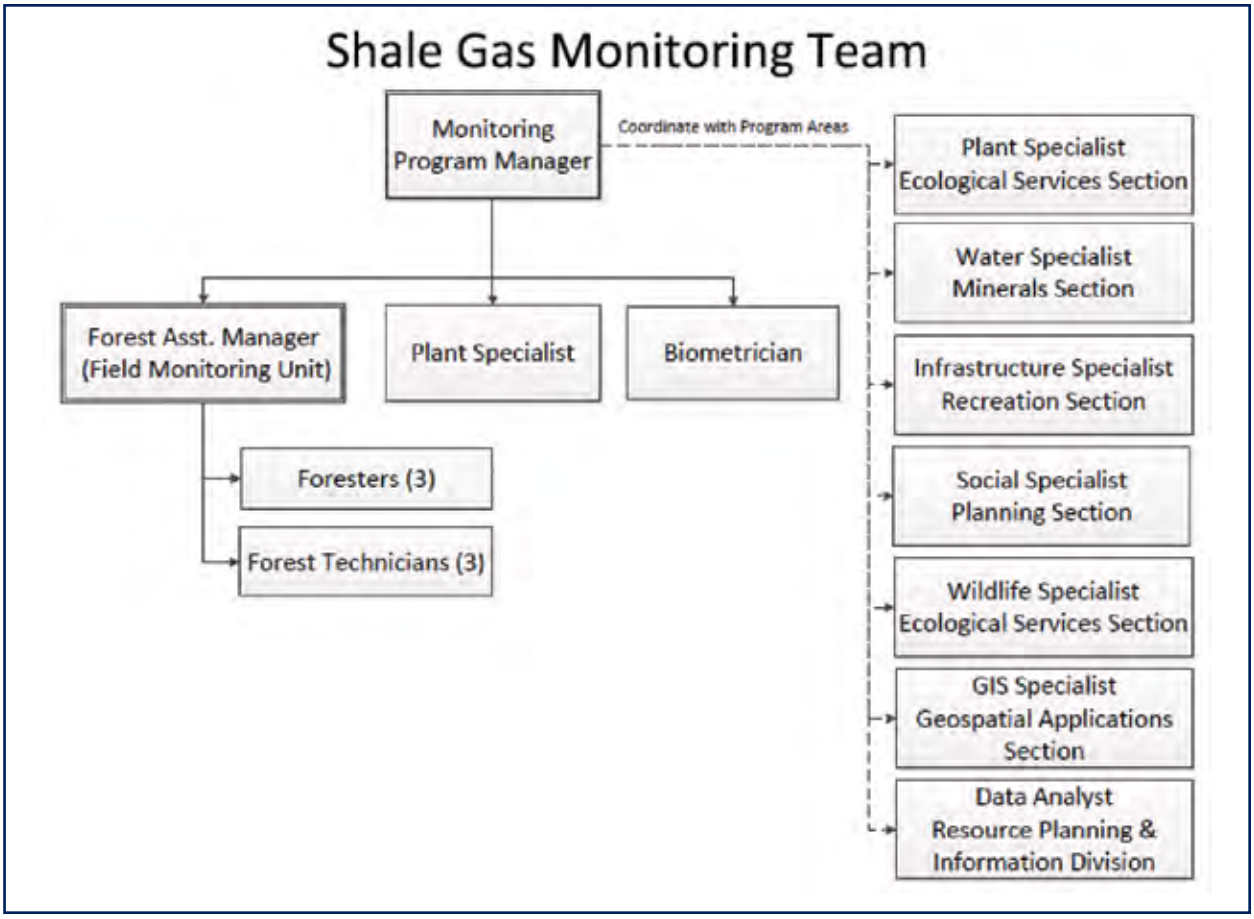


Figure 2.1. Organizational structure of the Shale Gas Monitoring Team.

Figure 2.2. Core gas forest districts.

Protocol Development Process

1. Monitoring Team proposes component to monitor.
2. Appropriate specialist, or group of specialists, conduct literature review and draft protocols.
3. Working group meets with field crews to refine the draft protocols and create the data sheets.
4. Field meeting is held with the entire Monitoring Team to review the protocols. Careful walkthrough of protocol with accompanying discussion.
5. Working group refines protocol based on team discussion.
6. Final walkthrough of revised protocol. Group discusses scope of the protocol and site selection.
7. Pilot field season of protocol begins.
8. Refine and move into full implementation.
9. Review and refine based on implementation.

On-the-Ground Management Activities

The bureau incorporates monitoring mechanisms as part of its oil and gas management administration. These mechanisms include planning, on-the-ground management, and the tracking and reporting of activities and accomplishments.

The bureau has seven forester positions whose duties include administering the Marcellus shale gas programs in the core gas forest districts. These "gas foresters" are responsible for:

- Maintaining district mineral records and reviewing mineral exploration permits.
- Monitoring compliance to various specific terms of the lease.
- Reviewing lease development plans and providing recommendations.
- Administration and monitoring of infrastructure construction.
- Administration of Right-of-Way Agreements and monitoring the implementation and compliance to terms of the agreement.
- Administration of Road Use Agreements and monitoring the implementation and compliance to specific terms of the agreement.
- Monitoring and mitigating impacts to other forest uses by negotiating restricted gas traffic during peak recreational use periods, e.g., hunting seasons, joint-use snowmobile trails, etc.

The major components of the bureau's approach to on-the-ground management are formally detailed in Guidelines for Administering Oil & Gas Activity on State Forest Lands[2] and include:

Proactive planning to avoid sensitive resource areas. This planning occurs at various points in time ranging from the SFERs that occur prior to lease sales to the review and the approval process for locating specific infrastructure. Proposed locations for well pads, rights-of-way, access roads, compressor stations, and water impoundments are thoroughly reviewed by the bureau prior to approval and construction. In certain situations, additional field surveys are conducted by bureau experts or environmental consultants. Overall, this effort represents a significant and critical process as potential negative impacts are avoided or minimized prior to construction. Significant measures are taken to protect, minimize, avoid, and mitigate effects to water quality, wetlands, vernal ponds, spring seeps, sensitive habitats, trails, recreation features, and other special resources.

Field management and inspections. Once approval is granted and construction begins, on-the-ground management and inspections are done for protecting special natural resources and state forest uses. Weekly inspections are recommended and occur for most construction activities. Deficiencies are recorded and corrective measures are implemented accordingly.

Incidents. The bureau tracks environmental incidents and violations to state forest rules and regulations associated with oil and gas infrastructure (e.g., pipelines and storage tanks) or activities (e.g., trucks hauling materials to a well pad). Both the bureau and DEP conduct regular inspections of gas related activities. Incidents outside the jurisdictional authority of the bureau are referred to DEP for investigation. DEP maintains inspection records and notices of violation (NOV) on its eFACTS[3] website. Incidents that fall within the bureau's jurisdictional authority, typically violations to the state forest rules and regulations, are investigated by the bureau.

A NOV or Consent Assessment of Civil Penalty (CACP) may be issued based on the results of a DEP investigation. A DEP NOV serves as a notification to the responsible party (typically the operator) of the details of the violation. A CACP is a consensual document authored by DEP and agreed to by the operator for the assessment of a civil penalty resulting from violations identified during an inspection. There are two categories of NOVs and CACPs: 1) Administrative and 2) Environmental Health and Safety. Examples of Administrative NOVs and CACPs include failure to post a permit and failure to post an erosion and sedimentation plan. Examples of Environmental Health and Safety NOVs and CACPs include inadequate silt fences, residual waste discharge, and brine or diesel fuel spills.

Between 2013-2016, DEP conducted 3,101 inspections on unconventional gas infrastructure on state forest land (Table 2.1). These inspections resulted in the issuance of 47 NOVs and one CACP issued to operators (Table 2.2).

The bureau maintains a confidential database that stores all incidents on state forest land in accordance with Visitor Services and Protection Directive #9, Incident Reporting. Incidents recorded in this system include those related to all activities on state forest land. Incidents related to oil and gas activity or infrastructure are noted regardless of whether the incident involves industry personnel or members of the public, e.g., a forest visitor vandalizing a gas pad identification sign would be noted as an incident related to gas activity. Between 2013-2016, a total of 141 incidents related to oil and gas activity or infrastructure have been recorded. This is down from 264 recorded between July of 2009 and 2012. Table 2.3 shows the top 15 incident types and number of incident reports related to oil and gas between 2013-2016 along with the corresponding number of incident reports between July 2009 and 2012.

Waivers. Operators may submit waiver requests to the bureau for certain conditions specified in the lease, e.g., buffer distances, non-development areas, viewshed areas, spacing, offsets, production reporting, drilling requirements, insurance, and well plugging. Any deviation from conditions specified in a lease or agreement requires a waiver. Requests must be justified and submitted in writing to the State Forester, or designee, for review and approval. The bureau reviews the waiver requests on a case-by-case basis and considers waivers only where it will provide greater protection for environmental or social values and is in the best interest of the commonwealth. For example, allowing for the reroute of a road to encroach upon an aesthetic trail buffer rather than impact a recently identified vernal pond. The tracking and review of waivers aid in the refinement of future lease terms and management practices.

Between 2013-2016, a total of 10 project waiver packages associated with oil and gas activity were submitted to address 18 individual situations. The most common waiver was for stream buffer encroachments.

DEP Inspection Type	Number of Inspections
Administrative/File Review	266
Compliance Evaluation	13
Drilling/Alteration	536
Follow-up Inspection	65
Incident- Response to Accident or Event	77
Plugging (Includes Plugged/Mined Through)	31
Pre-operation Inspection	6
Routine/Complete Inspection	1,818
Routine/Partial Inspection	126
Site Restoration	163
Total	**3,101**

Table 2.1. Total number of DEP inspections on state forest land unconventional gas infrastructure between 2013-2016.

Violation Category	Enforcement Type	Number
Administrative	NOV - Notice of Violation	17
Environmental Health & Safety	CACP - Consent Assessment of Civil Penalty	1
Environmental Health & Safety	NOV - Notice of Violation	30
Total	---	**48**

Table 2.2. NOVs and CACPs issued by DEP from inspections of unconventional gas infrastructure on state forest land between 2013-2016.

Incident Type	No. of Incident Reports (2013-2016)	No. of Incident Reports (2009-2012)
Criminal Mischief	16	15
Operation closed areas	14	4
Closure	13	21
Miscellaneous (not otherwise classified)	11	22
Motorized Vehicles (excluding ATVs/snowmobiles)	10	2
Crimes Code	9	20
Motor Vehicle Code (Title 75)	9	15
No Injury	8	20
Hunting	4	1
Reckless/Negligent operation	3	4
Littering	3	4
Theft	3	8
Vandalism	3	8
ATV Operation unauthorized areas	3	4
Hazards (man-made)	2	18
TOTAL	**111**	**166**

Table 2.3. Summary of top 15 incident types related to oil and gas and the number or incident reports from 2013-2016.

Type of Waiver	Number of Waivers (2008-2012)	Number of Waivers (2013-2016)
Wetland Buffer	15	2
Road Buffer	9	5
Lease Boundary Buffer	5	2
Trail Buffer	2	1
Natural Area Buffer	1	0
Stream Buffer	0	6
Other	3	2
Total	**35**	**18**

Table 2.4. Number of waivers by type.

The number of waivers in this period is down from the 35 waivers between 2008-2012 (Table 2.4). The decrease is likely due to the reduced amount of gas development activity between 2013-2016.

Forest Stewardship Council (FSC) Certification Audit. This audit represents a third-party, independent assessment against a set of accepted environmental and social indicators of sustainable forest management. PA state forests are one of the largest certified public forests in North America; a designation the bureau has earned every year since 1998.

Research and external partner collaboration

When appropriate and as resources become available, the bureau seeks to fund and cooperate with research entities in a coordinated fashion to address specific The bureau needs related to shale gas development. The intent is to leverage opportunities and resources for work that the bureau would not be able to accomplish otherwise, or work that is best suited for a research effort. The bureau is currently working with several partners and research entities. Table 2.5 lists research and partner collaborations.

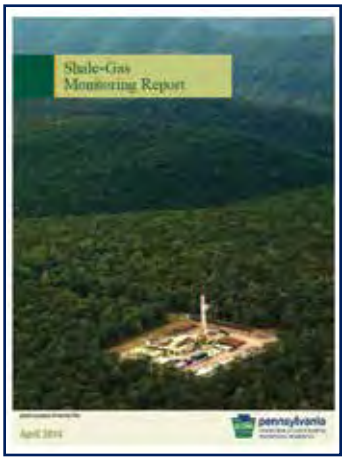
In addition to funded research and partner collaborations, the bureau also provides opportunities for researchers to conduct independent studies on state forest land. To conduct this type of work on state forest land, researchers must be granted permission by the bureau. Permission is granted or denied through the bureau's State Forest Research Agreement (SFRA) process. In this process, a project proposal and formal request is submitted to the bureau. The bureau then evaluates the request based on potential impacts the work may have on the state forest resource or staff. As a condition of the SFRA, annual progress reports, a final report, products, and publications are required to be submitted to the bureau.

Shale Gas Monitoring Reports

An essential function of the shale gas monitoring program is to regularly compile, analyze, and report on findings. As mentioned previously, this reporting serves two functions. It assists the bureau in evaluating effects and adjusting, if necessary, its management planning and practices. And it communicates to the public the effects of shale gas activities on state forest lands.

In 2014, the bureau released the first Shale-Gas Monitoring Report[4]. This report summarized data prior to Marcellus development in 2008 and for the 2008-2012 period. This report presented information based on the suite of 15 values identified for monitoring.

This second comprehensive report is an opportunity to communicate change on state forest land as well as discuss the bureau's adaptive management. To facilitate this, the report is organized by broad chapters that encompass each of the 15 values. The bureau will periodically issue additional reports as more data are collected and information is compiled.



Title/Work Description	Principle Investigator(s)	Institution	Reports/Publications
Evaluating Storm Water and Erosion and Sedimentation Control Measures Associated with Shale Gas Infrastructure in Forested Landscapes	Dr. Barry Evans	Penn State University	
Quantifying Soil and Landform Change Across Shale Gas Infrastructure in Northern Pennsylvania	Dr. Patrick Drohan	Penn State University	Drohan, P.J., Brittingham, M., Bishop, J. and Yoder, K. 2012. Early Trends in Landcover Change and Forest Fragmentation Due to Shale Gas Development in Pennsylvania: A Potential Outcome for the Northcentral Appalachians. Environmental Management 49: 1061. doi:10.1007/s00267-012-9841-6. Drohan, P.J. and M. Brittingham. 2012. Topographic and soil constraints to Shale Gas development in the Northcentral Appalachians. Soil Science Society of America Journal, 76:1696-1706. Fink, C.M., Drohan, P.J. 2015. Dynamic Soil Property Change in Response to Reclamation following Northern Appalachian Natural Gas Infrastructure Development. Soil Science Society of America Journal.
Quantifying the Cumulative Effects of Multiple Disturbance Regimes on Forested Ecosystems in Northern Pennsylvania	Dr. Patrick Drohan, Dr. James Finley and Dr. James Grace	Penn State University	
Effects of Natural Gas Pipelines and Infrastructure on Forest Wildlife	Dr. Margaret Brittingham	Penn State University	Barton, E., Pabian, S. and Brittingham, M. 2016. Bird Community Response to Marcellus Shale Gas Development. The Journal of Wildlife Management; DOI: 10.1002/jwmg.21117. Langlois, L.A., Drohan, P.J., Brittingham, M.C. 2017. Linear infrastructure drives habitat conversion and forest fragmentation associated with Marcellus shale gas development in a forested landscape. Journal of Environmental Management.
Assessing Landscape Change due to Marcellus Shale Drilling Operations and Devising Landscape Remediation Strategies to Minimize Site Impacts	Dr. Margaret Brittingham and Dr. Patrick Drohan	Penn State University	http://groundwork.iogcc.ok.gov/sites/default/files/brittingham-101013093530-phpapp01_0.pdf
Assessing Potential Impacts of Marcellus and Utica Shale Energy Development on the Timber Rattlesnake (Crotalus horridus) in North Central Pennsylvania	Dr. Gian Rocco and Dr. Robert Brooks	Penn State University	
Pennsylvania State Forest Visitor Use Monitoring (VUM) Program	Dr. Alan Graefe[1], Dr. Andrew Mowen[1], Dudley Kyle Olcott[1], Dr. David Graefe[2], Dr. Donald English[3]	[1]Penn State University, [2]Marshall University and [3]US Forest Service	Tioga & Tiadaghton (2008) http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20030740.pdf Sproul & Susquehannock (2011-12) http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20030739.pdf Tioga & Tiadaghton (2013-14) http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20031327.pdf Elk & Moshannon (2014-15) http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20032034.pdf Marcellus Summary (2016) http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20032659.pdf

Title/Work Description	Principle Investigator(s)	Institution	Reports/Publications
Acoustic Noise from Natural-Gas Compressor Stations on State Forest Land: Pilot Study	Dr. Thomas B. Gabrielson	Penn State University	Acoustic Noise from Natural-Gas Compressor Stations On State Forest Land: Pilot Study (Final Report)
Well Pad Invasive Species Surveys	Dr. David Mortensen and Kathryn Barlow	Penn State University	2012 and 2013 data sets Barlow, K.M., Mortensen, D.A., Drohan, P.J., Averill, K.M. 2017. Unconventional gas development facilitates plant invasions. Journal of Environmental Management.
Comparing Lepidopteran Communities Around Native and Non-Native Reclamation	Betsy Leppo	Western Pennsylvania Conservancy	
Tiadaghton State Forest 'Mock Pad' Reclamation	Dr. Patrick Drohan and Kathryn Barlow	Penn State University	https://stateimpact.npr.org/pennsylvania/2015/05/12/as-gas-boom-cuts-into-forests-scientists-study-how-to-put-it-back-together/
Vegetation Analysis on Dominion ROW in Tuscarora and Rothrock State Forests	Dr. David Mortensen and Karthryn Barlow	Penn State University	
Water Quality and Macroinvertebrate Assemblages	Dr. Adam Mumford	US Geological Survey	
Water Quality	Michael (Josh) Lookenbill	PA Department of Environmental Protection	
Water Quality	Dawn Hintz	Susquehanna River Basin Commission	http://mdw.srbc.net/remotewaterquality/ http://mdw.srbc.net/remotewaterquality/reports.htm Evaluation of Macroinvertebrate Communities in Exceptional Value and High Quality Streams Within the Remote Water Quality Monitoring Network (2016) RWQMN – DCNR Technical Summary (June 2016)
Road Maintenance	David Shearer	Penn State Center for Dirt and Gravel Roads Studies	
Plant Monitoring and Identification Training	Dr. Timothy Block	Morris Arboretum	

Table 2.5. DCNR research and collaborative efforts.

Website Links

[1] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20033429.pdf

[2] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20032134.pdf

[3] http://www.ahs.dep.pa.gov/eFACTSWeb/default.aspx/default.aspx

[4] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20029147.pdf

Literature Cited

Elzinga, Caryl L., D. Salzer, and J. Willoughby. 1998. Measuring & Monitoring Plant Populations. US Department of Interior, Bureau of Land Management, National Applied Resource Sciences Center. BLM/RS/ST-98/005+1730. Pg. 492.

Chapter III. Shale Gas Production and Administration

Key Points

- 2016 United States energy consumption was 97.4 quadrillion Btu.
- In 2016, 5.26 Tcf of natural gas was produced and brought to market by PA, with 8.9 percent of that volume coming from state forest land.
- Cumulative income from 1947 to 2016 from oil and gas activity on state forest land is $1,162,510,774.
- Revenues from oil and gas activity are allocated to the Oil and Gas Lease Fund.
- In general, shale gas development has not been impacting the bureau's implementation of its timber harvesting schedules and vice versa.

Introduction

Various forms of energy have been extracted and utilized throughout history to meet the needs of society. The U.S. Energy Information Administration (EIA) is an agency within the U.S. Department of Energy that provides independent and impartial energy information and statistics. EIA collects, analyzes, and disseminates energy estimates on coal, petroleum, natural gas, electric, renewable, and nuclear energy to promote sound policy making decisions and public understanding of energy and its interaction with the economy and the environment.

United States Energy Consumption

Energy consumption in the United States in 2016 was 97.4 quadrillion Btu. A Btu is defined as a British thermal unit, which is the energy required to raise one pound of water by one-degree Fahrenheit. Energy consumption is also expressed in quads, with one quad equaling one quadrillion Btu. This 2016 estimate of energy consumption by EIA is about the same as was reported in 2011 (Table 3.1). An illustration of estimated energy usage within the U.S. from 1776 to 2015 is in Figure 3.1.

Table 3.1. 2011 and 2016 U.S. energy consumption.

Primary Source	2016 quadrillion Btu	2016 Percent	2011 quadrillion Btu	2011 Percent
Coal	14.2	15%	19.9	20%
Natural Gas	28.5	29%	24.9	26%
Petroleum	35.9	37%	35.3	36%
Renewable Energy	10.2	10%	9.1	9%
Nuclear Electric Power	8.4	9%	8.3	9%
Total	**97.4**	**100%**	**97.5**	**100%**

The modern energy mix within the United States consists chiefly of five energy sources: oil or petroleum, natural gas, coal, various renewable energy sources, and nuclear energy (Figure 3.2). The second largest source of energy in the U.S. is natural gas or methane at 28.5 quads, or 29 percent of U.S. consumption.

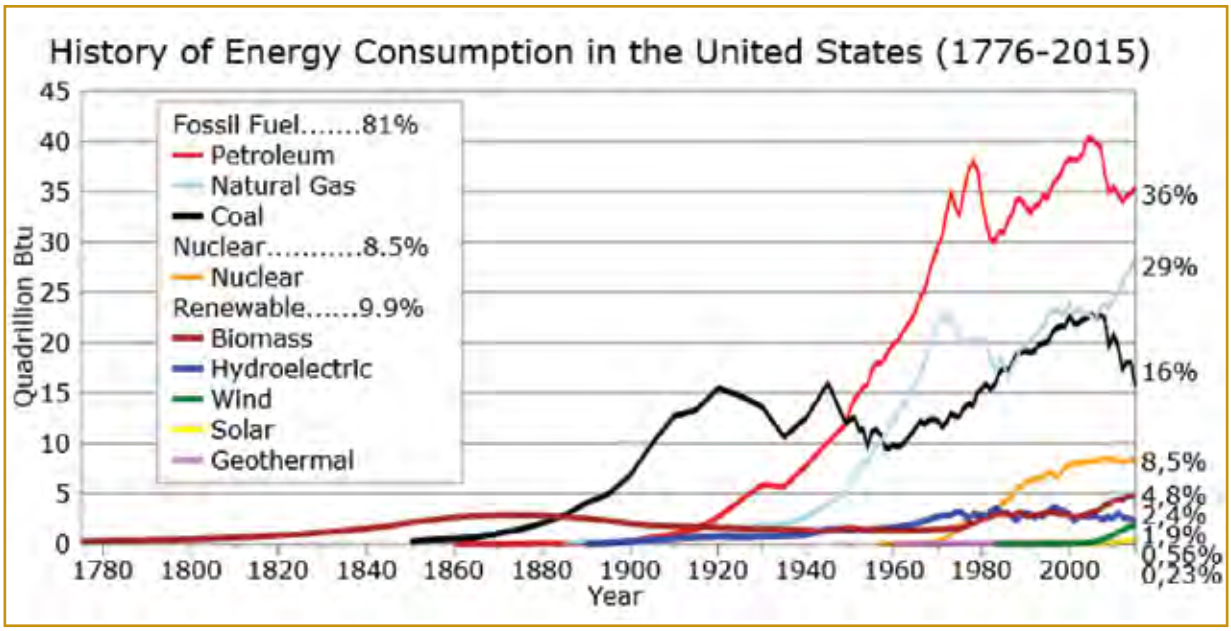


Figure 3.1. Estimated energy usage with the U.S. from 1776 to 2015.

Natural gas is a fuel of choice for heating, industrial processes, and electrical production where available in large quantities at a competitive price.

Since 2011, natural gas has increased market share in U.S. consumption from 24.9 to 28.5 quads. This is approximately a 4 percent increase since 2011. During this same time, coal has decreased in market share by approximately 5 percent.

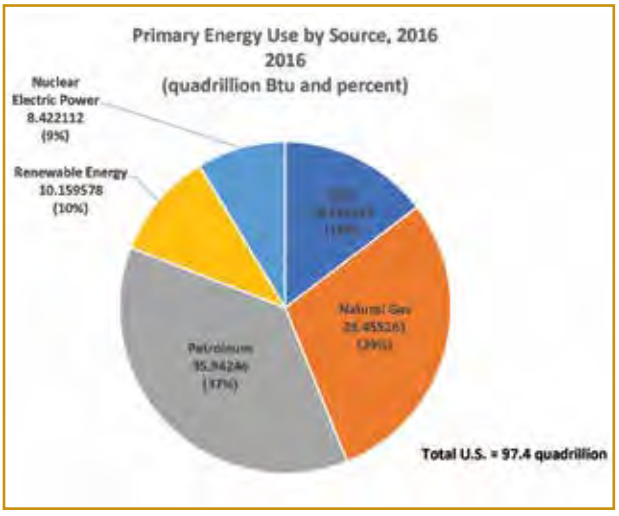


Figure 3.1. Estimated energy usage with the U.S. from 1776 to 2015.

Energy consumed in the U.S. continues to outpace production (Figure 3.4). The widest gap in consumption verses production occurred in 2005 when U.S. consumption was approximately 30% percent higher than production. In 2016, U.S. production met approximately 86 percent of consumption indicating the U.S. need for imported energy has decreased. Projections by EIA suggest that U.S. production may exceed consumption by the year 2026.

Pennsylvania Volume Estimates

Pennsylvania has a long history of providing natural gas to market. The EIA tracks reported gas production from all PA gas wells. From 2000 to 2007, prior to Marcellus, volumes produced in PA ranged from 0.15 to 0.18 Tcf annually. Marketed production increased from 0.2 Tcf in 2008 to 5.26 Tcf in 2016 (Figure 3.5). Production in years post 2007 reflect Marcellus shale development. Overall, production has increased during the 2000 to 2016 period. However, the increase in annual production has not been steady over this period. By looking at annual increases – or production growth – marketed production growth was modest from 2000 to 2009. Between 2010 and 2014, as developed Marcellus

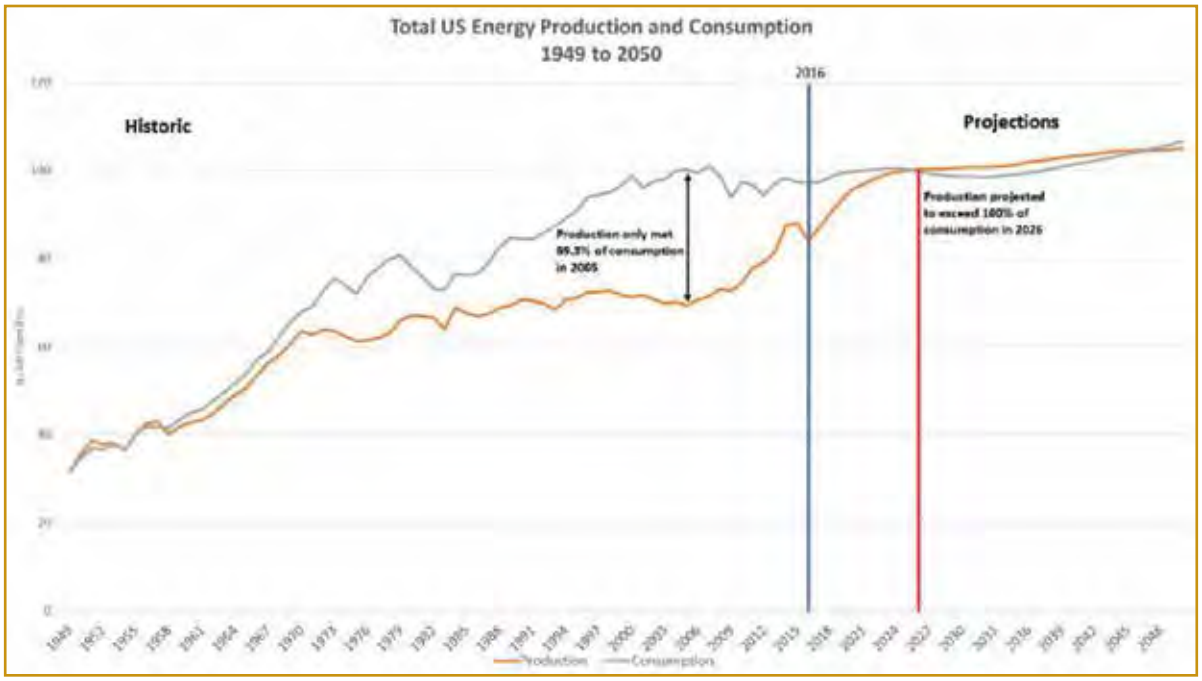


Figure 3.4. Total U.S. energy production and consumption.

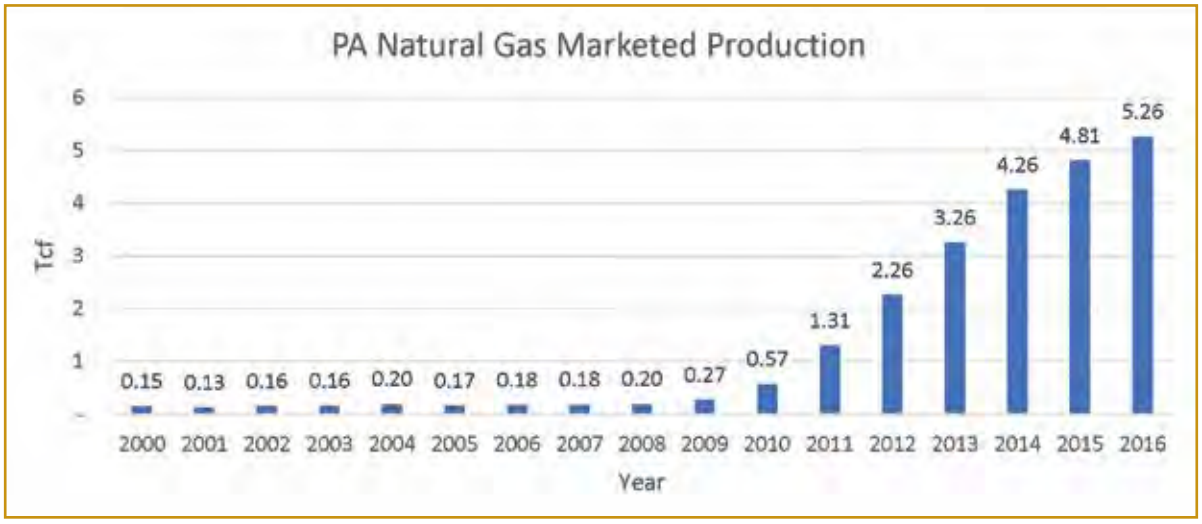


Figure 3.5. PA natural gas marketed production.

wells began moving gas to market, production growth increased substantially before trailing off in 2015 and 2016.

Pennsylvania Bureau of Forestry Gas Leases, Production, and Revenues

Since the first bureau issued gas leases in 1947, the development of natural gas resources on state forest land provided gas to market and a steady, increasing revenue stream. Natural gas leasing and development on state forest land can be broken into four main periods; deep Oriskany sandstone (1950's through 1970's), shallow Upper Devonian (1980's and 1990's), Trenton Black River (early 2000's), and Marcellus (2008 to present). Figure 3.6 illustrates historic levels of acreage under lease since 1947.

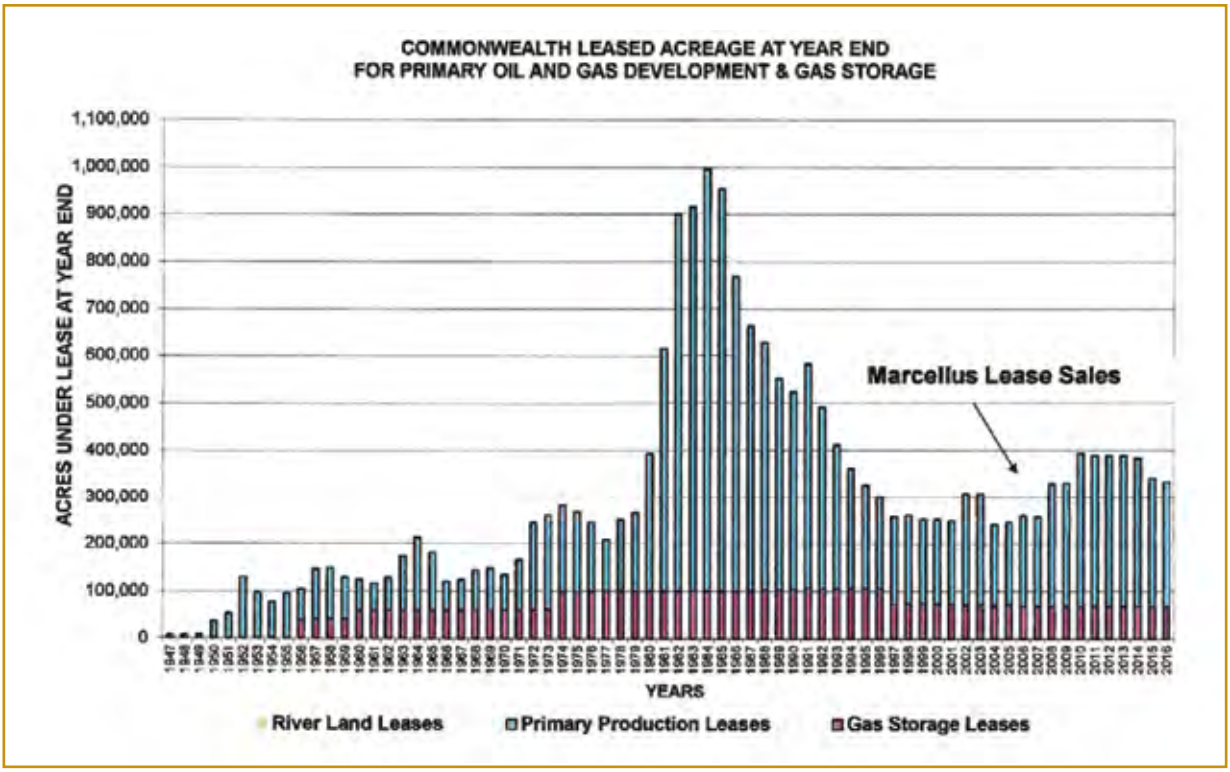


Figure 3.6. Commonwealth leased acreages.

The volume of natural gas produced from state forest land has historically made up a small percentage of overall PA production. From 1967 to 1992, natural gas volumes from state forest land have made up approximately 1 percent of overall production from PA. In the mid-90's, natural gas volumes from state forest land accounted for approximately 3.3 percent of overall PA production. Volume contributions of natural gas ranged from approximately 1-2 percent in the early 2000's leading up to Marcellus wells beginning to produce in 2010. Since Marcellus wells have begun producing, state forest land volume contributions of natural gas production have increased to over 8 percent of the total PA production (Table 3.2).

Decade	U.S. Total Tcf	PA Total Tcf	State Forest Gas Tcf	State Forest % PA Total
1940's	15.2	NA	0.007	NA
1950's	91.9	NA	0.285	NA
1960's	161.6	0.26	0.039	1.2
1970's	211.5	0.852	0.008	1.3
1980's	181.5	1.457	0.002	<1.0
1990's	193.5	1.353	0.030	2.6
2000's	201.5	1.793	0.024	1.4
2010 - 2016	182.1	21.783	1.977	8.9

Table 3.2. Pennsylvania natural gas production from state forest land.

Gas development on state forest land has generated substantial revenues from rentals and royalties associated with natural gas activities. Prior to Marcellus, the commonwealth received approximately $153,659,522 in total revenues related to gas activities from 1947 to 2007. Income from gas activities from 2000 to 2007 was approximately $5 million per year. From 2008-2016 the commonwealth received approximately $832,158,315 in revenues from gas activities on state forest land. This provided a revenue stream of approximately $80 million per year during this time (Table 3.3). In December of 2014, the total cumulative income from the program since 1947 exceeded one billion dollars in income.

Over the years, oil and gas revenues have been used to fund different commonwealth and department programs and projects. These include augmenting the commonwealth's general fund expenditures, land acquisition, recreation infrastructure additions and improvements, botanical surveys, equipment, and employee salaries. As revenues from oil and gas increased over the years, the rules for how these funds are allocated and spent have also evolved.

From 1947 to 1955 all income from state forest land leases was deposited into the state general fund. General fund money is allocated to support a broad array of government programs; including staff salaries, infrastructure, and equipment to maintain these programs. Because the revenues were put directly into the general fund, the funds were not readily available to the department for use on environmental projects.

As revenues from oil and gas increased through the 1950's, income was accumulated in a special fund. Act 256 of 1955, or the Oil and Gas Lease Fund, was created to allow oil and gas revenues to be deposited into this fund with spending authority granted to the Secretary of DCNR. The Oil and Gas Lease Fund allowed for four broad categories of expenditures; conservation, recreation, dam construction and maintenance, and flood controls on state forest and park lands.

From 1955 to 2008 the Oil and Gas Lease Fund remained unchanged and allowed DCNR and its predecessors to use the funds at the discretion of the Department Secretary. During this time the fund accumulated just over $150 million that was allocated for the following purposes:

- Land acquired for state forests (over 200,000 acres incrementally over time).
- Land acquired for 26 state parks (incrementally over time).
- Purchase oil and gas development rights under existing state forest lands (2,000 acres).
- Pine Creek Rail Trail acquisition and development.
- Numerous Heritage and Botanical Survey projects.
- Bureau field office vehicles (1980 onward).
- Computers for use by the bureau (1990 onward).
- Forest management and maintenance equipment.
- Staff salaries and materials for the management of the Oil and Gas Lease Fund.

Following the first Marcellus lease sale in 2008, DCNR received revenues surpassing those generated in the past. The Oil and Gas Lease Fund was modified to allow oil and gas revenues to be directed to the general fund. In total, $383 million were used to fill PA state budget gaps in the general fund over two budget years.

In 2012, the Oil and Gas Lease Fund authority was again changed to include fund distributions to several special funds and a definitive set-aside for DCNR. This legislation is known as Act 13 of 2012. The distribution was the Marcellus Legacy Fund ($35 million annually) and the Hazardous Sites Cleanup Fund ($15 million in addition to the $50 million annually allotted to DCNR). Table 3.4 illustrates the broad category expenditure and amounts from the Oil and Gas Lease Fund from 2008 through 2016 fiscal years.

Decade	Gas Storage Rentals	O&G Lease Rentals	O&G Lease Royalties	Total Income	Cumulative Income
1940's	$0	$4,671	$407,433	$412,104	$412,104
1950's	$291,951	$3,753,964	$21,774,636	$25,820,551	$26,232,655
1960's	$1,134,812	$1,700,169	$4,689,749	$7,524,730	$33,757,385
1970's	$2,855,941	$5,795,016	$1,391,068	$10,042,025	$43,799,410
1980's	$8,693,593	$25,918,737	$10,225,488	$44,837,818	$88,637,228
1990's	$13,198,747	$5,971,032	$14,825,508	$33,995,287	$122,632,515
2000's	$19,691,657	$171,842,932	$18,163,451	$209,698,040	$332,330,555
2010 - 2016	$18,791,731	$293,022,352	$518,366,136	$830,180,219	$1,162,510,774
Total	$64,658,432	$508,008,873	$589,843,469	$1,162,510,774	$1,162,510,774

Table 3.3. State forest land oil and gas income by decade.

Expenditure	Amount
General Fund Transfer	$383,000,000
DCNR Parks Operations	$223,978,000
DCNR Forestry Operations	$173,315,000
Marcellus Legacy Transfer	$105,000,000
DCNR Gen Govt Operations	$47,135,050
Vehicles & Equipment	$29,481,045
Services	$26,435,243
Personnel Services	$16,920,968
IT Equip, Software & Hardware	$7,511,378
Land Purchases	$6,992,395
Grants	$6,158,676
Aggregate, fuel, signs, uniforms, vehicle repair	$5,710,039
Supplies	$2,948,490
Printing, Postage, Freight	$1,482,864
Rent/Lease	$787,714
Capital Improvements	$663,762
Utilities	$650,959
Fixtures & Other Equipment	$321,560
Other	$317,932
Training	$301,345
Travel	$80,896
2008-2016 Fiscal Year Total	**$1,039,193,317**

Table 3.4. Oil and Gas Lease Fund category expenditure and amounts from 2008-2016 fiscal years.

Timber Harvesting Related to Gas Activities

According to the bureau's strategic plan, Penn's Woods, the state forest timber policy is: "State forest lands should provide a sustained yield of high quality timber consistent with the principles of ecosystem management." The bureau uses silviculture as a tool for regenerating the forest by following a timber harvest scheduling model that leads toward the goal of balancing the age class distribution; securing a sustainable flow of timber products; conserving and perpetuating underrepresented forest community types; and creating or improving specific types of wildlife habitat. The state forest system has been third-party certified by FSC as "well managed." To maintain forest certification and market harvested timber products from state forest land as "certified" wood, the bureau must show that its timber harvesting levels can be sustained and that harvesting levels are achieving desired future conditions. Meeting the timber harvest schedule's acreage targets is important to the sustainability of the timber industry in Pennsylvania, which relies heavily on sustained yields of forest products from state forest lands. A continuous, steady supply of quality timber from state forest lands is essential to the survivability of the hardwood industry and the economy of some regions of Pennsylvania.

Gas development has implications for the bureau's timber management program. A key question in evaluating the effects of shale gas development is whether the activity is affecting the attainment of annual harvest targets and placement of timber sales in the core gas forest districts. It may be possible, with additional monitoring, to discern any reductions in total acres harvested and/or acres harvested within areas now under shale gas lease that may occur in the future.

In general, shale gas development does not appear to be impacting timber harvesting activity and placement. Prioritizing areas for oak and ash salvage operations is one explanation for the current placement of timber sales. This is a common practice within the bureau when large tracts of timber succumb to a forest pest such as gypsy moth or emerald ash borer.

The deterioration of state highways from gas related activity throughout the shale gas region and associated road bonding is a potential concern for the forest products industry, upon whom the bureau depends to implement harvests plans and its long-term management plan. The weight, timing, and markedly increased frequency of shale gas development-related payloads contrasts to the traditional use of these highways by logging contractors, which involves fewer loads and attention to seasonal conditions. As a result, roads in this region have suffered accelerated wear. The Pennsylvania Department of Transportation (PennDOT) has responded by instituting increased road bonding requirements and damage assessments. In addition, the gas industry has funded highway upgrades and repairs in some areas. The Oil and Gas Act (Act 13 of 2012) provides certain protections to the timber industry and other at-risk industries regarding road bonding. Additionally, the transportation bill passed in 2013 addresses road bonding issues across Pennsylvania. The bureau works with PennDOT and other partners to address these impacts on state forest lands and the forest products industry.

A positive effect of natural gas development has been the use of gas development access roads for timber sales. Timber is transported from the forest to the mill by trucks that require road systems. If a timber sale is not adjacent to an existing state forest road, a haul road must be constructed. The cost of a haul road is deducted from the value of the timber being sold and is incurred by the bureau. Conversely, gas access roads are constructed at a cost to the gas company requiring the access. The bureau has leveraged these roads for timber removal whenever possible.

Crossing gas pipelines with heavy equipment associated with timber harvesting has created issues regarding pipeline integrity and safety. Gas operators are responsible for protecting their property in a manner that

does not impede the bureau from utilizing the surface. In some cases, pipelines were not buried to a depth considered adequate for heavy equipment crossing. In these cases, temporary padded crossings were utilized for the duration of the timber harvesting activity.

In addition to revenues generated directly from leases and gas royalties, the bureau also receives revenues from the sale of the timber associated with natural gas infrastructure development. Both subsurface ownership rights and state forest gas leases allow for the infrastructure necessary to develop mineral resources, such as pad clearings, compressor stations, roads, and pipelines. The construction of infrastructure may require the clearing and conversion of forest land. The commonwealth must be compensated for assets including timber and pulpwood and loss of future growth. Depending on the agreements or lease terms, operators have the option of compensating the commonwealth for the value of the timber based on a timber cruise or through a flat per acre rate. Either method results in the volume being sold at double the stumpage value. Although timber removed to facilitate gas activities is not FSC certified wood, 10 percent of revenues from these sales are deposited into the bureau's regeneration fund. This fund reinvests in projects on state forest land to establish new forest. Table 3.5 illustrates revenues from timber sales associated with gas development activities since 2008.

Agreements, Documentation, and Infrastructure Management

To manage infrastructure on state forest land, many legal documents, records, agreements, and licenses must be prepared, maintained, and continuously updated. With the onset of shale gas development, many of these tasks increased in frequency and complexity. Additionally, the bureau had to adapt to the novel components and considerations unique to shale gas development. See Table 3.6 for a description of several of the common components of documentation and management of state forest infrastructure.

The combined number of road use agreements (RUA) and right-of-way agreements (ROW) have decreased in the last 10 years (Figure 3.7). However, there has been an expanded workload due to the increased complexity of distinct types of agreements that have been issued during recent years. For information on requesting ROWs please see DCNR's Right of Way[1] webpage.

	Sawtimber		Pulpwood		Firewood		Payment In Lieu Of Volume Estimation	Total
Year	Board Foot Volume	$	Cubic Foot Volume	$	No. of Cords	$	$	$
2008	1,736,548	$1,797,505.38	127,410	$14,767.89	0	$0.00	$7,584.50	$1,819,857.77
2009	1,862,827	$1,637,112.27	101,039	$18,119.31	0	$0.00	$319,900.00	$1,975,131.58
2010	897,447	$847,474.36	47,124	$12,632.27	58	$514.00	$2,616,140.00	$3,476,760.63
2011	566,669	$647,863.79	44,636	$10,858.83	0	$0.00	$3,342,107.85	$4,000,830.47
2012	237,641	$160,373.66	57,343	$18,411.46	455	$9,206.30	$1,746,545.82	$1,934,537.24
2013	763,066	$715,343.19	34,030	$8,591.50	0	$0.00	$813,755.11	$1,537,689.80
2014	607,871	$798,141.96	16,734	$4,745.52	0	$0.00	$484,289.28	$1,287,176.76
2015	538,201	$610,190.45	10,800	$2,428.00	0	$0.00	$194,503.70	$807,122.15
2016	205,154	$134,813.11	10,631	$2,439.56	0	$0.00	$17,993.50	$155,246.17
Total	7,415,424	$7,348,818	449,747	$92,994	513	$9,720	$9,542,820	$16,994,352.57

Table 3.5. Timber sale revenues associated with gas development activities.

Task/Document	Description
Road Use Agreements	Agreements to use state forest roads to conduct commercial activities; includes provisions for compensation of the commonwealth for this use and protections for the safety of the visitors, as well as the natural resources within the state forest
License for Right of Way (ROW) Agreements	Pipeline or electrical lines to gas facilities require clearance of vegetation; these agreements outline the expectations and requirements of users/lessees
Communication tower requests	Currently a mortarium on communication towers except as part of gas lease or for purpose of public safety; for shale gas development, primarily at pad sites or Main Transmission Tie-in Interconnect sites
Licensee change of asset ownership: Assignments and transfers	As assets are sold and exchanged, all legal documents must be updated to reflect these changes
Agreement of Consent to Use of ROW	Agreements to define parameters and requirements of use, where 2 parties are sharing the same ROW or portions thereof
Accounting	Updates/changes to internal tracking system for payments, etc.
Comptroller Reports of Delinquent Accounts	Follow-up contact with lessees regarding delinquent payments for rental accounts

Table 3.6. Description of common components of documentation and management of infrastructure.

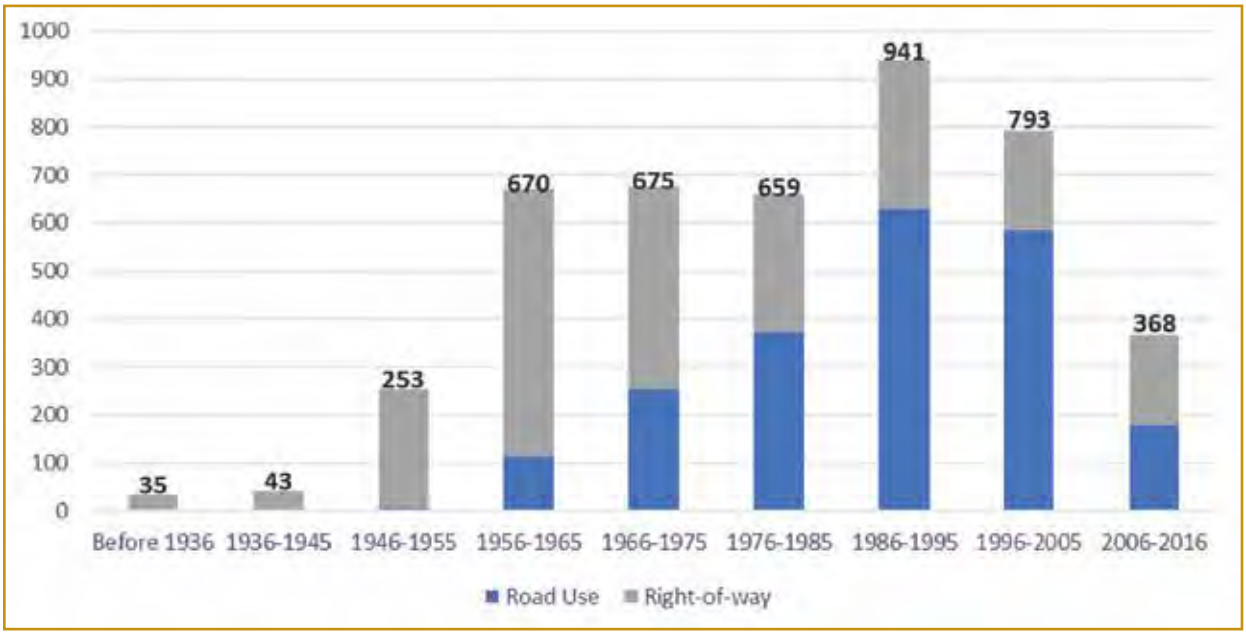


Figure 3.7. Total number of Road Use and Right-of-way agreements issued by 10-year blocks.

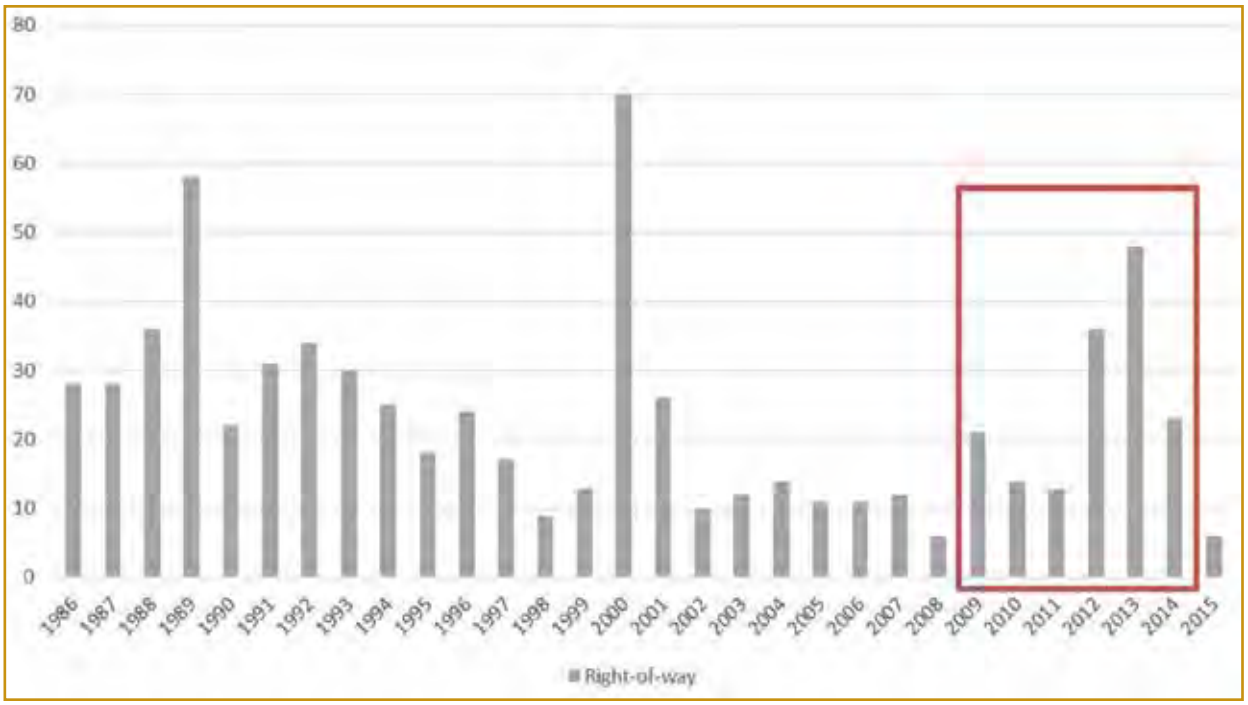


Figure 3.8. Right-of-way agreements by year for the past 30 years. Red box indicates increased number of right-of-way agreements issued, which coincides with shale gas development.

With the increased volume of natural gas being extracted from state forests came the need for additional pipelines. The leasing of state forest land for shale gas development brought an increase in the number of ROW agreements issued by the bureau (Figure 3.8). ROW agreements include electrical facilities for gas development, which existed prior to shale gas development to service meters, valves, etc., but increased with the onset of shale gas development. In addition, there are numerous agreements for large main gas transmission system upgrades and new lines along existing corridors that required expansion and construction.

In addition to the increase in number, agreements also became more complex. The standard template for such agreements required adjustment to address modern concerns in energy development. Prior to these updates in 2009, the template had not been revamped since the early 1990's. Many changes to management of the state forest system had occurred in this time and needed to be reflected in the new parameters in the template.

For example, during this time, the state forest system became certified by FSC, and many FSC standards have implications for gas infrastructure development, such as requirements for species composition of seed mixes or adhering to a list of approved herbicides. The update to the template provided an opportunity to include incentives for minimizing environmental impacts, such as placing electrical lines underground.

Another of the major new provisions included updated language regarding the prevention and removal of invasive plant species that were introduced because of infrastructure installation and maintenance. This new provision was only used on the large regulated gas transmission systems. In addition, threatened and endangered species considerations were updated as well. In the provisions, incentives for minimizing habitat fragmentation and environmental impacts, such as using existing rights-of-way or disturbed areas, were included.

Standard annual rental rates were adjusted to reflect actual project expenditures. These updated rates are

based on actual project expenditures on adjacent private lands as reported in the Oil & Gas Journal.

Additionally, timber compensation numbers were also updated to reflect recent market values in the updated provisions.

Transactions between companies often result in the transfer of agreements the companies hold with the bureau. Transfers represent a continuous part of the workload to keep paperwork up-to-date, but also provide the bureau with an opportunity to address issues and insert additional requests or conditions based on lessons learned. Thus, continuously adapting to the most recent science and information.

RUAs have existed for many years and are common in other operations on state forest land, such as timber extraction. Unlike ROW agreements, the main template did not change with the onset of shale gas development, but the supplementary provisions have become more diverse with gas as opposed to previous forest uses. Although a decrease in the number of agreements is seen in the past 10 years (Figure 3.9), the road needs for shale gas development are generally more demanding than traditional forms of road use, due to the quantity of truck traffic and the heavy hauling required for drilling operations. In general, all road use on lease tracts is granted by the lease agreement and not in a separate RUA, which is likely the reason for the decrease in formal RUA's. These recent RUAs have included more detailed supplementary provisions for the alterations and special considerations that may be needed to prepare a road for use during shale gas development. New provisional requirements are included to address specific aspects of use, such as culverts, trenching over vs. boring under roads, temporary pipeline protection to allow continuation of other activities, and any number of issues addressed in case-by-case addendums. However, the bureau recognizes there may be a need for additional agreement provisions because the time scale of the agreement for shale gas development may necessitate RUAs that span decades, where the traditional RUAs were generally written to address issues on a scale of months to years. To fully account for this new dynamic, a multi-disciplinary group was assembled and is currently working on how to transition from the short-term development type RUA to a longer-term agreement that includes provisions such as road maintenance for long-term gas access.

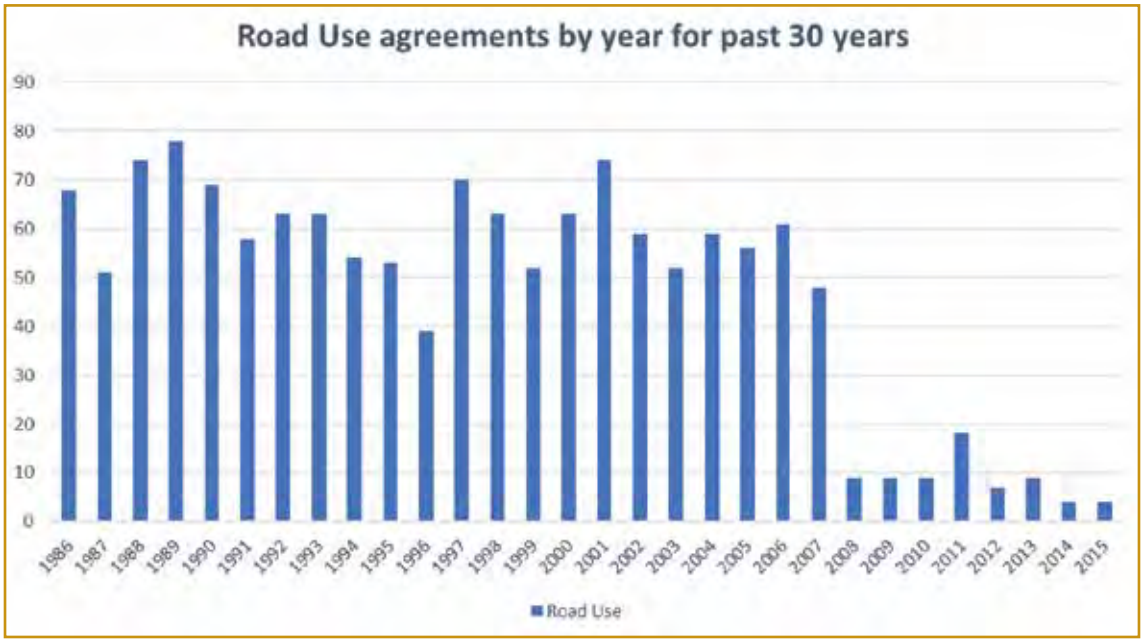


Figure 3.9. Road use agreements by year for the past 30 years.

The bureau may secure road bonds from companies for shale gas development if the activity is not on a tract that the company leased through the bureau that has a surety bond. The purpose of the bureau retaining bond for use of a road is to cover the cost of any necessary repairs resulting from the hauling activity. Road bonding guarantees that the appropriate funds are available to keep the road in is as good as, or better, condition than prior to the commercial use of the road. The bureau determines rates for proper road bonding based on two categories of hauling for commercial activities defined by gross vehicle weight. These two categories are light hauling and heavy hauling. Beyond vehicle weight, the bureau also takes into consideration the length or mileage of road(s) being used, the number of bridges crossed within that area, and the existing road surface materials. The figures are evaluated periodically to determine if updates or changes to current rates are necessary. As an example of the importance of this measure, one instance occurred in which a company needed truck traffic during thawed winter conditions. This did extensive damage to a road. The bureau worked with the company to correct the damage and the company went beyond baseline requirements to correct the damage. Bonding for this road was previously $30,000, but this incident illustrated the need to raise the rate to an amount that was more proportional to the true costs. It was then raised to over $300,000 to properly protect the bureau's investment.

In addition to RUAs and ROW agreements, the bureau has communication tower agreements. Currently, there is a moratorium on new communications towers on state forest land established in 2000, but exemptions for public safety are made. Also, the moratorium does not apply to gas leases since towers are part of the lease. Agreements for communications towers were promoted in shale gas development because off-site monitoring means less personnel and truck traffic on state forest roads, which is a public safety benefit. To address shale gas development specifically, additional guidelines have been developed to address unique situations, such as towers on severed rights lands vs. leased lands or restoration requirements at the end of the life of the tower.

Adaptation is crucial to effective management of the increased demands and novel considerations that come from the commercial use of state forest land. The bureau has had to adapt many processes to continue being good trustees of the commonwealth's resources.

Large Projects Committee

Even before shale gas extraction began on state forests, the uptick in the gas energy market created a need to transport increasing volumes of product. With existing pipelines nearing full capacity around 2006, new main gas transmission system pipeline requests began to inundate the bureau, beginning around 2008. To ensure due diligence and to examine the impacts, benefits, and appropriateness of each pipeline ROW project, the bureau created a formal internal review and approval process based on the FERC Pre-File Environmental Review Process[2]. This process fosters the "avoidance, minimization, mitigation, and monitoring" approach to energy development and to provide transparent documentation of the bureau's decision-making procedures. The reviewers, named the Large Projects Committee, consists of an interdisciplinary team. This committee examines proposals and negotiates alterations to avoid or minimize impacts to state forest land and its users. After each project is approved by the committee, it undergoes an additional round of review via the State Forest Environmental Review process (SFER). In this process, staff across the bureau can provide feedback and express concerns with aspects of the project. The entire review process typically takes between 18-24 months.

At the peak of activity, as many as 60 proposals were in the queue for review. These were mostly main gas transmission systems in existing corridors. But in recent years, the number of projects under review at any given time has been fewer than ten.

Currently, the committee meets weekly to discuss current proposals. Nearby states that also process pipeline ROW requests have contacted the bureau to learn more about this process to include in their state's review protocols.

Website Links

[1] http://www.dcnr.pa.gov/Business/Rights-of-Way/Pages/default.aspx

[2] https://www.ferc.gov/resources/processes/flow/lng-1.asp

Chapter IV. Shale Gas Infrastructure and Landscape Effects

Key Points

- 1,769.5 acres of state forest have been converted to accommodate shale gas infrastructure from 2008-2016.
- The amount of state forest acres converted to accommodate shale gas infrastructure from 2013-2016 (333.9 acres) was less than 2008-2012 (1,435.6 acres), which is indicative of the slow-down in development.
- 174.1 acres of state forest were converted to accommodate shale gas pad infrastructure, 124.1 acres for pipeline corridors, and 35.7 acres for road corridors between 2013-2016.
- The co-location of pipelines and roads has led to an increase in corridor width for roads that were improved to accommodate shale gas development.
- Fragmentation of large blocks of core forests resulted in a decrease of core forest greater than 200 hectares in size by 15,134 acres and increases in smaller category core forests (100-200 hectares and <100 hectares) since 2008.
- The fragmentation of forest leads to an increase in edge forest habitat. Since 2008, an additional 9,913 acres of edge forest have been created in the shale gas forest districts.
- Site rehabilitation (the act of reducing infrastructure pad footprints by revegetating no longer needed cleared areas) of shale gas infrastructure has taken place in six forest districts: Moshannon, Sproul, Tiadaghton, Elk, Susquehannock, and Tioga. Twelve well pads, two impoundment sites, two monitoring well sites, and one meter station have been subject to site rehabilitation.
- To better understand how Marcellus shale well pad construction techniques impact the effectiveness of forest reclamation practices, the bureau, in partnership with researchers from Penn State, constructed a 1-acre “mock well pad” demonstration site in May of 2015.
- Ongoing data collection on the “mock well pad” will be used to test different techniques, seed mixes, and tree and shrub species survival.

Introduction

Shale gas infrastructure is the most visible impact of shale gas development on state forests. Existing native vegetation often is cleared to build new roads, pipelines, and pads. Many existing roads are also expanded and widened so they can handle higher volumes of traffic and larger vehicles. Beyond the visual impact of clearing forest,

shale gas infrastructure development can increase forest fragmentation, reduce the amount of core forest habitat, and alter the recreational experience of some forest users.

Roads

Most state forest roads are improved dirt roads constructed for small vehicle traffic and occasional use by log trucks. They are not adequate for the heavy use of large vehicles involved in shale gas development. Therefore, existing roads must be modified to handle traffic associated with extraction of shale gas resources. Typical modifications involve widening the road and increasing the depth of the road base material. Additionally, new roads are created to reach pads located away from existing roads.

Road Construction and Modification

Road construction and modification for gas development declined from the 2008-2012 period (220.5 total miles) to the 2013-2016 period (42.3 total miles). The Elk State Forest was the only forest district where the miles of new roads constructed or modified increased for these periods (Figure 4.1). The increase in the Elk State Forest is partially attributed to the steady development that has occurred in the district over the years, severed rights development, and the unusually large land acquisitions.

Acres converted to road use were calculated using the final ROW width. The road ROW includes the road and the area adjacent to the road that is maintained as non-forest. When roads are modified, the road ROW may not be expanded. From 2008-2012, 197.5 acres were converted to accommodate shale gas roads and 35.7 acres were converted between 2013-2016. Three state forests (Moshannon, Sproul, and Susquehannock) did not have any acres converted to road ROWs from 2013-2016 (Figure 4.2). Additionally, the Elk State Forest was the only state forest with an increase in acres converted to road ROWs from 2008-2012 to 2013-2016.

Road Surveys

The bureau assesses conditions on roads used for shale gas annually. The road profile, slope, cross-section width, cross section slope, drainage/infiltration features, running surface width, canopy gap width, limit of clearance width, and ditch widths are measured at permanent plots every ¼ mile. From 2012 to 2014, 215 improved or new roads have been surveyed (2012-119, 2013-85, 2014-11). In 2015, 33 of those roads were resurveyed and in 2016, 17 roads were resurveyed. Roads will be resurveyed periodically to determine trends and longevity of materials used.

Treadway, road surface, cross section, and limit of clearance widths have all increased from gas development (see Figure 4.3 for illustration of these measurements). Limit of disturbance is a bureau designation that is negotiated with the gas operator and falls within the limit of disturbance (the separation between the areas that can be disturbed and those that will not be disturbed based on the specifications of the DEP approved permit) where actual removal of predominant vegetation cover, including overstory, midcanopy or understory vegetation, and/or original soil substrate will occur. The increase in road widths occurred on public use roads, administrative roads, and drivable trails (Figures 4.4, 4.5, and 4.6). The largest increase occurred when comparing the limit of clearance. For example, the limit of clearance for public use roads was ~30 feet prior to improvement and ~52 feet after improvement. Increases in limit of clearance for all road types were primarily due to the co-location of pipelines in the same corridor as roads. Wider cross sections and limit of clearances relate to more open tree canopies over the roadway which negatively affects habitat connectivity, wild character, and increases fugitive dust. The greatest change in road character occurred on drivable trails and gated administrative roads. Typically, drivable trails and gated roads are very narrow with complete canopy cover and receive only very limited maintenance. However, after upgrades for shale gas activities they resemble improved public use roads (Figure 4.7). Road

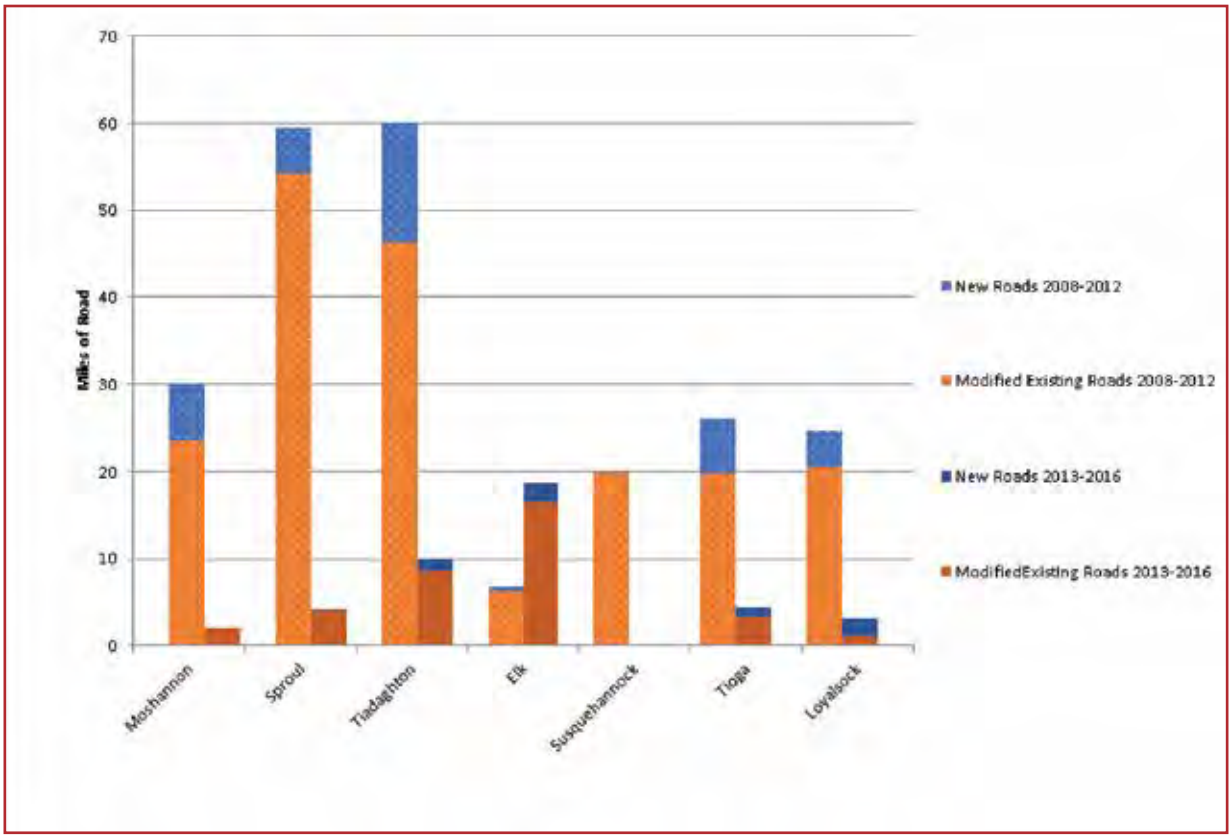


Figure 4.1. Miles of new road construction and existing road modification for 2008-2012 and 2013-2016 by state forest in the core gas forest districts.

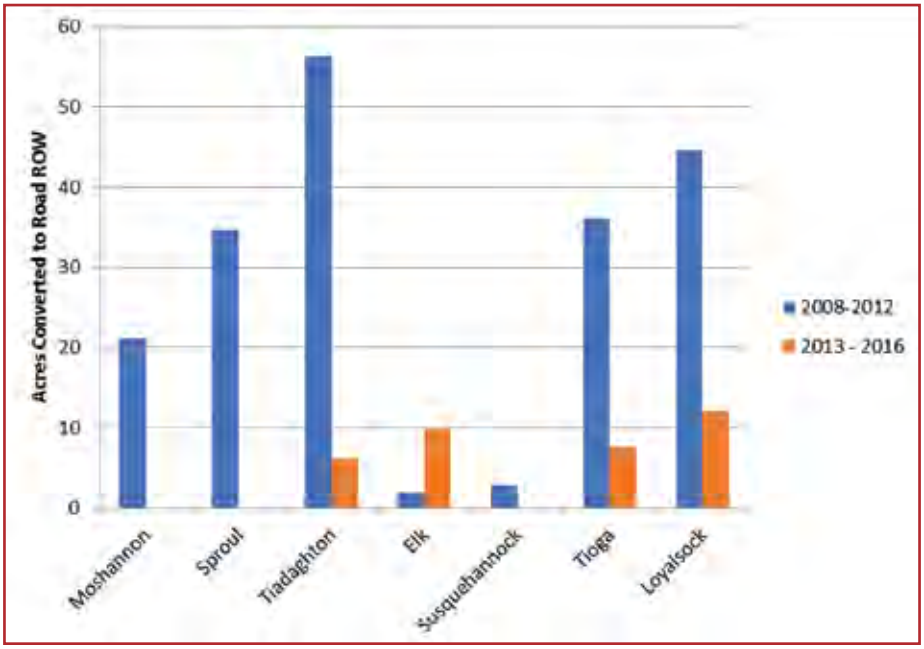


Figure 4.2. Acres converted to road right-of-way 2008-2012 and 2013-2016 by state forest in the core gas forest districts.

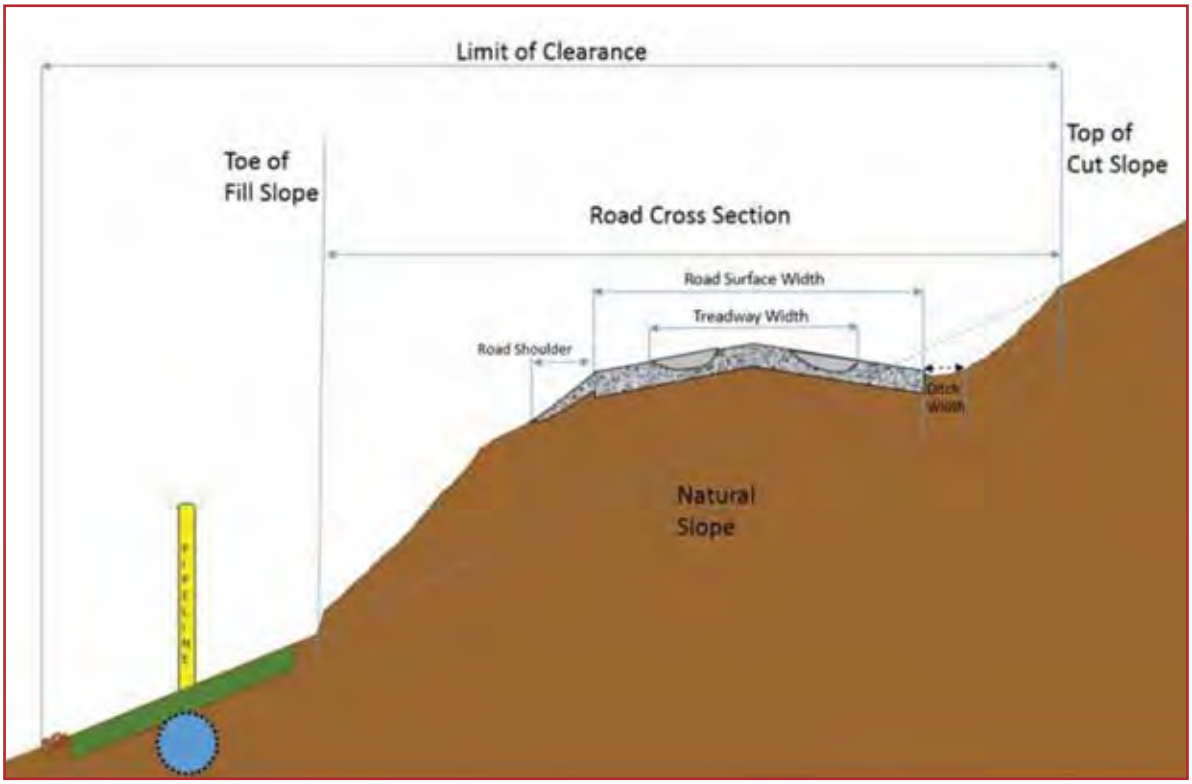
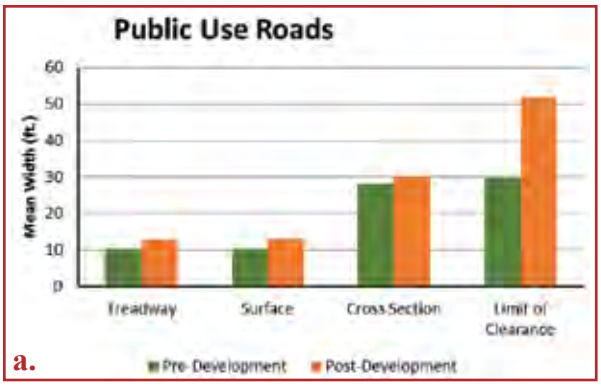
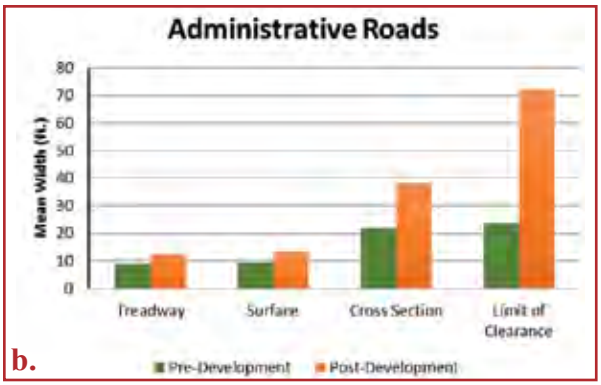


Figure 4.3. Diagram of road width measurements on road surveys.





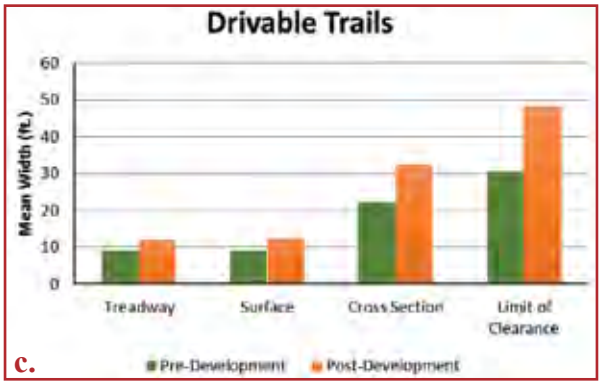


Figure 4.4. Treadway, road surface, cross section, and limit of clearance widths (ft.) for public use roads (a.), administrative roads (b.) and drivable trails (c.) on state forest land prior to and after improvement for oil and gas use.

Figure 4.5. Typical high use public road before (left) and after (right) improvement for oil and gas use.

Figure 4.6. Typical low use public road (left) and typical low use gas road with pipeline adjacent to road (right).

Figure 4.7. Typical gated administrative road (left) and typical administrative road used for oil and gas (right).

widths and conditions are affected by several factors including topography, size of vehicles, and amount of traffic. For instance, roads improved for pickup truck access are not widened as much as roads improved for heavy equipment use. The number and type of pipelines installed adjacent to roads and the adjacent topography also affect the limit of clearance and how much space is needed for equipment and soil maneuverability.

Pre- and post-gas roads had similar surface conditions. Post-development roads showed a slightly higher percentage of poor plots (6 percent) than pre-development roads (3 percent). Roads are considered in poor condition if you must brake or drive around a condition (e.g., potholes, ruts, and erosion) on the road or if a road condition causes loss of traction (e.g., rills and washboards). Roads with adequate conditions (good condition, but it could use attention in the future in some manner) for pre-development were 6 versus 10 percent for post-gas development roads. The primary reasons for poor ratings were potholes and inadequate depth of top cover aggregate to base material.

Dust Control

Increased traffic on roads used for shale gas can lead to increased road dust. Road dust is a nuisance to recreationists that can cause decreased visibility and increase wear on vehicle parts. Additionally, dust can alter soil chemistry out to ten meters from the roadway (Brown 2009) which may alter forest floor soil ecology. Limestone road dust can also increase soil pH which is conducive to the establishment of invasive plant species. The use of dust suppressants has been requested by various companies to help control dust on state forests roads.

Dust suppressants can have negative effects on the environment and road. Penn State's Center for Dirt and Gravel Road Studies (CDGRS) maintains a list of approved suppressants that are deemed safe for the environment. Most of these suppressants are derived from petroleum emulsions. These products bind the fine soil particles tightly enough that the road becomes like pavement. Potholing and other issues can still arise where an inadequate subbase or improper drainage are present. Potholes, rills, ruts, and drainage issues that are in the road prior to application remain in the road and are then very difficult to remove due to the hard surface.

Some types of road surface materials can reduce dust issues. Many common road surface materials are made of high proportions of clay or very fine particles. These particles are easily lifted into the air when dry and when vehicles pass over them (Figure 4.8). Driving Surface Aggregate (DSA) developed by CDGRS and PennDOT contains fine crushed rock as a binder rather than soil/clay particles and produces less dust. Any of the finer rock particles that do lift will readily drop back out whereas clays and fine soil particles suspend in the air for long periods of time. Other factors that increase dust are vehicle speed, daylight, and moisture. The bureau recommends maintaining canopy cover, reducing speeds, and applying water to help reduce dust.

Since 2013, one request was submitted for the application of a chemical dust suppressant. Ultrabond 2000®, a petroleum emulsion, was applied to 1.1 miles of Okome Road in the Tiadaghton State Forest. While the product has greatly reduced dust, it has also resulted in a pavement-like hardening of the road surface that will make future maintenance more challenging (Figure 4.9).

Road Closures

Complete or partial state forest road closures are sometimes necessary to safely accommodate shale gas activities. Unfortunately, road closures can be inconvenient for state forest users or nearby landowners. The bureau works closely with companies to keep closures to a minimum. In areas with partial road closures, one-way traffic is allowed using multiple methods. One method is to use staggered one-way traffic like a PennDOT road project. In this case, gas companies typically coordinate the traffic control through flaggers. However, in one instance a company used portable red lights to alternate traffic direction.

Figure 4.8. Dust on a wide surface open canopy road with traditional 2A-Modified surface aggregate.

Figure 4.9. Gravel road after application of a petroleum emulsion to control dust, notice the road surface has hardened like pavement.

Another method is to incorporate temporary one-way traffic where a road loop system can work. One-way traffic reduces the risk of meeting large vehicles coming from the opposite direction and keeps traffic in motion. Utilizing these methods helps to keep the permanent road corridor narrow and maintains tree canopy connectivity.

Since 2013, there were three instances where one-way traffic was utilized. One area in the Elk State Forest is still being utilized as a one-way loop (Boundary Line Rd-Doe Run Rd-North Fork Rd) from October 2015 to present. In the Loyalsock State Forest, a one-way road loop (Hagerman-Long Run-Gray's Run) was utilized in May 2016. One administrative road in the Tioga State Forest was opened for fall hunting seasons and was made a one-way loop (Sawmill Trail-Matson Rd) to reduce traffic conflicts.

Some complete road closures may still be necessary such as for the installation of a pipeline in the road shoulder or a pipeline crossing a road. The bureau attempts to keep these closures brief and outside of popular times to visit state forest, e.g., evenings and weekends. There have been three total road closures on state forest since 2013. These have been temporary closures in the Tiadaghton State Forest (Big Spring Road – Aug. 2015, 3 weeks; Boone Road – Sept. 2015, 8 hours; and Huntley Road – Sept. 2015, 10 hours). Additionally, though not a state forest road, there was a township road (Kato-Orviston) that traverses through the Sproul State Forest that was closed for short periods from May to September 2015 for the installation of a pipeline in the road shoulder. This road remained open on evenings and weekends.

Bridges

The bureau has worked diligently to ensure the effects shale gas roads have on streams is minimized. Many bridges on state forest roads needed replacement due to age or were not suitable for large heavy loads. In these cases, companies have been required to pay for upgrades. New and replaced bridges are added into PennDOT's bridge database system and are scheduled for periodic field inspection for safety and structural analysis. Bridges are inspected about every five years and are either inspected by DCNR Bureau of Facility Design and Construction engineers or certified contractors.

Between 2013-2016, two new bridges have been installed and three existing bridges were replaced and/or upgraded. The two new bridges were on an administrative road for well pad access and were for the same stream crossing in the Elk State Forest. The crossing was a braided stream and alternate routes

required crossing wetlands and increasing forest fragmentation. The three existing bridges were replaced in 2015 in the Tiadaghton and Elk State Forests (administrative roads), and the Loyalsock State Forest (public use road).

Through field visits of past bridge replacements and installations, the bureau has noted obstructions to aquatic organism passages (AOP). Types of obstructions include perched pipes (Figure 4.10), clean fill placed in the stream channel (Figure 4.11), structures too narrow for the stream channel, or improper placement. As a result, the bureau has begun official surveys of these structures following the North Atlantic Aquatic Connectivity Collaborative (NAACC) protocols in addition to structural assessments to specifically identify any potential issues related to AOP and stream/riparian habitat connectivity. Using information from field visits and these new monitoring inspections, the bureau has updated guidelines that include criteria for the type of structures to use (emphasizing open bottom), span criteria, bank stability and structure angle, and material used for stabilization as well as aesthetic requirements.

Figure 4.10. Pipe on first order stream perched and too narrow for the natural stream bed. The company has agreed to replace the pipe with an open bottom arch.

Figure 4.11. Example of bridge on first order stream with clean fill in the stream channel impeding aquatic organism passage. Water passes under the substrate causing disconnected habitat. In clean mountain streams it can take years for the open substrate to fill in.

Pads

The term "pad" is used to reference well pads, compressor stations, freshwater impoundments, storage pads, stone pits, and meter valve or tap stations. Summaries of the number and acreage of pads are given for 2008-2012 and 2013-2016.

Multiple pad types can occur within the same cleared area. For example, a company may clear a portion of forest and then place a well pad and freshwater impoundment in the cleared area. The cleared area is divided between the two pad types. There are inconsistencies between the 2008-2012 pad data in this report and the first Shale Gas Monitoring Report. These inconsistencies occurred because pad boundaries have been refined/corrected over time using updated data and imagery (Figure 4.12).

Newly constructed pads within the core gas forest districts declined from 224 pads in 2008-2012 to 41 in 2013-2016. The acres converted to pads decreased from 665.7 to 174.1 along with the acres cleared (1126.2 to 303). The Elk State Forest was the only forest district with an increase in pad and cleared acreage between 2008-2012 and 2013-2016 (Figure 4.13). The increase in the Elk State Forest is partially attributed to the steady development that has occurred in the district

Figure 4.12. Illustration of how the digitally represented pad boundaries have been corrected over time. In the first report the latest aerial image for this site (left side) was taken prior to construction. The actual pad boundary, number of pads, and limit of clearance is unknown. Therefore, this site was classified as one well pad. The well pad limit of clearance (white dashed line) was used as the pad acreage. In 2013 (right side), a new aerial image was available, and three separate pad types were clearly visible (in black); a well pad, a freshwater impoundment, and a storage pad. Each of these pads is given its own limit of clearance (white dashed line). This results in more pads and less total pad acreage/

over the years, severed rights development, and the unusually large land acquisitions. The greatest number of acres converted to pads was for well pads followed by freshwater impoundments (Figure 4.14). From 2013-2016, 18 pads (23.5 acres) were no longer being used and have been reclaimed.

Well Pads

Well pads are the areas where drilling and hydraulic fracturing occur. Typical shale gas well pads have one to ten wells and are approximately 3.5 to 7 acres in size. Well pads may also have small compressor stations or freshwater storage tanks associated with them. Wells for multiple shale targets (e.g., Marcellus, Burkett, and Utica) may be drilled from the same pad site if pre-planning is done by the operator.

Well pads are the most abundant type of shale gas pad on state forests. The number of new well pads declined for all districts from 2008-2012 to 2013-2016. This was the biggest decline for all pad types. Well pad acres and cleared acres declined for all districts except the Elk State Forest. The Elk State Forest also had the greatest number of well pads, most well pad acres, and most cleared acres of all the gas forest districts for 2013-2016 (Table 4.1).

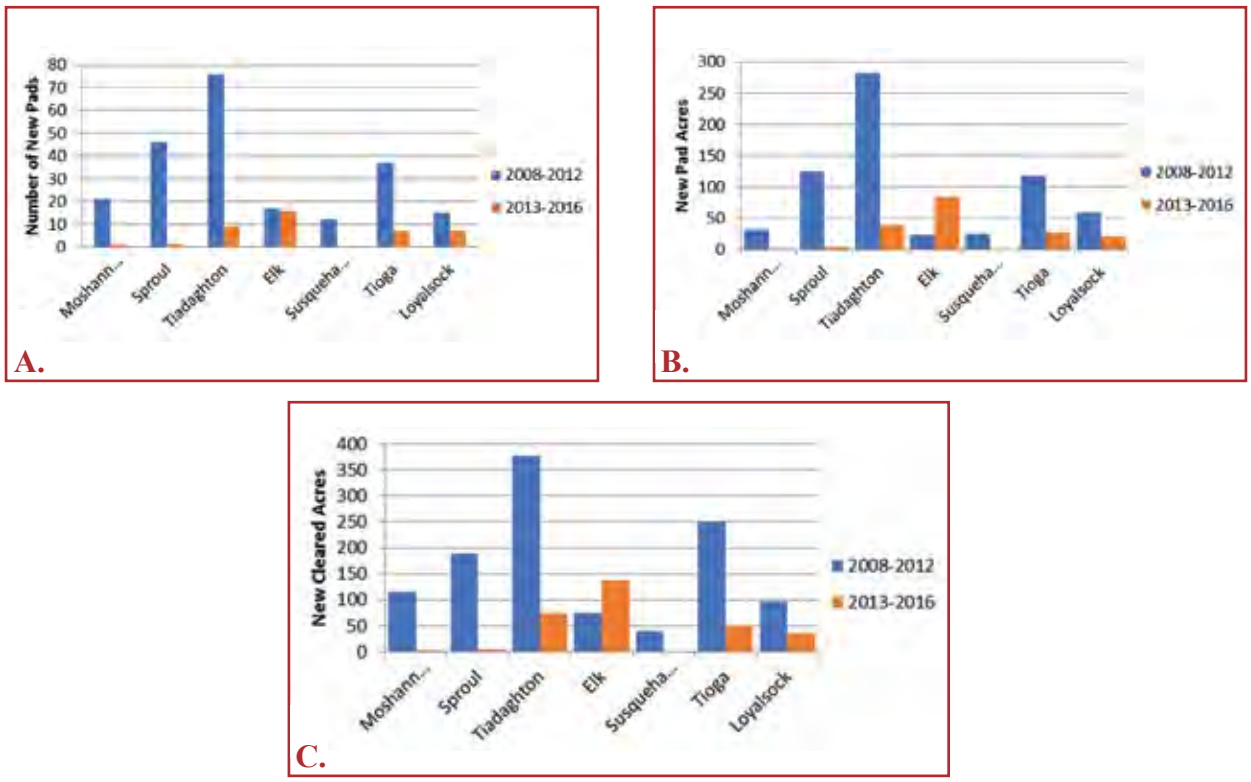


Figure 4.13. Number of new pads constructed (A), total new pad acres (B), and total cleared acres (including temporary limit of clearance) (C) by state forest district for 2008-2012 and 2013-2016.

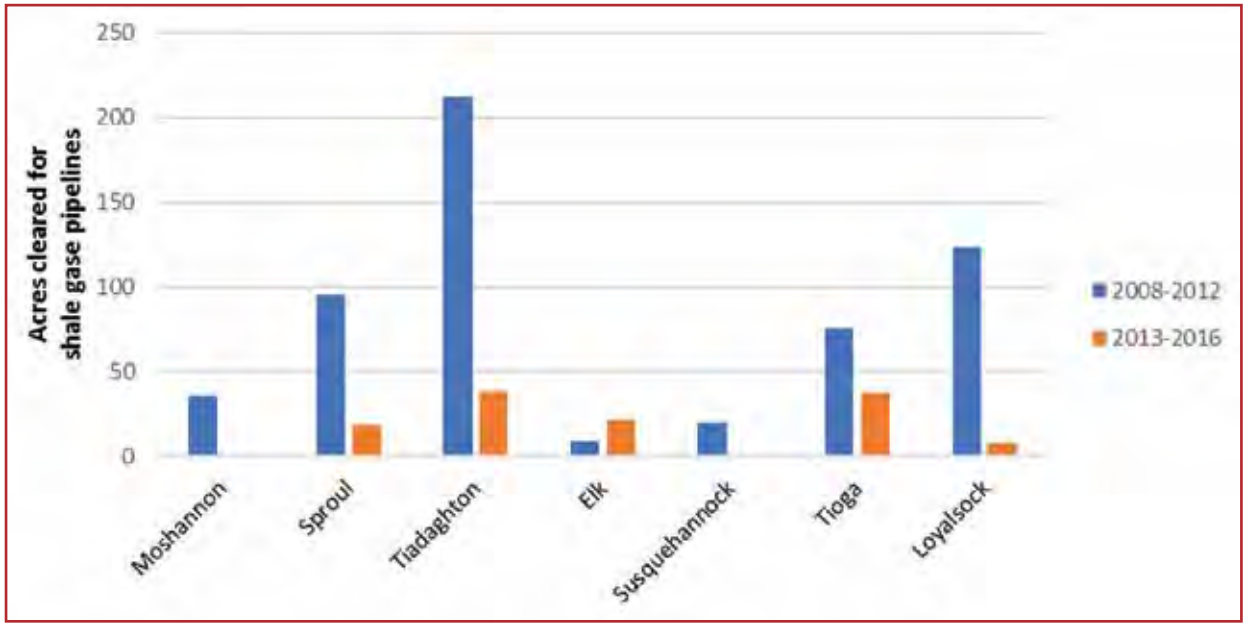


Figure 4.14. Acres of new pads by pad type for 2008-2012 and 2013-2016.

This is due to the steady pace of development and land acquisitions in this state forest.

Compressor Stations

Compressor stations are used to increase pressure within pipelines and can service multiple well pads. Compressors stations may also have separators, which remove undesirable particles or liquids from the gas, or chemical storage located on the site.

Five new compressor stations requiring 40.1 cleared acres, were constructed from 2013-2016. New constructions, acres, and cleared acres declined from 2008-2012 to 2013-2016 (Table 4.1). The Tiadaghton State Forest had the largest increase in number of compressor pads and cleared acres.

Freshwater Impoundments

Hydraulic fracturing requires an average of 5 million gallons of water to complete a well. Freshwater storage impoundments in proximity to well pads are needed to ensure a consistent and adequate supply of water to the well. There are three types of water storage that are included as freshwater impoundments:

- Earthen Impoundments – Non-portable, open pits that are typically five to 14 acres in size. Dams are constructed using soil and require a permit if they are over 15 feet high.
- PortaDams – Semi-portable above ground impoundments made of heavy-duty liners on a steel framework. They are typically three to five acres in size.
- Above-ground storage tanks – Semi-portable cylindrical tanks that are often set on concrete slabs.

Five new freshwater impoundments requiring 59.9 cleared acres, were constructed from 2013-2016. New constructions, acres, and cleared acres declined from 2008-2012 to 2013-2016 (Table 4.1). The Elk State Forest had the only increase in number of freshwater impoundments, acres, and cleared acres.

Other pads

The following pads are also used to support shale gas infrastructure:

- Storage pads – facilities that provide temporary storage for equipment and materials for developing shale gas infrastructure.
- Meter stations – facilities that measure the amount of natural gas being supplied or withdrawn to pipelines.
- Valve stations – facilities used to isolate segments of gas pipelines. They are typically located every 15-20 miles along a pipeline.
- Tap stations – facilities that direct gas from a gathering system to a transmission pipeline. They typically only have pressure regulating equipment.
- Stone pits – facilities where stone is extracted to support shale gas development activities.

Four new other pad types requiring 5.3 cleared acres, were constructed for 2013-2016. New constructions, acres, and cleared acres declined from 2008-2012 to 2013-2016 (Table 4.1). The Elk State Forest had the only increase in number of other pads, acres, and cleared acres.

Pipelines

Pipelines are an efficient method to move oil and gas from wells to market. Most wells have gathering pipelines that carry gas to larger transmission pipelines. Transmission pipelines then transport oil and gas to markets within a state or even across state lines. Some wells also use pipelines to carry water from offsite storage facilities to wells for hydraulic fracturing.

Building and maintaining underground pipelines requires clearing the ROWs of trees and other woody vegetation. The impact of pipeline ROWs on state forests can be minimized based on where they are built. In an analysis of fragmentation of core forest habitat, Langlois et al. (2017) found that pipeline ROWs comprised the highest

Table 4.1. Number of pads, pad acres, and cleared acres for each pad type and state forest 2008-2012 and 2013-2016.

Pad type	State Forest District	Number of new pads		New Pad Acres		New Cleared Acres	
		2008-2012	2013-2016	2008-2012	2013-2016	2008-2012	2013-2016
Well Pads	Elk	15	12	21.0	59.3	66.8	95.6
	Loyalsock	9	4	37.1	10.1	59.2	23.1
	Moshannon	13	0	21.5	0	72.9	0
	Sproul	34	1	96.9	3.7	143.5	3.7
	Susquehannock	4	0	15.0	0	22.2	0
	Tiadaghton	52	5	183.5	19.4	230.3	33.9
	Tioga	25	5	88.1	21.3	185.3	41.4
Sub Total:		**152**	**27**	**463.1**	**113.7**	**780.2**	**197.6**
Compressor Stations	Elk	1	1	1.8	5.2	3.0	6.9
	Loyalsock	1	1	10.4	2.2	13.0	3.3
	Moshannon	1	0	1.8	0	2.1	0
	Sproul	3	0	6.5	0	9.0	0
	Susquehannock	1	0	0.03	0	1.1	0
	Tiadaghton	2	3	5.2	14.8	6.1	29.9
	Tioga	3	0	9.0	0	16.4	0
Sub Total:		**12**	**5**	**34.7**	**22.2**	**50.7**	**40.1**
Freshwater Impoundments	Elk	1	2	1.3	17.6	4.6	33.1
	Loyalsock	4	1	10.2	7.1	16.8	8.1
	Moshannon	2	0	6.6	0	19.4	0
	Sproul	3	0	19.8	0	32.1	0
	Susquehannock	5	0	7.8	0	11.8	0
	Tiadaghton	13	1	83.1	5.0	126.9	11.3
	Tioga	5	1	15.0	4.5	35.4	7.4
Sub Total:		**33**	**5**	**144.0**	**34.2**	**247.0**	**59.9**
Other Pads	Elk	0	1	0	1.7	0	1.7
	Loyalsock	1	1	1.4	1.0	3.0	1.0
	Moshannon	5	1	2.2	0.8	10.8	0.8
	Sproul	6	0	2.0	0	3.5	0
	Susquehannock	2	0	2.4	0	4.0	0
	Tiadaghton	9	0	10.3	0	14.7	0
	Tioga	4	1	5.7	0.5	12.4	1.9
Sub Total:		**27**	**4**	**23.9**	**3.9**	**48.3**	**5.3**
Grand Total:		**224**	**41**	**665.7**	**174.1**	**1126.2**	**303.0**

State Forest District	Pre-existing Pipelines	Years	Shale-Gas Pipelines	Co-Located Pipelines	Total
Moshannon	175.6	2008 to 2012	22.0	4.3	**201.9**
		2013 to 2016	0	0	**0**
Sproul	190.3	2008 to 2012	19.3	12.0	**221.6**
		2013 to 2016	1.4	0	**1.4**
Tiadaghton	18.5	2008 to 2012	42.4	2.4	**63.2**
		2013 to 2016	7.8	0	**7.8**
Elk	169.0	2008 to 2012	1.7	23.5	**194.3**
		2013 to 2016	9.7	0	**9.7**
Susquehannock	179.7	2008 to 2012	3.2	0	**182.9**
		2013 to 2016	0	0	**0**
Tioga	35.1	2008 to 2012	17.0	0	**52.1**
		2013 to 2016	3.3	0	**3.3**
Loyalsock	8.9	2008 to 2012	16.2	0	**25.1**
		2013 to 2016	1.8	0	**1.8**
Total:	**777.2**		**145.8**	**42.2**	**965.2**

Table 4.2. Miles of non-shale gas pipelines, shale gas pipelines and shale gas pipelines co-located within existing utility corridors by forest district, 2008-2012 and 2013-2016.

portion of total gas development footprint within their study area of Lycoming County and had the largest effect on habitat fragmentation. When possible, the bureau encourages companies to co-locate pipelines within existing corridors (roads, pipelines, or electrical) and avoid high quality streams, wetlands, and steep slopes. When this is not possible, the bureau recommends following BMP's (Oil and Gas Management Guidelines[1]) that can reduce potential impacts, such as encouraging scrub/shrub habitat in the pipeline corridor to reduce impacts to wildlife.

Within the core gas forest districts, 188 miles of pipeline corridors have been constructed since 2008. Of those 188 miles, approximately 22 percent were co-located within an existing utility ROW. Most shale gas pipelines were installed prior to 2013 (142 miles). The Elk State Forest was the only state forest district with more new pipeline miles from 2013-2016 than 2008-2012. The Elk State Forest also had the most miles of pipelines installed (9.7) from 2013-2016 (Table 4.2).

The acres cleared to install new pipelines for shale gas development can be calculated in a geographic information system (GIS). For shale gas pipelines co-located within existing utility corridors, only the acres added to the corridor are counted for shale gas pipelines. Approximately 696 acres of forest have been cleared for shale gas pipelines: 572.4 acres were cleared from 2008-2012 and 124.1 acres were cleared from 2013-2016. The Elk State Forest was the only state forest district with more new cleared acres from 2013-2016 than 2008-2012. However, the Tiadaghton State Forest had the most acres cleared for both time periods (Figure 4.15).

The bureau recommends new pipelines be constructed on gentle slopes to help reduce erosion. Approximately 126 miles of shale gas pipeline corridor within the core gas forest districts occur on slopes less than 10 percent. When steep slopes can not be avoided, 5.3 miles of shale gas pipelines were built on slopes greater than 20 percent (Table 4.3). Erosion and sedimentation control measures are required for all pipelines, but they are especially important for pipelines on steep slopes. The bureau and DEP regularly monitor the effectiveness of these control measures on pipelines.

Pipeline Stream Crossings

Clearing pipeline rights-of-way and installing pipelines across streams may lead to bank erosion and long-term impacts on streamside vegetation within the ROW. To reduce long-term negative impacts on the streams, pipeline installation companies working on state forest land are required to follow Post Construction Storm Water Management (PCSM) and Erosion and Sedimentation Control BMPs.

The bureau assessed topography, vegetation, and stream bank characteristics at 14 pipeline stream crossings in 2016 (Figure 4.16). The bureau has also developed pipeline stream crossing BMPs incorporating information from DEP and the Pennsylvania Fish and Boat Commission (PFBC).

At the 14 pipeline stream crossings evaluated, the average ROW width (measured 25' from the stream bank) was 82.3' (minimum-37', maximum-180'). The average slope from the stream bank to 25' uphill was 14 percent (minimum-0 percent, maximum-48 percent) and the average slope from the stream bank to the horizon was 15 percent (minimum-2 percent, maximum-45 percent). The width and slope were measured on both sides of the streams, but the results were combined because there was not a difference by side.

The stream bank cover for both banks was recorded upstream, downstream, and within the ROW. Most stream banks upstream, downstream, and within the ROW were covered with naturally occurring vegetation. However, many streams also had Erosion and Sedimentation (E&S) vegetation on the banks within the ROW, but not outside the ROW (Table 4.4). E&S vegetation are plant species that were planted in the ROW to quickly grow and stabilize the disturbed soil when installing the pipeline.

Bank sloughing was the only erosion detected and it was found on 3 stream crossings. The erosion on the

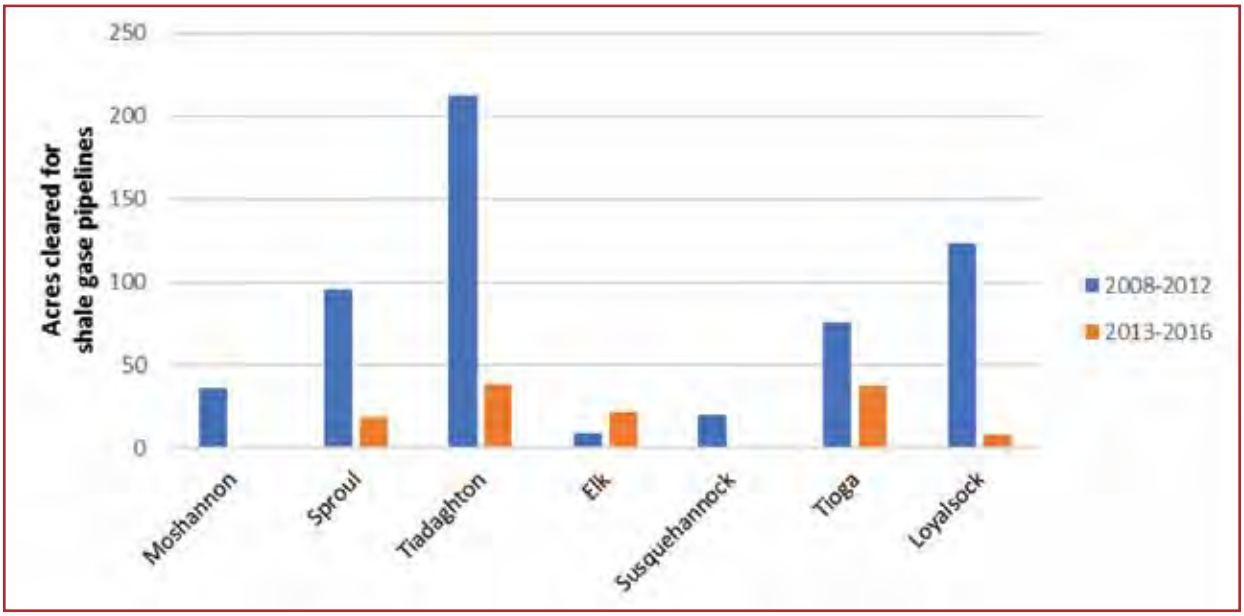


Figure 4.15. Acres of forest cleared for shale gas pipelines by forest district, 2008-2012 and 2013-2016.

State Forest District	Years	0 to 10%	10 to 20%	20 to 30%	30 to 40%	40 to 50%	> 50%	Total
Moshannon	2008-2012	20.4	1.5	0.1				22.0
	2013-2016							0.0
Sproul	2008-2012	17.9	1.4					19.3
	2013-2016	1.4						1.4
Tiadaghton	2008-2012	36.5	4.5	0.6	0.3	0.2	0.2	42.4
	2013-2016	7.6	0.2	0.1				7.8
Elk	2008-2012	1.7						1.7
	2013-2016	9.6	0.1					9.7
Susquehannock	2008-2012	1.2	1.5	0.3	0.2			3.2
	2013-2016							0.0
Tioga	2008-2012	16.1	0.7	0.2				17.0
	2013-2016	2.7	0.4	0.2				3.3
Loyalsock	2008-2012	10.6	2.8	1.1	1.7			16.2
	2013-2016	0.8	1.0					1.8
	Total:	**126.4**	**14.1**	**2.6**	**2.2**	**0.3**	**0.2**	**145.8**

Table 4.3. Miles of new shale gas pipeline corridors by percent slope by forest district, 2008-2012 and 2013-2016.

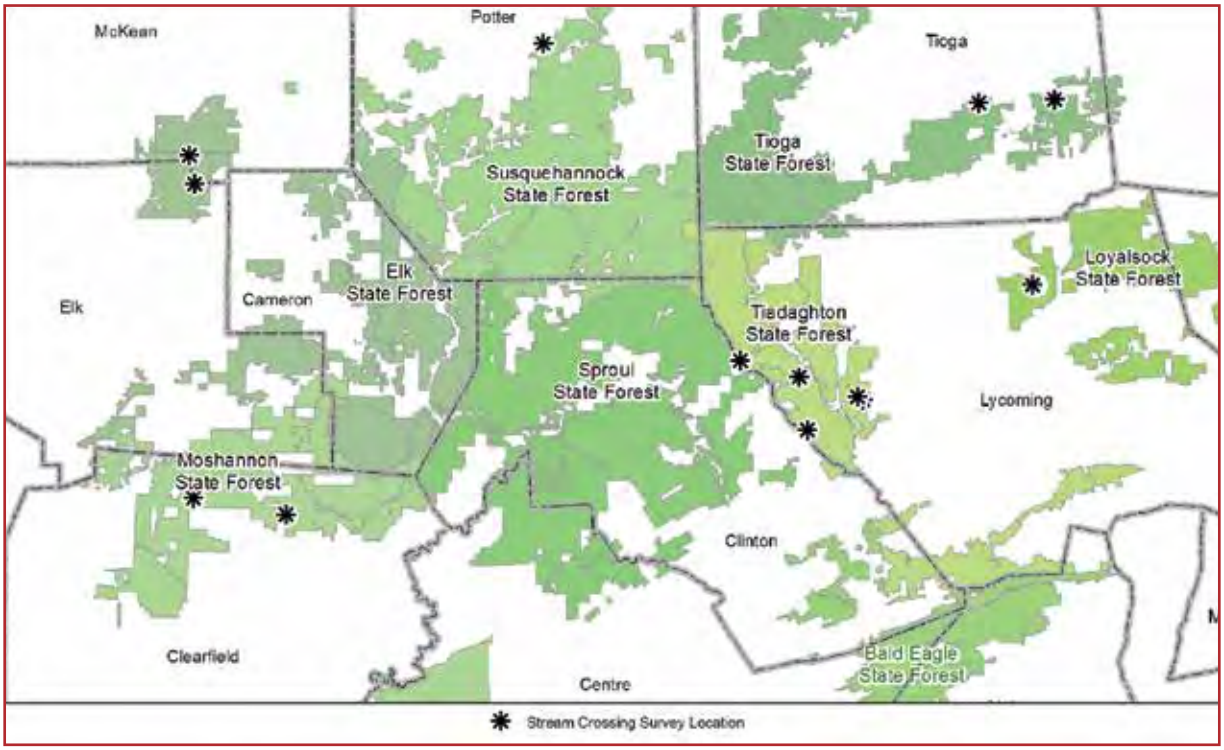


Figure 4.16. Location of pipeline right-of-way stream crossings that were assessed in 2016.

Stream Bank Cover	Within ROW	Outside ROW
Rock Armor	4	1
Erosion Control Materials (Mat, Sock, etc.)	2	1
Naturally Occurring Vegetation in good condition	8	14
Erosion and Control Vegetation in good condition	5	0
Dense root coverage (may or may not be undercut)	0	1
Exposed bank with little or no root coverage	0	1
Other: Road and Culvert	0	1
Other: Bridge and Culvert	0	1

Table 4.4. Number of streams with each bank cover type within and outside the pipeline rights-of-way for 14 streams assessed in 2016. Stream bank sections could have multiple cover types.

crossing in the Tiadaghton State Forest was on one bank within the ROW and was considered light (Figure 4.17). Erosion on the crossing in the Loyalsock State Forest was also considered light, but occurred on both stream banks within the pipeline ROW (Figure 4.18). Erosion on the crossing in the Moshannon State Forest was considered moderate, but did not occur within the pipeline ROW. The erosion occurred on an outside bend in the stream within a power line ROW that is adjacent to the pipeline ROW. The pipeline at this crossing was installed in 2011. However, erosion can be seen at that site in a 2006 aerial photo (Figure 4.19). Therefore, the erosion was not caused by the installation of the pipeline.

Efforts taken to reduce stream bank erosion within pipeline ROWs appear to be working. Vegetation along all banks was in good condition and artificial methods of stabilizing the bank were still present. Erosion was rare and when it was present within the pipeline ROW it was light. The only case of moderate erosion was present prior to the pipeline installation and was outside the pipeline ROW and was known to be there prior to the construction of the pipeline.

Figure 4.17. Light bank sloughing on the left bank of the right-of-way in the Tiadaghton State Forest.

Figure 4.18. Left and right banks of the right-of-way in the Loyalsock State Forest. Light bank sloughing was observed on both banks.

Figure 4.19. A 2006 aerial photograph of the power line right-of-way adjacent to the crossing in the Moshannon State Forest. This photograph was taken 5 years prior to the installation of the pipeline. Bank sloughing that was detected in the 2016 assessment is also seen in this photograph.

Post Construction Stormwater Management

New roads and pads increase the amount of impervious surface on state forest lands. Impervious surfaces can increase and concentrate surface water runoff which may lead to erosion, heavier flooding, or introduce pollution into streams. The Federal Clean Water Act (CWA) prohibits the discharge of pollutants in waterways without a permit. Within Pennsylvania, the CWA permitting process is administered by DEP. In 2012, DEP changed the permitting to include new standards for post construction storm water management (PCSM). All new construction projects since 2012 are required to follow the new guidelines and some older projects have been required to update their stormwater management to the new standards.

Water gardens, infiltration basins, infiltration trenches, and infiltration berms (earthen or media sock) are used to control stormwater runoff (Figure 4.20). Water gardens allow water to percolate through the soil and have wetland vegetation growing in them. This slows water flow and allows water to be removed through evapotranspiration. Infiltration basins are similar except they do not have wetland vegetation. Berms and trenches are designed to slow or capture water and move it to basins or PCSM structures. However, PCSM practices can have unintended repercussions. They may involve clearing more forest (Figure 4.21), change the natural process of water infiltration in the forest, and may impact habitat for amphibians. The bureau began documenting where PCSM structures were installed on pads in 2013 and along roads in 2016.

Four roads were surveyed for PCSM structures: Matson Road and Oak Ridge Trail in the Tioga State Forest and Narrow Mountain and Sugar Camp roads in the Loyalsock State Forest. These roads received substantial PCSM practices to account for road stormwater runoff. Ten infiltration basins were installed on these roads. They were, on average, one-half acre in size with average widths (distance beyond road footprint) of 93 feet and average lengths (parallel to road) of 240 feet. One infiltration berm 30 ft. wide by 265 ft. long was installed. One trench 70 ft. wide for the length of the road was installed (approximately 0.8 acres).

Six gas well pads were surveyed in 2016 that held 12 PCSM structures. Of those structures two were designed to hold water (rain gardens). Three structures, which are not supposed to hold water (one infiltration berm and two conveyance channels), were holding water during the survey. Standing water in these structures may affect amphibian populations.

Total Infrastructure Development

A total of 1,769.5 acres of state forest have been converted to accommodate shale gas infrastructure

Figure 4.20. Post construction stormwater management practices. A. Water garden, B. Retaining pond with overflow, infiltration trench and basins, C. Infiltration basin, and D. infiltration berm.

Figure 4.21. Pre-existing administrative roads. Red lines depict the limit of clearance if there were no infiltration structure.

(1,435.6 acres 2008-2012 and 333.9 acres 2013-2016). This includes the acreage of the pad footprint and the limit of clearance for pipeline and road corridors. The Tiadaghton State Forest has had the most number of acres converted to accommodate shale gas infrastructure but saw a large decline from 2008-2012 and 2013-2016. The Elk State Forest was the only state forest with increase conversion to shale gas infrastructure from 2008-2012 and 2013-2016 (Figure 4.22).

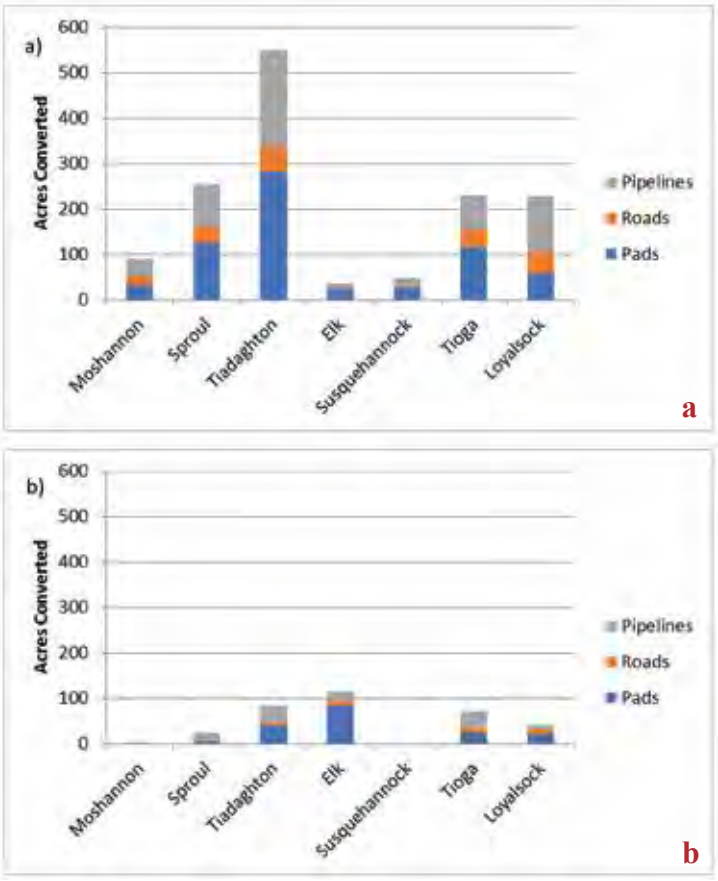


Figure 4.22. Acres converted to accommodate shale gas development from forest to shale gas infrastructure by state forest and infrastructure type, for 2008-2012 (a) and 2013-2016 (b).

Fragmentation and the Forest Landscape

State forests in the shale gas region make up part of the largest block of core forest habitat in Pennsylvania. Shale gas development reduces forest cover and causes fragmentation. Forest fragmentation is the process by which a continuous forest habitat becomes separated into smaller or more isolated forest patches (Halia, 1999). These smaller habitat patches are more vulnerable to further disturbance and degradation, have more forest edge habitat, and greater separation between forest patches. As core forests are fragmented by non-forest, remaining patches become more susceptible to invasion by exotic species and pathogens due to increased forest edge. The loss of connectivity between patches of forest habitat can result in a loss of biodiversity and genetic variation across a landscape.

Forest edges are the area from the edge of a disturbance up to 100 meters into the forest. A human-created edge, such as a timber sale boundary or the limit of clearance for a ROW, is often abrupt, forming straight lines that can cut across landscape features. Natural disturbances; however, often cause ragged, feathered, and non-symmetrical boundaries that often follow landscape features like ridge tops or creeks. Microclimate differences in air temperature, wind speed, light availability, and relative humidity often contribute to edge forests that can be hotter and drier than the interior forest (Gelhausen, et al., 2000). They have also been shown to increase plant species richness; however, some of the species richness is from more non-native, invasive plant species such as garlic mustard (*Alliaria petiolata*), honeysuckles (*Lonicera spp.*), or privets (*Ligustrum spp.*) (Haila, 1999). The effects of fragmentation and an increase in forest edge on wildlife vary. Some species of songbirds, such as golden winged warblers prefer the thick shrubby vegetation found on edges (Patton et al. 2010). Soule et al. (1988) found that edges benefited mesopredators (such as possums, raccoons and bobcats) and led to the decline of vulnerable prey species.

The bureau recognizes that forest fragmentation and forest edges may affect biodiversity and ecosystem

health. A stated goal in the State Forest Resource Management Plan (2016) is to "consider forest fragmentation, connectivity, and patch distribution in management decisions affecting state forest resources." Additionally, the bureau's Guidelines for Administering Oil and Gas Activity on State Forest Lands[1] address the potential effects of forest fragmentation. It recommends co-locating new infrastructure, like roads and pipelines within existing corridors, and minimizing the footprint of infrastructure pads to the furthest extent possible. Langlois et al. (2017) recommends siting new well pads as close as possible to existing pipelines to further reduce core forest fragmentation. Bureau land managers work with operators to place new infrastructure near adjacent infrastructure when practical and reduce construction disturbance to the greatest extent possible. However, other factors including underlying geology and lease tract boundaries also influence the placement of pads. As part of shale gas monitoring efforts, the

Co-location of waterline right-of-way and improved road on Tiadaghton State Forest.

bureau recognized the need for a landscape level analysis to describe the change in the structure of forest habitat since the onset of gas development on state forest lands. After reviewing a variety of methods and types of analysis, the bureau selected the Landscape Fragmentation Tool v 2.0 developed by the University of Connecticut Center for Land Use Education and Research (CLEAR) was selected to perform an assessment of the change in forest habitat in the core gas forest districts (Parent & Hurd, 2008). This tool is based on research completed by Vogt et al. (2007) which proposed a pixel-based approach to quantifying fragmented forested landscapes. The Landscape Fragmentation Tool (LFT) uses ArcGIS Spatial Analysis technology to classify forest into four categories: patch, edge, perforated, and core forest. One drawback of this tool is that it can only distinguish forest from non-forest and cannot assess early successional forest or shrublands from mature forest. In this model, edge is defined as the first 100 meters of forest along the outside edge of a forest patch. This distance of 100 meters was also accepted for use in the landscape tool by Drohan et al. (2012) to describe forest land cover change due to shale gas development in Pennsylvania. Core forest is forest habitat not subject to disturbance or the edge effect and are split into three size classes by the Tool: small (less than 100 hectares or 247 acres), medium (between 100 and 200 hectares or 247 and 495 acres), and large (greater than 200 hectares or 495 acres). Forest patches are small areas of forest surrounded by non-forest (Parent & Hurd, 2008) that are completely subject to edge effects. Perforated forests are areas around a disturbance that are surrounded by core forest (Figure 4.23).

The CLEAR Landscape Fragmentation Tool (LFT) utilizes raster data that are reclassified to forest or non-forest pixels. The bureau modeled forest fragmentation for the core gas forest districts as of December 2008-2012. High resolution imagery was not available close to these "cutoff" dates so vector data were used to create a dataset representing non-forest and forest conditions. These vector data were then converted to raster data for use in the LFT. Forest and non-forest habitats were identified using the 2016 Bureau of Forestry Forest Communities Classification data. Community classes were reclassified to forest or non-forest. This data layer was then updated with shallow-gas development, roads open to the public, other rights-of-way data, and other non-forest features as of December 2008 to provide

additional non-forest information. If the actual width of the linear feature was not available, default values, such as 20 feet width for roads, were assigned. Since timber harvests are temporary and rarely result in non-forest, they were considered forest for the analysis. In many cases, the available data stopped at the state forest boundary so the 2005 National Land Cover Data (NLCD) were added to provide a buffer around the state forest boundary to minimize false edge effects. A second base map was created using data as of December 2012. Shale gas related features were added to the 2012 base map using the area cleared for development. The base maps were then converted to raster with 15 feet by 15 feet pixel size. The CLEAR Forest Fragmentation Tool was run on both base maps using a 100-meter distance to delineate edge effect. Raster results from the tool were then converted to polygons and clipped to the core gas forest districts.

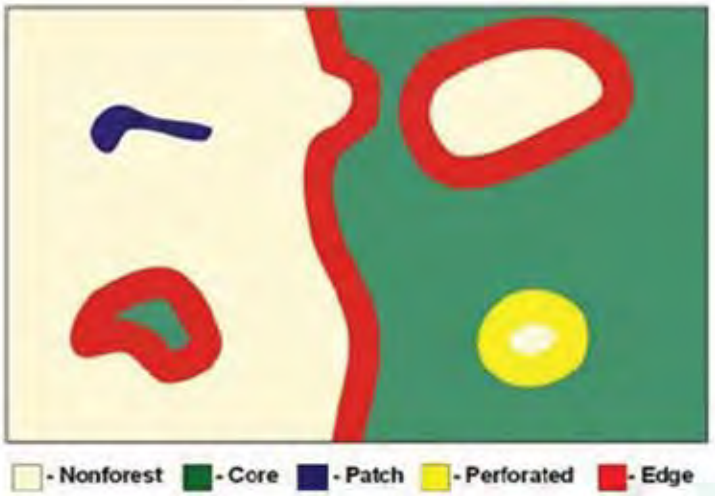


Figure 4.23. Visual representation of non-forest, core forest, patch forest, perforated forest, and forest edge in CLEAR tool analysis (Available at: http://clear.uconn.edu/tools/lft/lft2/method.htm).

There have been many updates, corrections, and revisions to the Forest Communities Classification data and the state forest boundaries, along with the roads and rights-of-way data since 2008. Some roads previously designated as drivable trails have been reclassified to administrative roads. Administrative roads not related to shale gas development typically do not receive regular maintenance and the forest canopy can grow over the road; potentially reducing fragmentation. In some cases, pipeline ROW holders have provided more accurate pipeline data. Re-creating a 2016 base map using the same method used for the 2012 report would have included these data changes and made it very difficult to isolate effects of shale gas development since 2012.

To model only the effect of shale gas development in the core gas forest districts, the raw results from 2012 (posted to the PASDA website) were updated with shale gas development data and the results summarized. To do this, all shale gas development cleared areas (limits of clearance) were buffered by 100 meters. The limits of clearance were classified as non-forest and the buffers were classified as edge due to their contiguous nature. These results were then used to update the 2012 raw results. The area of core forests was checked to determine whether they had changed from one core forest size category to another. The 2008/2012 boundaries of analysis were replicated as closely as possible and the 2016 results clipped. This method used the same criteria as the CLEAR Forest Fragmentation Tool, but it does not utilize the tool to generate the results.

Updating the 2012 analysis resulted in changes to the core forest category near development and conversion of perforated to edge forest. The conversion of perforated to edge illustrates locating new disturbance near existing non-forest areas. See Figure 4.24.

The analysis results provided by the LFT are based on conditions before shale gas development (Table 4.5) and as of December 31, 2016 (Table 4.6) on the seven core gas forest districts. Prior to shale gas development, the Sproul State Forest had the most acres of non-forest (9,362 acres), due in part to the amount of shallow natural gas exploration that had historically occurred. Additionally, the Sproul and Moshannon State Forests had the highest amount of edge forest acres

Figure 4.24. Example of perforated forest converted to edge. Gray – non-forest, mango - perforated forest, yellow – edge, diagonal hatch- new edge forest, and red- perforated forest now classified as edge.

(53,485 and 35,808, respectively) primarily due to shallow gas development and large rights-of-way that pre-date shale gas activity. Perforated forest acreage was consistent across districts, except for the Sproul State Forest, which had 8,535 acres of perforated forests — nearly 4,800 acres more than the next highest district. Again, this is due in part to the history of shallow natural gas extraction on this district.

Table 4.6 describes the results of the updated landscape analysis where the 2012 results were updated with the new shale gas development limits of disturbance. In total, there are 31,600 acres of non-forest lands in the core gas forest districts. Of the core gas forest districts, the Sproul State Forest had the most acres of non-forest (9,453) and edge forest (54,544). This is due primarily to historic shallow gas development, but also includes significant acres of rights-of-way.

After eight years of gas development and infrastructure creation on state forest lands, noticeable changes to the forest landscape are evident (Tables 4.7 and 4.8). The largest increase overall was in edge forest. Since 2008, an additional 9,913 acres of edge forest (35 percent change in the Elk State Forest specifically) has been created in the core gas forest districts. This is due primarily to the creation and expansion of pipeline rights-of-way and in some cases, the expansion of state forest roads to accommodate heavy hauling or to co-locate pipeline infrastructure. Co-location of infrastructure is likely the explanation for the decrease of 172 acres in forest patches and 258 acres in perforated forests from 2008-2016. The acreage of forest patches has declined by 10.9 percent in the Tioga and 9.5 percent in the Moshannon State Forests. Perforated forest acres decreased by 14.1 percent in the Tiadaghton State Forest. Overall since 2008, core forests greater than 200 hectares have decreased slightly in all the core gas forest districts, with the Tiadaghton State Forest — a state forest with some of the largest development areas — showing the greatest decrease (3.4 percent). All core gas

Forest District	Total Acres	Non-forest	Edge	Perforated	Patch	Core Forest (>200 ha)	Core Forest (100-200 ha)	Core Forest (<100 ha)
Moshannon	183,955	6,155	35,808	3,747	1,045	116,229	11,052	9,919
Sproul	302,937	9,362	53,485	8,535	1,111	209,879	8,947	11,618
Tiadaghton	145,153	1,989	17,888	1,156	401	114,249	5,315	4,155
Elk	190,472	3,649	21,033	3,696	449	153,230	4,056	4,359
Susquehannock	257,840	4,032	30,638	2,532	1,310	209,266	5,583	4,479
Tioga	157,321	3,094	19,846	1,972	248	120,316	7,848	3,997
Loyalsock	114,449	1,049	11,938	1,608	262	97,105	1,760	727
Total	**1,352,127**	**29,330**	**190,636**	**23,246**	**4,826**	**1,020,274**	**44,561**	**39,254**

Table 4.5. Landscape Analysis Results – Pre-Marcellus Landscape Conditions (all values in acres)

Forest District	Total Acres	Non-forest	Edge	Perforated	Patch	Core Forest (>200 ha)	Core Forest (100-200 ha)	Core Forest (<100 ha)
Moshannon	184,069	6,109	36,809	3,811	946	114,588	11,619	10,187
Sproul	302,451	9,453	54,544	8,538	1,092	208,448	8,171	12,205
Tiadaghton	145,330	2,735	20,857	993	387	110,422	5,362	4,574
Elk	190,055	3,782	22,063	3,557	439	151,832	4,056	4,326
Susquehannock	257,844	4,132	30,828	2,552	1,307	208,690	5,855	4,480
Tioga	157,779	3,867	21,961	1,924	221	116,888	8,457	4,461
Loyalsock	114,586	1,522	13,486	1,615	262	94,272	2,487	942
Total	**1,352,115**	**31,600**	**200,549**	**22,988**	**4,654**	**1,005,140**	**46,008**	**41,175**

Table 4.6. Landscape Analysis Results – December 31, 2016 Landscape Conditions (all values in acres)

Forest District	Non-forest	Edge	Perforated	Patch	Core Forest (>200 ha)	Core Forest (100-200 ha)	Core Forest (<100 ha)
Moshannon	-46	1,001	64	-99	-1,641	567	268
Sproul	91	1,059	3	-19	-1,431	-776	587
Tiadaghton	746	2,969	-163	-14	-3,827	47	419
Elk	133	1,030	-139	-10	-1,398	0	-33
Susquehannock	100	190	20	-3	-576	272	1
Tioga	773	2,115	-48	-27	-3,428	609	464
Loyalsock	473	1,548	7	0	-2,833	727	215
Total	**2,270**	**9,913**	**-258**	**-172**	**-15,134**	**1,447**	**1,921**

Table 4.7. Landscape Analysis Results – Total Change from Pre-Marcellus to December 31, 2016 (in acres)

Forest District	Non-forest	Edge	Perforated	Patch	Core Forest (>200 ha)	Core Forest (100-200 ha)	Core Forest (<100 ha)
Moshannon	-0.74	2.80	1.70	-9.46	-1.41	5.13	2.70
Sproul	0.97	1.98	0.03	-1.72	-0.68	-8.67	5.05
Tiadaghton	37.48	16.60	-14.08	-3.45	-3.35	0.89	10.09
Elk	3.63	4.90	-3.77	-2.13	-0.91	0.00	-0.76
Susquehannock	2.49	0.62	0.78	-0.24	-0.28	4.88	0.01
Tioga	25.00	10.66	-2.45	-10.93	-2.85	7.75	11.62
Loyalsock	45.08	12.97	0.42	-0.04	-2.92	41.32	29.58

Table 4.8. Landscape Analysis Results – Percent Change from Pre-Marcellus to December 31, 2016.

		Pre-Marcellus		December 31, 2016		Change	
Forest District	Total Acres	Core Forest (>200 ha)	Core Forest (<100 ha)	Core Forest (>200 ha)	Core Forest (<100 ha)	Core Forest (>200 ha)	Core Forest (<100 ha)
Moshannon	184,069	116,229	9,919	114,588	10,187	-1,641	268
Sproul	302,451	209,879	11,618	208,448	12,205	-1,431	587
Tiadaghton	145,330	114,249	4,155	110,422	4,574	-3,827	419
Elk	190,055	153,230	4,359	151,832	4,326	-1,398	-33
Susquehannock	257,844	209,266	4,479	208,690	4,480	-576	1
Tioga	157,779	120,316	3,997	116,888	4,461	-3,428	464
Loyalsock	114,586	97,105	727	94,272	942	-2,833	215

Table 4.9. Landscape Analysis Results – Changes to Core Forest acres per District

	Pre-Marcellus (in acres)	December 2012 (in acres)	December 2016 (in acres)	Change 2008-2016 (in acres)	Total % Change 2008-2016
Non-forest	29,330	31,020	31,600	2,270	7.7
Edge	190,636	194,991	200,549	9,913	5.2
Perforated	23,246	23,835	22,988	-258	-1.1
Patch	4,826	5,037	4,654	-172	-3.6
Core Forest (>200 ha)	1,020,274	1,011,033	1,005,140	-15,134	-1.5
Core Forest (100-200 ha)	44,561	45,808	46,008	1,447	3.2
Core Forest (<100 ha)	39,254	40,404	41,175	1,921	4.9

Table 4.10. Landscape Analysis Results –Change from Pre-Marcellus to December 31, 2016, including 2012 results (all core gas forest districts combined).

forest districts lost core forest greater than 200 hectares. The fragmentation of these large blocks resulted in increases in the smaller category core forests in almost all districts, with the Loyalsock State Forest experiencing a 41.3 percent change in core forests between 100 and 200 hectares in size and a 29.6 percent change in core forests less than 100 hectares in size.

Table 4.9 summarizes the changes to the largest and smallest core forest blocks. As a general practice, the bureau attempts to minimize new disturbances in the largest core forests and attempts to locate new infrastructure in areas that have been previously disturbed. Lessees choose areas to target for development of well pads that they believe will yield significant gas returns. While the bureau works with companies to locate pads to avoid negative ecological effects, the selection of the general area for the pads is made based on the presence of gas. Once a core forest has been fragmented, co-location of waterlines, pipelines, impoundments, and compressors is attempted to consolidate these landscape effects to as few locations as possible. The decrease in core forest blocks is largest in areas with more leased and severed tracts such as the Tiadaghton (loss of 3,827 acres of core forest greater than 200 hectares) and Tioga State Forests (loss of 3,428 acres of core forest greater than 200 hectares). As one would expect, the decrease in acreage in the largest class of core forest directly translates to an increase in smaller core forest blocks. Since 2008, gains in new large core forest blocks were from state forest land acquisitions.

Table 4.10 summarizes the changes from pre-Marcellus conditions to December 2016. Included as a reference in this table are the changes in acreage reported in the 2012 report. Overall, forest disturbance decreased from 2012 to 2016, with only 580 new non-forest acres created during that period. While non-forest has only slightly changed, more edge acres were created from 2013-2016 (5,558 acres) than from 2008-2012 (4,355). This is due primarily to the fact that while well pad creation has slowed on state forest lands, pipeline rights-of-way are still actively being constructed. Since 2008, state forest has lost 15,134 acres of core forest greater than 200 hectares in size, which is a percent decrease of 1.5 percent.

This analysis provides valuable insight into trends in forest acres being changed to non-forest or fragmented forest and how the size of the core forest is being altered. However, a more refined approach at an individual species level is necessary to get a true picture of how gas development may be affecting forest ecosystems. Due to the variation of wildlife and plant responses to an increase in forest edge or a loss of habitat connectivity, species-specific studies would be helpful in evaluating how these landscape level changes are affecting species residing within the state forest.

Site Rehabilitation

The bureau's Guidelines for Administering Oil and Gas Activity on State Forest Lands[1] provide guidance for oil and gas operators to rehabilitate sites. These guidelines encourage tree species diversity, appropriate species selection for ecological goals, and maintenance of habitat structure for target wildlife species. All site rehabilitation projects are evaluated and decided upon at the site level and within the context of the surrounding forest landscape. Full ecological restoration in many cases will take decades, which underscores the need to look at every step in the process as an opportunity for restoration and enhancement of habitat.

The terms revegetation, reclamation, restoration, and rehabilitation are often used interchangeably, but have different meanings to the bureau. The definitions become important when discussing expectations with operators and determining final goals for a site.

Site rehabilitation refers to the overarching act of mitigating some type of land-use change or disturbance.

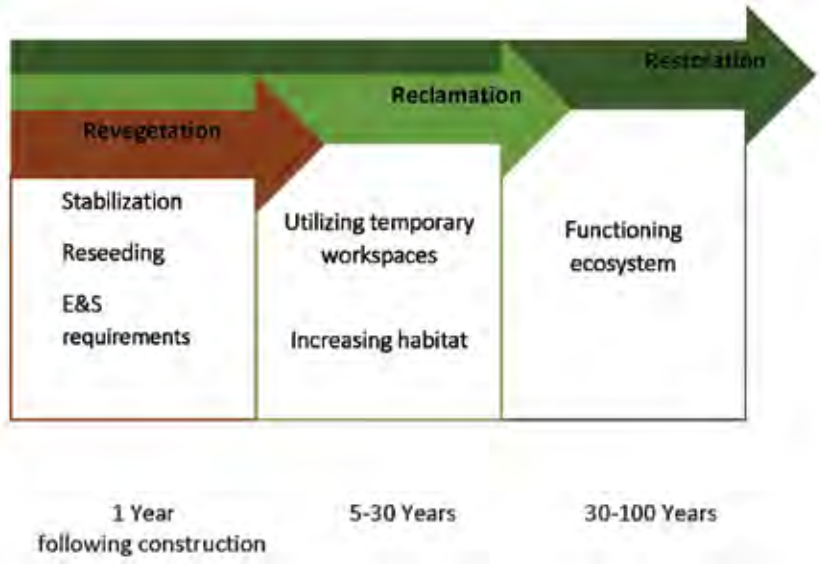
Rehabilitation is a sliding scale, with required stabilization, at the "low" end and functional ecological restoration at the "high" end. The bureau uses the term site rehabilitation to refer to any project that seeks to reduce the footprint of natural gas infrastructure and improve ecosystem health at the infrastructure site. Within infrastructure sites, passive rehabilitation is common. This is where opportunistic forb, shrub, and tree species colonize the site without human aid. Active rehabilitation includes soil stabilization, grass establishment, invasive plant control, and shrub or tree planting. The general goal of site rehabilitation efforts is to assist the recovery of an ecosystem or the ecosystem services that have been lost or degraded. Rehabilitation goals take into consideration the need and level of rehabilitation and what was found during pre-project monitoring. The work to achieve this goal takes many forms and is a step-wise process over the life of the site.

Revegetation refers to planting grasses and legumes over a disturbed site or bare soils. This is the site stabilization required by DEP regulations to protect exposed soils from accelerated erosion and sedimentation. All gas infrastructure that has been constructed and all land cleared for development must be revegetated following completion of construction. The bureau recommends the use of native legumes, grasses, and forbs to meet revegetation regulations. However, no regulatory mandate exists in Pennsylvania for operators to use only Pennsylvania native plant species during revegetation efforts. As a result, some seed mixes used for these projects include a mix of native and non-native species or are made up of non-native cool season grasses such as orchardgrass (*Dactylis glomerata*) and timothy (*Phleum pratense*).

Completed *Revegetation* project in Moshannon State Forest. Well pad acreage was reduced, and the site was seeded with non-native cool season grasses and clover.

Reclamation reduces the overall size of the disturbed area and uses native plants to rebuild organic topsoil, improve native plant diversity, and encourage site use by native insects and wildlife. Reclamation projects often seek to re-establish the original form of the vegetation community at the site and begin the process of regaining ecological function. Interim reclamation refers to minimizing the original disturbance footprint by rehabilitating all portions of the site not needed for immediate production operations. Final reclamation refers to the practice of reclaiming a majority

Site Rehabilitation



or the entire disturbed site by removing infrastructure, fencing, and aggregate material; spreading topsoil and re-contouring the site; and planting native grasses, shrubs, and trees. Final reclamation is the first step to full restoration. At this point, the site can proceed through natural processes toward the final restoration of ecosystem functions that existed prior to the initial disturbance.

To date, much of site rehabilitation work on state forest lands has been interim reclamation (i.e., reclamation of unused pad space that may need to be cleared and utilized again for future gas development). On pipelines, these projects often take place within the areas designated as the temporary workspace and involves tree and shrub plantings. On pad infrastructure, similar plantings have occurred on areas of the temporary workspace. Only a small fraction of well pads have undergone interim reclamation. The reasons cited for not reclaiming portions of pad infrastructure vary, but two reasons are common: 1) the pad needs to remain developed to accommodate further unconventional development targeting different shale formations below the Marcellus shale and 2) bureau guidelines seek to minimize the infrastructure footprint during construction which leaves little unnecessary workspace to reclaim.

Example of site *reclamation* on pipeline right-of-way. Note scrub-shrub habitat in temporary workspace on right side of pipeline right-of-way.

Fink and Drohan (2015) found soils on unconventional gas infrastructure sites were often too compacted for plant roots to grow through. Therefore, reducing soil compaction and creating variable micro-topography during reclamation is essential for successful establishment of native plants. The bureau has adopted soil dumping methods like those published by the Appalachian Regional Reforestation Initiative (ARRI, 2007) or simple soil ripping of at least eight inches. These methods have been found to be adequate for restoring necessary soil function. Soil ripping at various depths is currently being tested and compared to techniques that do not reduce soil compaction at the bureau's mock well pad site in the Tiadaghton State Forest.

Partial well pad reclamation in Sproul State Forest, following the use of methods similar to ARRI soil dumping (compare to soil ripping photo below).

Pad reclamation study site Tiadaghton State Forest, following soil ripping methods: 8" ripping depth on left, compared to 20" ripping on right (compare to ARRI dumping method photo above).

The bureau defines *restoration* as the return of a disturbed site to the functioning ecosystem state prior to disturbance. Ideally, this functioning state would be the same as what existed at the site prior to the disturbance. However, depending on the ecological conditions this may not be possible. In this case, the bureau may seek to restore the site to provide a completely different suite of ecosystem services. This type of site rehabilitation accelerates the recovery of an ecosystem's health and provides the appropriate pathways for ecosystem functions to become self-sustaining. To date, no gas infrastructure sites have reached the final restoration stage.

Site Rehabilitation efforts (by state forest) as of September 2017:

Site rehabilitation of Marcellus infrastructure has taken place in six forest districts: Moshannon, Sproul, Tiadaghton, Elk, Susquehannock, and Tioga. Twelve well pads, two impoundment sites, two monitoring well sites, and one meter station have been subject to site rehabilitation.

Moshannon State Forest:

Two Marcellus well pads on leased areas have been subject to site rehabilitation. One pad was reduced from 2.6 acres to 0.5 acres and was reseeded with a seed mix that included white clover and wildflowers. The same reseeding process was used on another 5-acre well pad. A 16.5-acre impoundment site was reduced to 5.2 acres and the impoundment was removed. At this site, both red pine and white pine seedlings were planted, as well as American hazelnut and shagbark hickory. An impoundment fence is now being used at the site to exclude white-tailed deer to improve survival of the tree and shrub seedlings.

In addition, one well pad and one impoundment in areas with severed rights have been subject to efforts to reach the interim reclamation stage. The well pad had its size reduced from 3.5 to 1.3 acres and had 2,000 red pine seedlings planted. The 10.6-acre impoundment site was recontoured and planted with a mix that included clover and wildflowers. Additionally, a one-half acre area cleared for a meter site, that was not constructed, was reseeded and 20 apple trees were planted.

Eleven conventional gas wells have also been plugged in the Moshannon State Forest and their respective pads have been subject to site rehabilitation practices. Pads, which are typically a half acre in size, have been planted with seed mixes that include clover and wildflowers. Plantings of hardwood and white pine seedlings are planned for 2019.

Sproul State Forest:

Most reclamation has taken place on former strip mine areas. However, reclamation techniques such as the ARRI soil dumping methods have been applied to some shale gas infrastructure. Four well pads have been subject to site reclamation methods and converted into wildlife food plots, one of which was planted specifically to benefit elk. A fifth well pad has been subject to partial reclamation practices that included tree plantings. Additionally, efforts are on-going to plug and restore historic shallow gas wells across the Sproul State Forest.

Tiadaghton State Forest:

One well pad has been subject to interim reclamation efforts to go from a size of four acres down to two acres. Five pipeline sites have had their temporary workspace areas planted with conifers and fenced enclosures of native shrubs to create feathered, early successional habitat along pipeline limits of disturbance.

Native tree and shrub plantings along pipeline corridor in Tiadaghton State Forest.

Elk State Forest:

Three well pads have been subject to interim reclamation methods which reduced their total footprint size from six combined total acres down to approximately three. Many pads on the Elk State Forest have been built to accommodate not only Marcellus shale development, but also Utica shale development and cannot be reclaimed currently. Several stone pits that were originally used for shallow gas development from the 1980s to early 2000s have also been reclaimed.

Susquehannock State Forest:

Two monitoring well pads have reached a reclaimed state. The 2.3-acre Horton Run Colony Road site was planted with a native seed mix and efforts are ongoing to plant white pine seedlings. The 1.6 acre monitoring well pad near Big Fill Hollow has also been reclaimed.

Tioga State Forest:

One operator has reduced the footprint of some well pads, but only through spreading topsoil and planting cool season grasses rather than reclaiming the site with native species. A second operator has reseeded three monitoring well pads (each two acres in size) that are no longer needed. Two of these sites were planted with seedlings that have shown poor survival.

Loyalsock State Forest:

Planting of native trees and shrubs has occurred in riparian areas on two pipelines that cross Grays Run and Long Run. To date, no pad infrastructure has been subject to site rehabilitation actions.

"Mock Well Pad" Reclamation Demonstration Site

The uncertain timeframe of gas extraction makes full site restoration unlikely in the short term. Therefore, interim site reclamation is essential to re-establishing some ecosystem functions at well pad sites. However, there are several challenges to ecologically significant site reclamation in and around Marcellus shale development sites. Typically, there are very compacted soils and subsoils due to the necessary grading to create well pads.

Grays Run Pipeline crossing in Loyalsock State Forest. Note reduced width at stream crossing and planting areas along pipeline edge.

In some portions of the state forest where development is occurring, topsoil is lacking and subsoils are extremely rocky. This makes seed mix establishment a challenge during site reclamation.

To better understand how Marcellus shale well pad construction techniques affect the effectiveness of forest reclamation practices, the bureau, in partnership with researchers from Penn State, constructed a one-acre "mock well pad" demonstration site in May of 2015. The demonstration site is in the Tiadaghton State Forest in an area that was previously used as temporary workspace during construction of a nearby pipeline ROW. The overarching goal of this work is to evaluate and demonstrate interim reclamation techniques that can be applied at relatively low costs to improve the ecological function of sites utilized for Marcellus gas infrastructure within forested landscapes. The three objectives of this work are: 1) demonstrate next-generation BMPs for soil preparation, native grass plantings, and reclamation practices on retired sites,

2) demonstrate the viability of "soft edge" creation using native tree and shrub species, and 3) create an educational opportunity for bureau staff, regulators, gas operators, and the public along with providing field-tested Marcellus site reclamation guidance.

Once the site had been selected, the area was cleared to accommodate a one-acre pad. The soil was removed and stockpiled as per typical construction practices and a vibratory roller was used to compact the subsoil to industry well pad standards. A nuclear density gauge was used to ensure soil bulk density of the mock pad site was the same as the average bulk density of well pads on state forest lands.

Cleared and compacted mock well pad surface prior to soil compaction remediation.

Severely compacted soils are a limitation to planting success on well pad sites that are to be reclaimed. In addition to the compacted subsoils, the pad is usually covered with a significant amount of limestone that serves as a secure running surface for equipment and vehicles. One reclamation option is to simply spread stockpiled topsoil over this running surface and plant over top. Another option is to remove the limestone, re-spread topsoil, and plant over the compacted subsoil layer. A third option is to remove the limestone, rip the subsoil layer with equipment to reduce compaction, then spread, and reincorporate topsoil. To test the success of various soil treatments, the well pad site was split into four treatment areas: 1) topsoil spread over compacted rock and subsoil, 2) rock removed, topsoil spread over compacted subsoil, 3) rock removed, 8"-deep ripping to alleviate subsoil compaction, topsoil re-spread over area, and 4) rock removed, 20"-deep ripping to further alleviate deep subsoil compaction, topsoil re-spread over area.

Aerial view of mock pad site with four soil treatments – from left to right: (1) topsoil spread over compacted rock and subsoil, (2) topsoil spread over compacted subsoil, (3) 8" ripping, and (4) 20" ripping.

In addition to testing soil compaction alleviation techniques, the mock well pad site is also being utilized to test the establishment success of three different seed mixes. The first mix is the typical native and non-native species mix that is used in many gas development projects. The second mix is made up entirely of native plant species and the third mix is the all-native mix with four native wildflower species added (Table 4.11). After initial establishment of all planted sites, comparisons of initial establishment success could be compared between soil treatments.

Mock well pad site planting map.

One limitation to native, perennial warm season grasses being used for site reclamation involves the wording of

some existing erosion and sedimentation regulations. The regulations require "70% perennial cover" 45 days after initial planting. Typically, native warm season grasses exhibit root growth prior to shoot growth, which limits the leaf growth present immediately following planting, but does not limit the ability of these species to hold soil with their root systems. Grass mixes that are typically used and include predominately cool season grasses show a significant amount of "green-up" 45 days after planting, but the grasses lack a well-developed root system. Native seed mixes at the mock well pad clearly show that if planted correctly, this drawback of native mixes is not as prevalent as once thought.

"Typical" Native/Non-native Mix

Rate (in lbs/ac)	Species
2	Timothy (*Phleum pretense*)
6	Perennial ryegrass (*Lolium perenne*)
6	Virginia wild-rye (*Elymus virginicus*, PA Ecotype)
2	Little bluestem (*Schizachyrium scoparium*)
2	Big bluestem (*Andropogon gerardii*)
6	White clover (*Trifolium repens*)
4	Partridge pea (*Chamaecrista fasciculata*)
0.5	Black-eyed Susan (*Rudbeckia hirta*)

All Native Species Mix

Rate (in lbs/ac)	Species
30	Oats (*Avena fatua*) ****Cover Crop****
6	Virginia wild-rye (*Elymus virginicus*, PA Ecotype)
4	Indiangrass (*Sorghastrum nutans*, PA ecotype)
4	Big Bluestem (*Andropogon gerardi*)
3	Switchgrass (*Panicum virgatum*)
3	Deer-tongue grass (*Dicanthelium clandestinum*)
4	Partridge Pea (*Chamaecrista fasciculata*, PA ecotype)
0.5	Black-eyed Susan (*Rudbeckia hirta*)

All Native Species Mix with Native Wildflowers

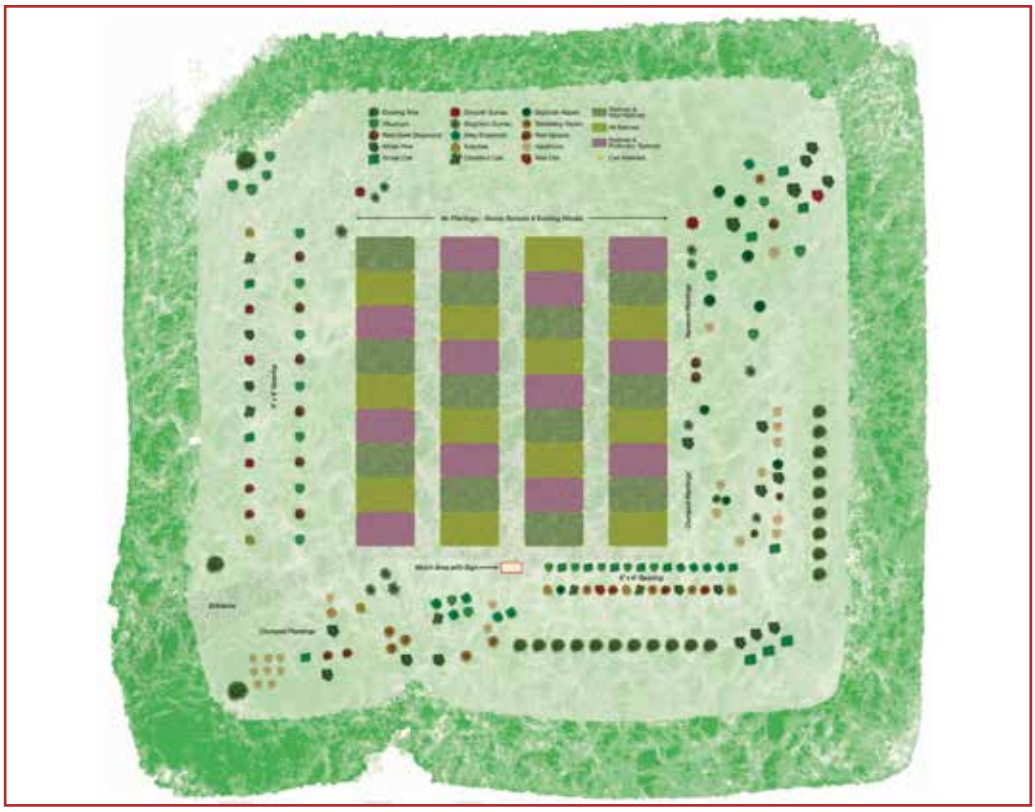
Rate (in lbs/ac)	Species
30	Oats (Avena fatua) ****Cover Crop****
*	Virginia wild-rye (*Elymus virginicus*, PA Ecotype)
4	Indiangrass (*Sorghastrum nutans*, PA ecotype)
4	Big Bluestem (*Andropogon gerardi*)
3	Switchgrass (*Panicum virgatum*)
3	Deer-tongue grass (*Dicanthelium clandestinum*)
6	Partridge Pea (*Chamaecrista fasciculata*, PA ecotype)
0.5	Black-eyed Susan (*Rudbeckia hirta*)
0.5	Wild bergamot (*Monarda fistulosa*)
0.5	Canada goldenrod (*Solidago canadensis*, PA ecotype)
0.5	Common milkweed (*Alclepias syriaca*)
0.5	Showy-tick trefoil (*Desmodium canadense*)

Table 4.11. Seed mix treatments at mock well pad project.

Hand-seeding of native species at mock well pad study site.

Typically, native warm season grasses take two to three growing seasons to fully establish and mature on a given site. As of Fall 2017, the seed mixes have been growing on site for three growing seasons. Annual cover data has been collected for a subset of the planted demonstration cells across all seed mixes and soil treatments for all three growing seasons. Data analysis is ongoing, but general observations suggest that wild bergamot (*Monarda fistulosa*), partridge pea (*Chamaecrista fasciculata*), and Indiangrass (*Sorghastrum nutans*) appear to be the most prevalent species in the areas planted with native seed mixes. Crown-vetch (*Coronilla varia*) is the most abundant invasive plant species at the mock pad site and is actively being controlled to reduce its prevalence in some places. This species was present in the seed bank at the edges of the opening prior to construction of the mock pad.

To further utilize the mock pad reclamation site, pad



"edges" were used to test success of native trees and shrubs in a variety of planting configurations. Native tree species planted include: tulip poplar, red spruce, eastern white pine, bigtooth aspen, trembling aspen, chestnut oak, and northern red oak. Native shrub species planted include: silky dogwood, gray dogwood, Washington hawthorn, scrub oak, smooth sumac, staghorn sumac, and arrowwood viburnum. These plantings were arranged in four different ways: 6' x 6' spacing, 8' x 8' spacing, clumps, and random placement. In addition, one of the four edges of the well pad were not seeded or planted and will be permitted to succeed naturally as a comparison to the planted areas. After three growing seasons, the total average survivorship was 71 percent. Some individual species, such as Washington hawthorn (45 percent survivorship) and white pine (55 percent survivorship), have not fared well. However, others such as silky dogwood, smooth sumac, and staghorn sumac have 100 perecent survivorship after three growing seasons (Table 4.12). Neither planting configuration or pad side showed significant differences in survivorship after three years.

Ground-level photo of all native seed mix cover 45 days after planting, note vegetative cover approaching 70 percent.

Initial establishment of seed mixes 45 days after planting. Topsoil spread over compact subsoil treatment (on left) versus topsoil spread over compact rock and subsoil (on right). Note increased height of grasses on left.

Native warm season grass and wildflower plantings (foreground) and native shrub and tree plantings (background) at mock well pad site.

Species	Surviving Stems / Total Stems	Survivorship
Rhus typhina	12/12	100%
Cornus amomum	11/11	100%
Rhus glabra	5/5	100%
Viburnum dentatum	18/22	82%
Cornus racemosa	8/10	80%
Quercus rubra	4/5	80%
Populus tremuloides	7/9	78%
Quercus illicifolia	10/15	67%
Populus grandidentata	6/9	67%
Liriodendron tulipifera	4/6	67%
Picea rubens	5/8	63%
Quercus montana	3/5	60%
Pinus strobus	11/20	55%
Crataegus phaenopyrum	10/22	45%

Table 4.12. Tree survivorship, by species, at the mock well pad site three years following planting.

In addition to the reclamation data collection that will continue to take place at the mock pad site, the area will be used as a demonstration site for bureau staff, regulators, gas operators, and the public. When this project was proposed, the intent was to use this site to develop field-tested management guidance for use on and off state forest lands in areas being developed for unconventional gas. The bureau is committed to adaptive management on state forest lands in all facets of gas development, including site restoration and reclamation. By demonstrating these next-level management practices, the bureau and cooperators from Penn State believe that guidelines that improve ecological function in and around gas development areas using native plants are now feasible across the commonwealth.

Website Links

[1] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20032134.pdf

Literature Cited

Brown, W. E. 2009. Impacts of dirt and gravel road dust on roadside organic forest soils and roadside vegetation. Thesis. The Pennsylvania State University, State College, PA, USA.

Drohan, P.J., Brittingham, M., Bishop, J. & K. Yoder. (2012). Early trends in landcover change and forest fragmentation due to shale gas development in Pennsylvania: A potential outcome for the northcentral Appalachians. Environmental Management, 49: 1061-1075.

Fink, C.M. & Drohan, P.J. (2015). Dynamic soil property change in response to reclamation following northern Appalachian natural gas infrastructure development. Soil Science Society of America Journal, 79: 146-154.

Gelhausen, S.M., Schwartz, M.W., & C.K. Augspurger. (2000). Vegetation and microclimatic edge effects in two mixed-mesophytic forest fragments. Plant Ecology, 147: 21-35.

Haila, Y. (1999). Islands and fragments. In M.L. Hunter (Ed.), Maintaining biodiversity in forest ecosystems (pp. 234-264). Cambridge, United Kingdom: Cambridge University Press.

Langlois, L. A, Drohan, P.J., Brittingham, M. C. (2017). Linear infrastructure drives habitat conversion and forest fragmentation associated with Marcellus shale gas development in a forest landscape. Journal of Environmental Management, 107 (2017): 167-176.

Parent, J.R. & Hurd, J.D. (2008). Landscape Fragmentation Tool (LFT) v 2.0: Overview. University of Connecticut College of Agriculture & Natural Resources, Center for Land Use Education and Research. Retrieved 11/30/12. http://clear.uconn.edu/tools/lft/lft2/index.htm

Patton, L. L., D. S. Maehr, J. E. Duchamp, S. Fei, J. W. Gassett, & J. L. Larkin. 2010. Do the golden-winged warbler and blue-winged warbler exhibit species-specific differences in their breeding habitat use? Avian Conservation and Ecology: 5(2): 2.

Pennsylvania Bureau of Forestry. (2016). Guidelines for Administering Oil and Gas Activity on State Forest Lands.

Pennsylvania Bureau of Forestry. (2016). State Forest Resource Management Plan, pp. 34-38.

Soule, M.E., Bolger, D.T., Alberts, A.C., Wrights, J., Sorice, M., S. Hill. 1988. Reconstructed dynamics of rapid extinctions of chaparral-requiring birds in urban habitat islands. Conservation Biology, Vol. 2 (1): 75-92.

Sweigard, R., Burger, J., Zipper C., Skousen, J., Barton, C. & Angel, P. 2007. Low compaction grading to enhance reforestation success on coal surface mines. Forest Reclamation Advisory No. 3, The Appalachian Regional Reforestation Initiative (ARRI). Available at: https://arri.osmre.gov/FRA/Advisories/FRA_No.3.pdf

Vogt, P., Riitters, K.H., Estreguil, C., Kozak, J., Wade, T.G. & J.D. Wickahm. 2007. Mapping spatial patterns with morphological image processing. Landscape Ecology, 22: 171-177.

Chapter V. Ecosystem Condition

Key Points

- Impacts to stream water quality from shale gas development at the sampled water monitoring sites were not detected for the period of 2008-2016.
- Over 85 percent of streams in the core gas forest districts are classified as Exceptional Value (EV) or High Quality (HQ).
- In response to stakeholder feedback and recommendations, bureau monitoring staff has been certified to collect aquatic macroinvertebrates for monitoring water quality.
- Twenty-four of 37 macroinvertebrate collection sites sampled by the department had IBI (Index of Biotic Integrity) score comparisons that were within tolerance. DEP has conducted follow-up work on three of 13 sites that were identified as falling outside of comparison tolerances and found the scores have rebounded.
- Short-term air quality studies by DEP have demonstrated that gas-related compounds, particularly odor-causing compounds, are present near shale gas operations.
- As of December 2016, 238 infrastructure pads and an additional 66 associated access roads have been surveyed for invasive plant species. Bull thistle, crown-vetch, and spotted knapweed were the top three encountered invasive plant species.
- The most abundant invasive plant species (based on average percent cover) on rights-of-way were Japanese stiltgrass, crown-vetch, tall fescue, and Canada thistle.
- Only 29 infrastructure pads out of 238, or 12.1 percent of all pads, were found to be free of invasive plant species. The most common invasive species found were bull thistle (142 pads), crown-vetch (98), and spotted knapweed (91).
- Early Detection and Rapid Response efforts from 2013-2016 have resulted in detection of 71 populations of high-threat invasive plants.
- Three of ten Post Construction Stormwater Management (PCSM) structures were monitored and found to contain amphibian eggs indicating they hold water long enough for breeding.
- Of the five road culverts assessed for facilitating aquatic organism passage, three were rated as allowing limited aquatic organism passage and two were rated as allowing full aquatic organism passage. No assessed culverts blocked all aquatic organism passage.

Introduction

The bureau monitors state forests for changes and impacts to water, air, soil, flora, wildlife, and forest health related to gas development. Changes in each of these facets of forest ecosystems can provide indications of effects to forests due to natural gas development.

Water

The development of shale gas wells requires large amounts of freshwater; typically, 5 million gallons per well. Due to economic and logistic constraints, the source for much of this water is local – drawn from nearby streams or groundwater wells. Most forest land within the core gas forest districts drain to the Susquehanna River (97.7 percent), with a small portion flowing to the upper Allegheny River. Because of this, freshwater use for shale gas development on state forest lands is primarily regulated by the Susquehanna River Basin Commission (SRBC). Accordingly, the bureau depends on SRBC to properly manage the extraction of freshwater from streams that flow within and through state forest lands within the basin. Additionally, Act 13 requires all gas well applicants to submit and obtain a water management plan from DEP, outlining where water will be obtained, how water will be reused, and wastewater treatment plans. Presently, there are no groundwater withdrawals for shale gas development on state forest leases. More information on SRBC's project review regulations, which apply to shale gas development, can be found at SRBC's[1] website.

DEP estimates that approximately 3,500 miles of stream traverse state forest lands within the core gas forest districts, including many of the best-known fishing and boating waters in Pennsylvania. Maintaining and protecting the quality of water in these streams is one of the bureau's highest priorities. Therefore, one of the objectives of the shale gas monitoring program is to evaluate the potential effects of shale gas development on water resources within state forest lands.

Most streams found on state forest land are similar to this first-order stream.

As described in the first Shale-Gas Monitoring Report, streams and rivers in Pennsylvania can be classified in several ways. One informative classification is stream order, which is the position of a stream within the hierarchy of tributaries in a drainage network. Table 5.1 and Figure 5.1 provide the distribution of stream orders on state forest lands in the core gas forest districts. It is important to note that stream mileages vary according to the data source and scale used by the jurisdictional agency that manages the classification. Most of the streams (>70 percent) are first-order streams. This means that the streams on state forest land are generally small, headwater streams that can be influenced greatly by the surrounding forest. These first-order streams have the potential to affect many others downstream.

Another important stream designation is that promulgated under Chapter 93 of DEP regulations. Chapter 93 pertains to water quality standards and protected uses of state waters. The water uses protected

under Chapter 93 for a given water body are designated within the regulations (i.e., in a list of streams found throughout the state) and the designation from this classification can be updated by DEP if deemed appropriate based on new data. Based on the rules and criteria, this DEP classification system represents a good indicator of both the quality of a water body and the protection it receives under regulations. Table 5.2 and Figure 5.2 show the DEP Chapter 93 classification of streams throughout the shale gas forest districts. Over 85 percent of stream miles fall within one of the higher protection waters, i.e., High Quality (HQ) or Exceptional Value (EV). The total number of stream miles is greater for this dataset than for the NHD Plus Stream Order dataset because a finer scale of mapping is used.

Stream Order	Miles of Stream	Percentage of Stream Miles
1st	1,570.4	72.3%
2nd	379.6	17.5%
3rd	170.5	7.8%
4th	27.9	1.3%
5th	25.0	1.2%
Total	**2,173.4**	**100.0%**

Table 5.1. Distribution of stream orders within the core gas forest districts.

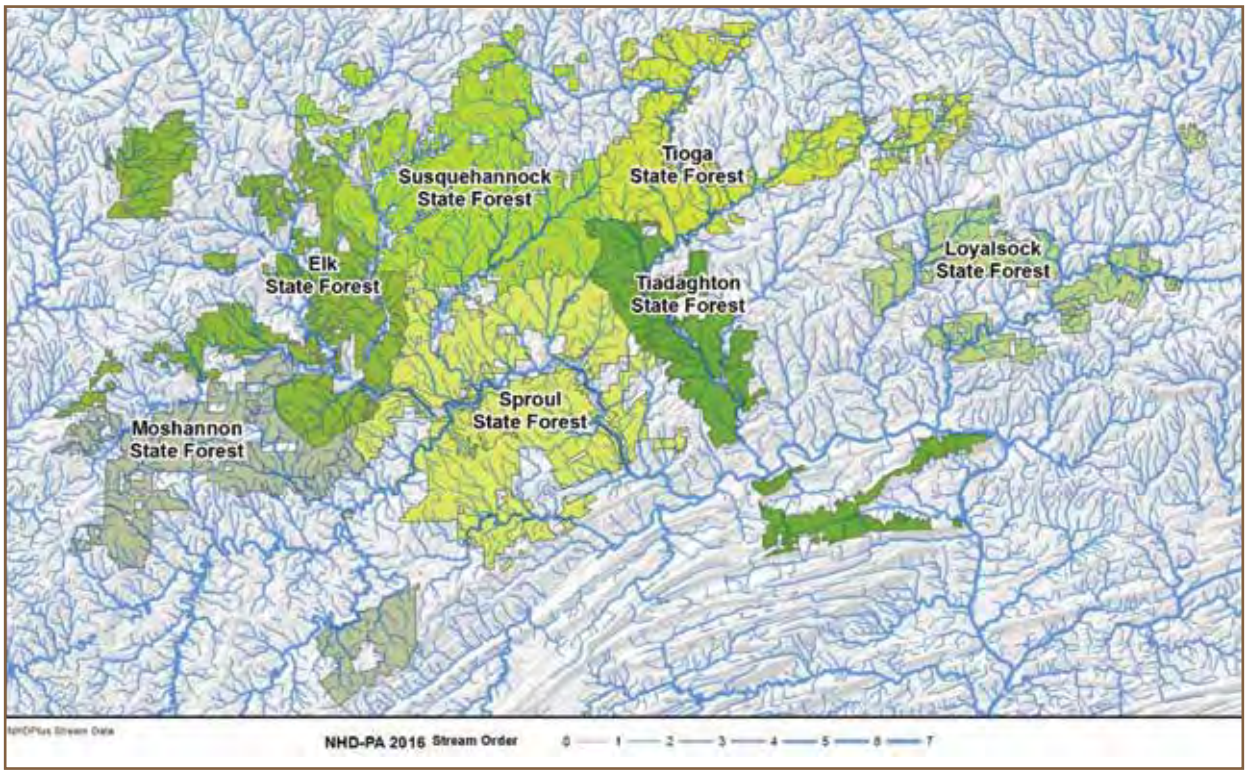


Figure 5.1. Map of stream orders of the shale gas forest districts based on the U.S. Environmental Protection Agency's National Hydrography Dataset Plus, 2016.

Chapter 93 Classification	Miles of Stream	Percentage of Stream Miles
WWF (WARM WATER FISHES)	2.8	0.1%
TSF (TROUT STOCKING)	36.3	1.0%
HQ-TSF (HIGH QUALITY-TROUT STOCKING)	2.6	0.1%
HQ-CWF (HIGH QUALITY-COLD WATER FISHES)	1348.7	39.0%
EV (EXCEPTIONAL VALUE)	1685.5	48.7%
CWF (COLD WATER FISHES)	386.1	11.2%
Total	**3462.1**	**100.0%**

Table 5.2. Classification of streams within the shale gas forest districts based on Pennsylvania Department of Environmental Protection Regulations Chapter 93 designations.

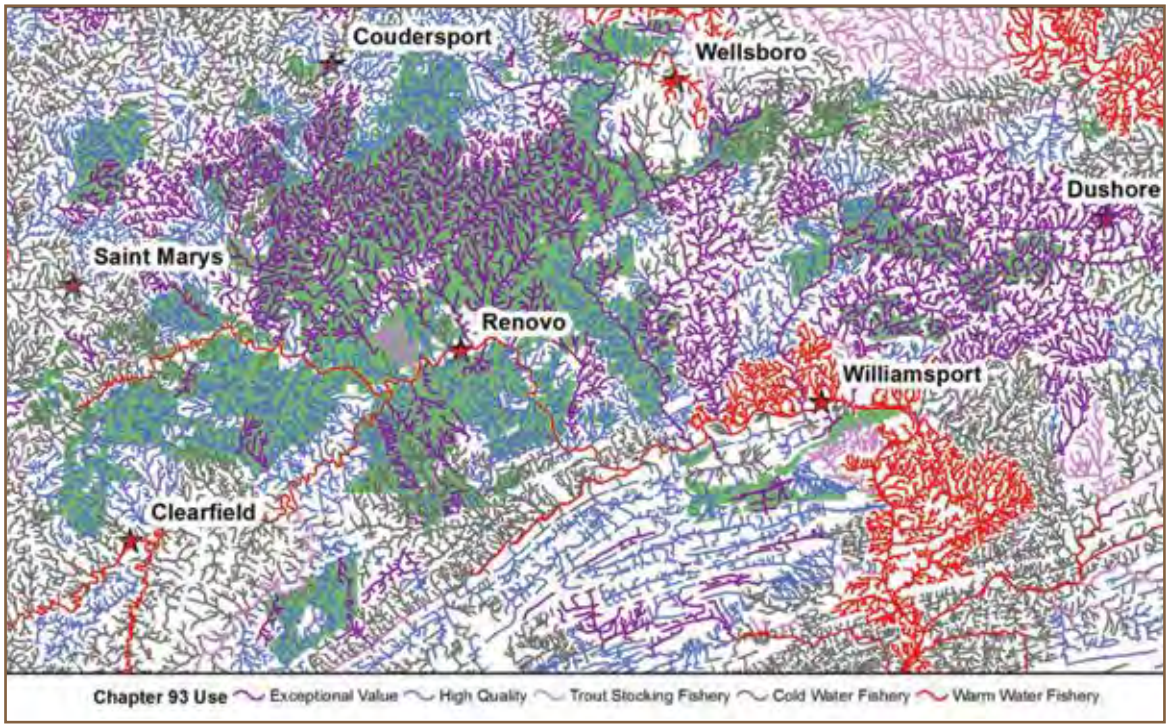


Figure 5.2. Map of streams in the shale gas forest districts with Pennsylvania Department of Environmental Protection Regulations Chapter 93 designations.

A third important stream classification is based on designations by the PA Fish and Boat Commission (PFBC). PFBC classifies certain water bodies in several ways, including trout-stocked streams, naturally reproducing trout streams, Class A wild trout streams, and wilderness trout streams. These PFBC classifications are valuable not only as an indicator of the health of the trout population, and thereby of the water quality, but also as an indicator of the recreational experience available to state forest users. Table 5.3 and Figure 5.3 show the PFBC trout classification of streams throughout the shale gas forest districts.

Water Quality Monitoring

The main concerns regarding water quality in areas subject to gas development are from chemicals and salts that can be spilled during transportation or during

PFBC Classification	Miles of Stream	Percentage of Stream Miles
Trout-stocked	287.1	10.3%
Naturally Reproducing Wild Trout	1,953.5	70.1%
Class A Wild Trout	421.2	15.1%
Wilderness Trout	126.0	4.5%
Total	**2,787.8**	**100.0%**

Table 5.3. Classification of streams within the shale gas forest districts based on the Pennsylvania Fish and Boat Commission designations.

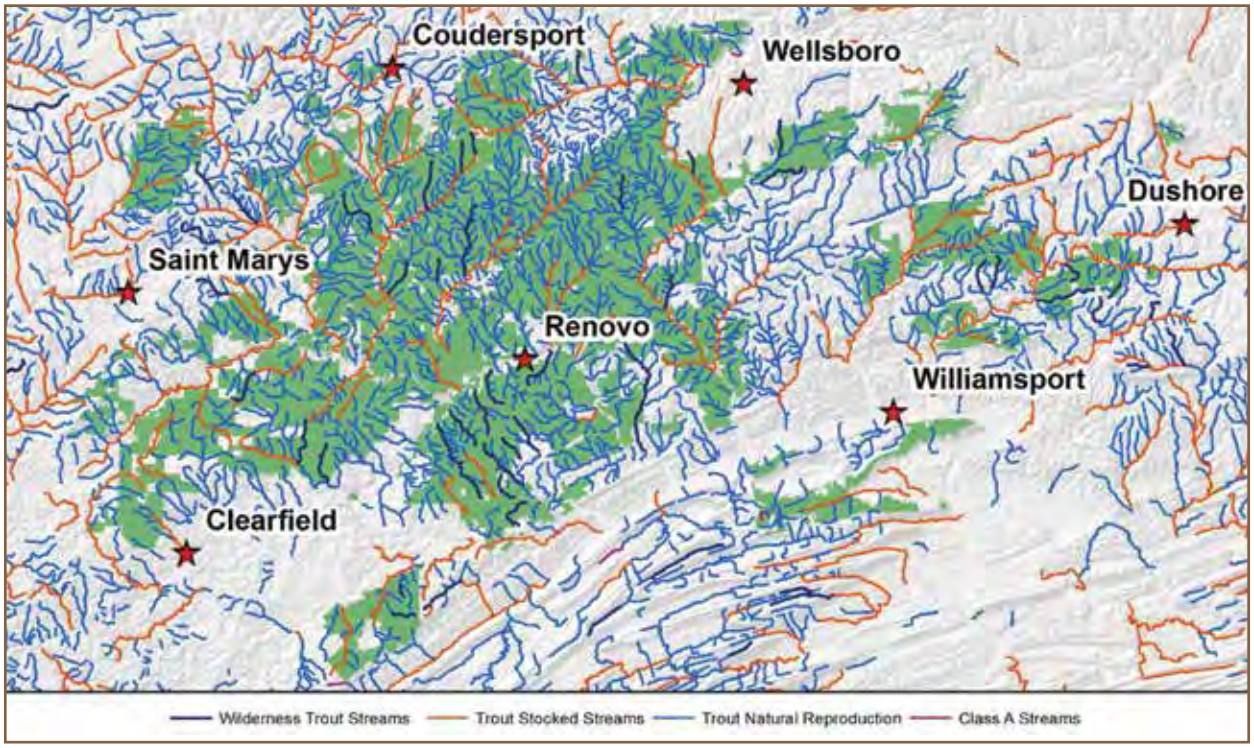


Figure 5.3. Map of streams in the shale gas forest districts with Pennsylvania Fish and Boat Commission designations.

drilling activities. Increases in water temperature, soil erosion, sedimentation, and turbidity (a measure of water's relative clarity or cloudiness) from construction of infrastructure and roads improved to accommodate heavy hauling also pose concerns. Existing monitoring is in place to attempt to detect water chemistry changes that may be due to these and other shale gas development activities on state forest lands.

Shale Gas Related Chemicals

During the hydraulic fracturing process, water is mixed with fracturing fluids and proppants, which is a solid material, typically sand, that hold open the fractures within the tightly bedded shales allowing gas to flow from higher to lower pressure areas. This mix of water and chemicals is injected into wells to release gas from the shale. These fracturing fluids can pose a potential spill risk during transportation to well sites or during well development operations. Monitoring for such potential impacts is achieved in two ways: by inspecting the pad and operations occurring on site and by conducting more testing at sites identified for additional monitoring, such as testing nearby waters for the

materials of concern (e.g., hydrocarbons and glycols). In addition to the monitoring performed by the bureau, DEP enforces regulations regarding spills at well sites. DEP may perform or require an operator to perform additional monitoring related to a specific spill event. It should also be noted that DEP adopted significantly enhanced well construction and casing and cementing standards to protect water supplies in 2011.

Once the well is completed, 10 to 30 percent of the water used in the process returns to the surface and must be reused or disposed. This water is typically referred to as flowback water. Flowback water contains hydraulic fracturing fluids as well as other chemicals, such as metals (e.g., barium and strontium) and salts (e.g., chloride and bromide), that are picked up from the shale formation while the water is underground. These metals and salts can also be found in some waterways as certain rock formations at the surface are weathered through natural erosion processes. Approximately 70 to 90 percent of the injected water remains in the shale formation with only a small percentage returning to the surface with the flowing gas. The returned water is removed from the gas with dehydration units at the pad site and stored in steel tanks. This formation water may or may not have similar characteristics to flowback water.

Preparing Water Samples for Testing.

Monitoring streams for the presence of fracturing fluids or flowback water can be achieved in two ways. First, water samples can be tested by accredited laboratories for the presence of metals and other chemicals typically known to occur in flowback water. The bureau's continuous in-stream monitoring (BOF CIM), the DEP continuous in-stream monitoring (DEP CIM), the SRBC Remote Water Quality Monitoring Network (RWQMN), and the USGS Toxic Substances Hydrology Program (TSHP) collect surface water grab samples that are tested for the presence of these chemicals. Second, waters can be tested for more general parameters, such as total dissolved solids or specific conductance, that serve as indicators of the high salinity typically associated with flowback water. The metrics are measured using the bureau's widespread water sampling protocol, continuous monitoring devices, the DEP CIM, the RWQMN, and the TSHP. These general parameters can indicate potential problems, which will then necessitate more specific tests to be completed to better identify and isolate any sources of contamination. Water chemistry is dynamic and complex, often requiring more frequent and sophisticated testing methods to attempt to identify where contamination originated. However, the bureau's monitoring program and its partners are positioned to find irregularities in water quality and initiate the necessary steps to identify the source of the change.

Most streams within northcentral Pennsylvania forests will have good water quality with relatively low conductivity, cool temperatures, and moderate pH. This general observation allows the use of expected ranges for these parameters which can be compared to measured values. Values that fall outside of expected ranges may require a more intensive inspection by the bureau and/or DEP.

Erosion and Sedimentation Associated with Development

Throughout the shale gas development process, there are numerous occasions where land clearing or earth disturbance is required, such as pad, road, and pipeline construction. Each of these construction activities

requires an erosion and sedimentation control permit from DEP. DEP monitors the installation and maintenance of erosion and sedimentation control measures. Monitoring for sediment pollution, which can affect aquatic organisms such as benthic macroinvertebrates and fish, can be conducted by testing waters for the content of suspended sediment or by testing waters for turbidity. These characteristics are measured using the DEP CIM, RWQMN, TSHP and the bureau's macroinvertebrate sampling. Lastly, erosion potential can be assessed at the source by examining conditions on-the-ground, such as vegetative cover and the effectiveness of erosion and sedimentation control measures. Figure 5.4 provides a visual overview of the bureau's water monitoring program outlining ongoing work completed by field crews on the Shale Gas Monitoring Team as well as work completed by other organizations that partner with the bureau (External Partnerships & Collaborations).

Macroinvertebrate collection.

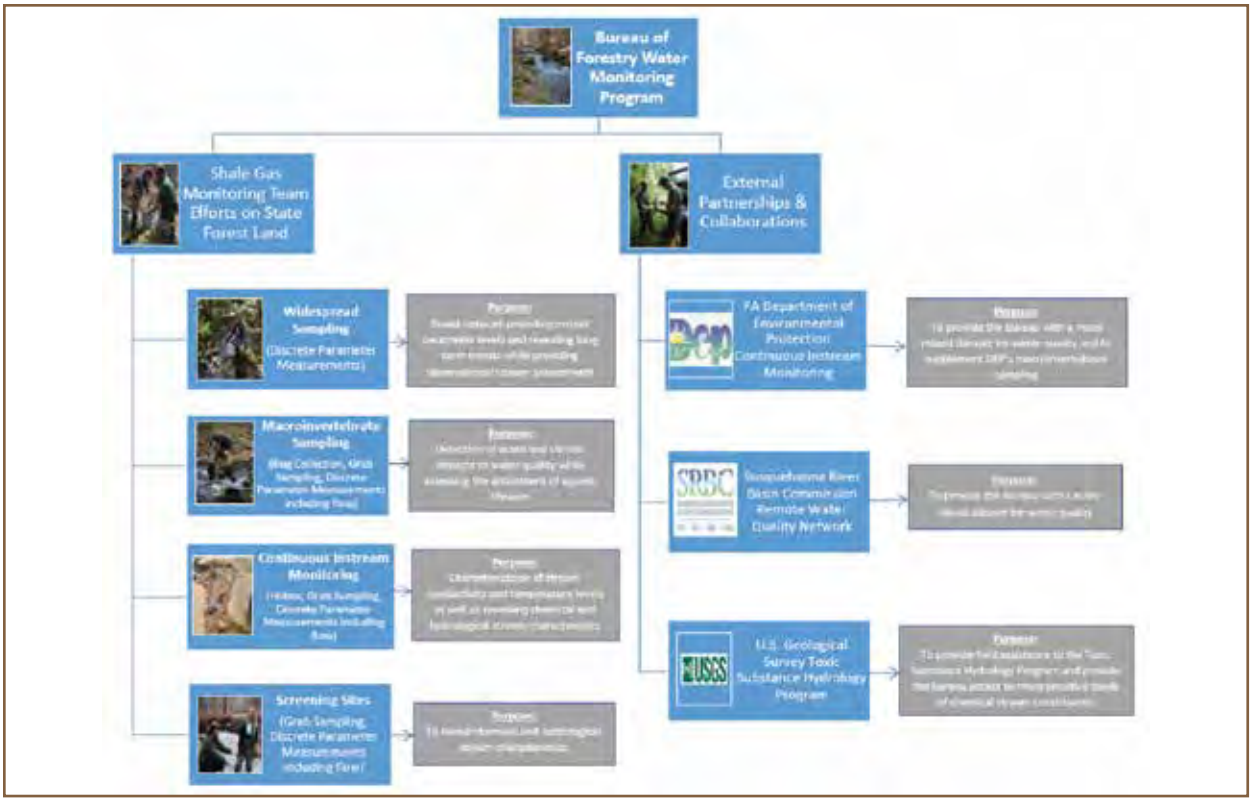


Figure 5.4. Overview of the bureau's water monitoring program.

BOF Continuous In-stream Monitoring (CIM)

The bureau deployed CIM devices at select sites on 18 different streams in the Loyalsock and Tiadaghton State Forests between 2013-2016 (Figure 5.5). Devices (manufactured by Onset Computer Corporation called a "Hobo") collected temperature and conductivity data on 15-minute intervals along with periodic field chemistry, surface water grab samples, and flow measurements collected by on-site field staff. As described in the 2014 Shale-Gas Monitoring Report, field chemistry, grab sampling, and flow measurements are employed to obtain a discrete analysis of chemical constituents and flow at a given point in a stream. Field chemistry is collected using a YSI ProPlus multi-parameter meter to measure the following parameters: temperature, pH, dissolved oxygen, conductance, and specific conductance. A Hach 2100Q is used to measure turbidity. Grab samples are collected in bottles and sent to the DEP Bureau of Laboratories for analysis on a specified suite of parameters (Table 5.4). Flow measurements are taken using a Hach FH950 flow meter and top-set wading rod. The flow meter is then able to calculate a flow/discharge rate based on the USGS mid-section method (Rantz, 1982).

A continuous in-stream monitoring device utilized by the bureau, called a "Hobo", shown here deployed in a stream and out for cleaning during a maintenance visit.

Grab Sampling Parameters
Specific Conductance
pH
Alkalinity
Barium
Strontium
Chloride
Bromide
Total Suspended Solids
Total Dissolved Solids
Methane

Table 5.4. List of parameters tested for grab samples collected at Bureau of Forestry continuous in-stream monitoring sites. Samples were tested by the Pennsylvania Bureau of Laboratories.

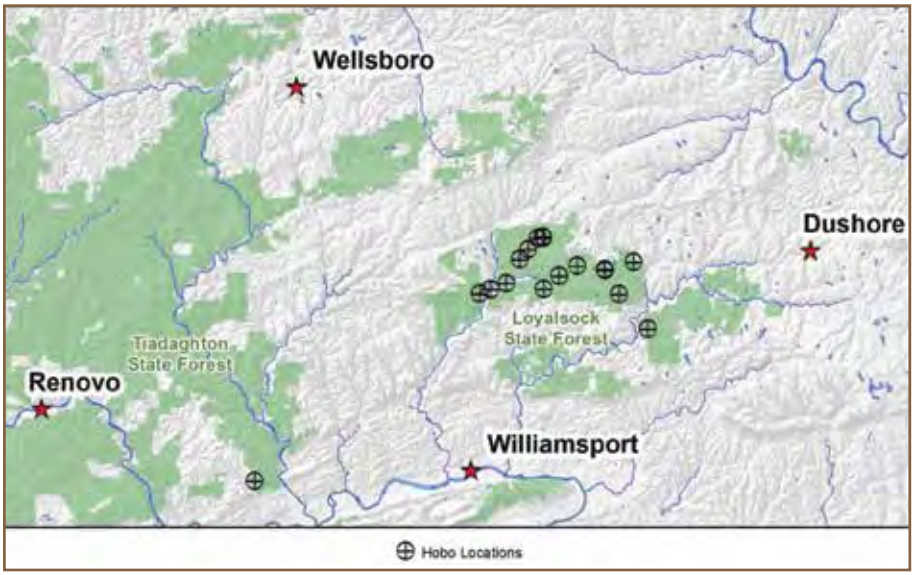


Figure 5.5. Deployment sites of Pennsylvania Bureau of Forestry continuous in-stream monitoring devices (Hobos).

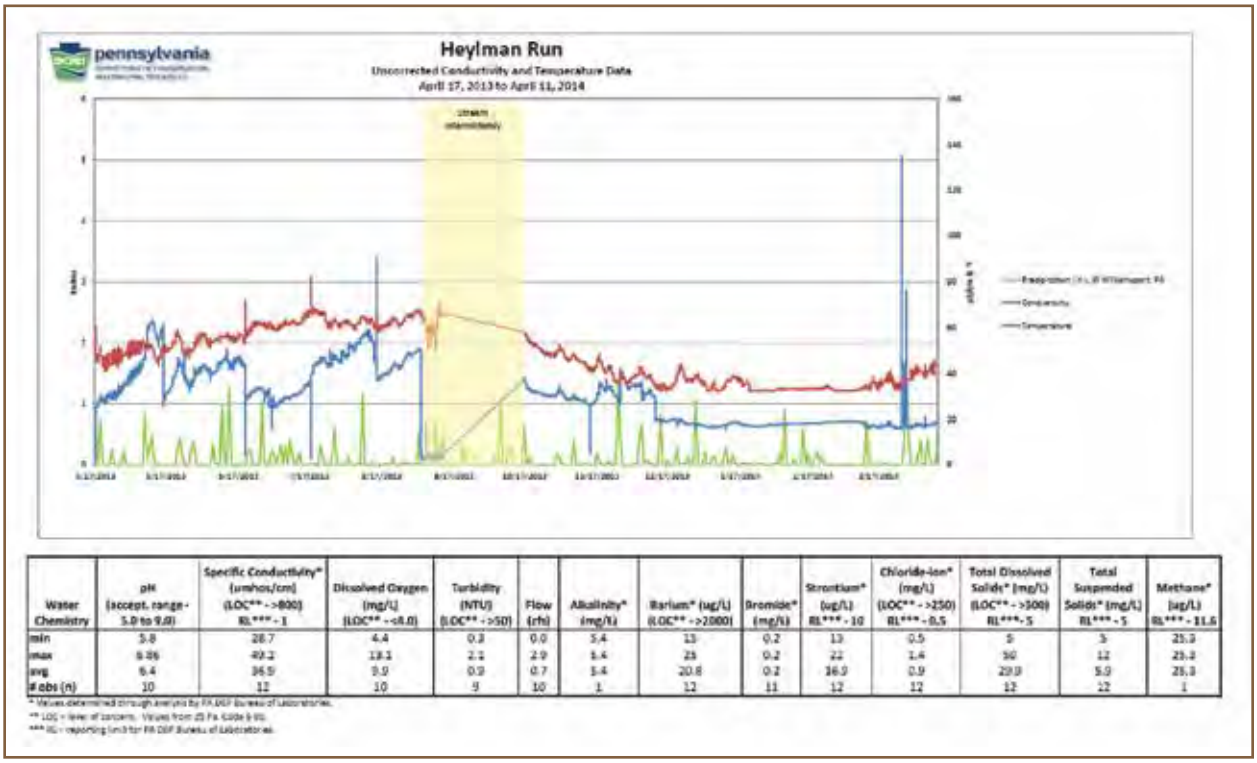
Over the four-year period that Hobos were deployed in the various streams, there were no occasions requiring more intensive monitoring of these streams. The report for Heylman Run is found in Figure 5.6 and links to other reports can be found in Table 5.5.

Note that data in the reports are uncorrected and the spikes in temperature and conductivity coincide with Hobo maintenance visits. All results and analyses were consistent with expectations of each stream and within levels of concern.

DEP Continuous In-stream Monitoring (CIM)

The DEP Division of Water Quality Standards uses deployable instream monitors called "Sondes" that collect measurements on a near-continuous basis. DEP commonly configures instream monitors like Sondes to measure four parameters: water temperature, specific conductance, pH, and dissolved oxygen. Monitors can also be configured to measure additional stream properties such as turbidity and water depth. DEP has developed protocols based on the USGS Guidelines and Standard Procedures for Continuous Water Quality Monitors: Station Operation, Record Computation, and

Collecting a water grab sample.



Water Chemistry	pH (accept. range - 5.0 to 9.0)	Specific Conductivity* (umhos/cm) (LOC** - >800) RL*** - 1	Dissolved Oxygen (mg/L) (LOC** - <4.0)	Turbidity (NTU) (LOC** - >50)	Flow (cfs)	Alkalinity* (mg/L)	Barium* (ug/L) (LOC** - >2000)	Bromide* (mg/L)	Strontium* (ug/L) RL*** - 10	Chloride-ion* (mg/L) (LOC** - >250) RL*** - 0.5	Total Dissolved Solids* (mg/L) (LOC** - >500) RL***- 5	Total Suspended Solids* (mg/L) RL*** - 5	Methane* (ug/L) RL*** - 11.6
min	5.8	28.7	4.4	0.3	0.0	5.4	13	0.2	13	0.5	5	5	25.3
max	6.86	49.2	13.1	2.1	2.9	6.4	23	0.2	22	1.4	50	12	25.3
avg	6.4	36.9	9.0	0.9	0.7	5.4	20.8	0.2	16.9	0.9	29.0	5.0	25.3
# obs (n)	10	12	10	9	10	1	12	11	12	12	12	12	1

* Values determined through analysis by PA DEP Bureau of Laboratories.
** LOC = level of concern. Values from 25 Pa. Code § 93.
*** RL = reporting limit for PA DEP Bureau of Laboratories.

Figure 5.6. Report from a Pennsylvania Bureau of Forestry continuous in-stream monitoring device (Hobo) site on Heylman Run showing conductivity/temperature data and summarized periodic discrete and grab sample results.

Forest District	Stream	Report Link
Loyalsock	Bear Trap Hollow Run Conductivity Data, 2016	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032826.pdf
Loyalsock	Big Dry Run Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031147.pdf
Loyalsock	Bovier Run Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031146.pdf
Loyalsock	Buck Run Conductivity Data, 2015	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031145.pdf
Loyalsock	Butternut Run Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031144.pdf
Loyalsock	Doe Run Conductivity Data, 2015	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031143.pdf
Loyalsock	Doe Run Conductivity Data, 2016	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032831.pdf
Loyalsock	East Branch Mill Creek Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031157.pdf
Loyalsock	Hawk Run Conductivity Data, 2015	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031156.pdf
Loyalsock	Hawk Run Conductivity Data, 2016	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032830.pdf
Loyalsock	Heylman Run Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031155.pdf
Loyalsock	Little Dry Run Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031154.pdf
Loyalsock	NB Rock Run Conductivity Data, 2015	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031153.pdf
Loyalsock	Pleasant Stream Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032828.pdf
Loyalsock	Pleasant Stream Conductivity Data, 2016	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032827.pdf
Loyalsock	Potash Hollow Run Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032825.pdf
Loyalsock	Potash Hollow Run Conductivity Data, 2016	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032824.pdf
Loyalsock	Rock Run Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031151.pdf
Loyalsock	Rock Run Conductivity Data, 2015	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031152.pdf
Loyalsock	Rock Run Conductivity Data, 2016	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032823.pdf
Loyalsock	Rock Run Conductivity Data, 2016	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20032829.pdf
Tiadaghton	UNT Chatham Run Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031149.pdf
Loyalsock	UNT Mill Creek Conductivity Data, 2014	http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20031150.pdf

Table 5.5. Continuous in-stream monitoring device (Hobo) reports.

Data Reporting Manual (Wagner et al., 2006). This allows DEP to produce verified data that will be used to assess water quality for aquatic life use. Aquatic life is grouped into use categories, each having its own water quality standards. Aquatic life use assessments determine and/or verify that surface water is meeting the water quality standards and maintaining the conditions necessary to support that category of aquatic life.

A continuous in-stream monitoring device utilized by PA DEP, called a "Sonde", shown here during a maintenance visit.

The bureau has partnered with DEP to implement continuous instream monitoring (CIM) at 13 sites on state forest lands (Table 5.6). Initial efforts in 2010, including Horton Run in the East Fork Sinnemahoning basin, were one-year deployments to complete aquatic life use assessments as well as documenting baseline conditions prior to any oil and gas development activities. Since 2010, nine of these one-year deployments have been implemented on or near state forest lands. In addition, most recent and ongoing deployments on Rock Run (a tributary to Lycoming Creek) in Lycoming County, Hyner Run in Clinton County, Pine Creek in Lycoming County, and Kettle Creek in Potter County have been implemented as part of the DEP Water Quality Network (WQN). This allows DEP to monitor these sites for a minimum of five years with the addition of routine biological and chemical monitoring.

CIM baseline results indicate that the targeted deployment locations are pristine surface waters with little to no impacts to water quality. The results will be used in future monitoring efforts to determine any changes in water quality over time. DEP publishes CIM reports on its webpage[2].

Stream Name	County	District	Period
Horton Run	Potter	Susquehannock	Spring '10 - Spring '11
Kettle Creek	Potter	Susquehannock	Fall '10 - Present
Asaph Run	Tioga	Tioga	Spring '12 - Spring '13
Straight Run	Tioga	Tioga	Spring '12 - Spring '13
Canada Run	Tioga	Tioga	Spring '12 - Spring '13
Hyner Run	Lycoming	Sproul	Summer '14 - Present
Pine Creek	Lycoming	Tiadaghton	Fall '10 - Present
Wallis Run	Lycoming	Tiadaghton	Summer '11 - Summer '12
Browns Run	Lycoming	Tiadaghton	Fall '12 - Fall '13
Grays Run	Lycoming	Tiadaghton	Fall '12 - Fall '13
Rock Run	Lycoming	Tiadaghton	Summer '14 - Present
Loyalsock Creek	Lycoming	Loyalsock	Summer '08 - Summer '13
Clear Shade Creek	Somerset	Gallitzin	Summer '11 - Summer '12

Table 5.6. Pennsylvania Department of Environmental Protection continuous in-stream monitoring sites on or near state forest lands.

SRBC Remote Water Quality Monitoring Network (RWQMN)

Within the shale gas region there are ten SRBC RWQMN stations on state forest land (Figure 5.7) and an additional six with catchment areas that substantially drain state forest land (Table 5.7 and Figure 5.8). These stations were installed in 2011 and are part of a larger network of >60 stations in the Susquehanna River Basin. The SRBC RWQMN is a network of continuous in-stream monitoring devices (Sondes) that monitor pH, temperature, dissolved oxygen (DO), specific conductance, and turbidity at 15-minute intervals. The locations have telemetry capabilities which enable data to be transmitted and posted directly to the SRBC website[3] on an approximate "real-time" basis.

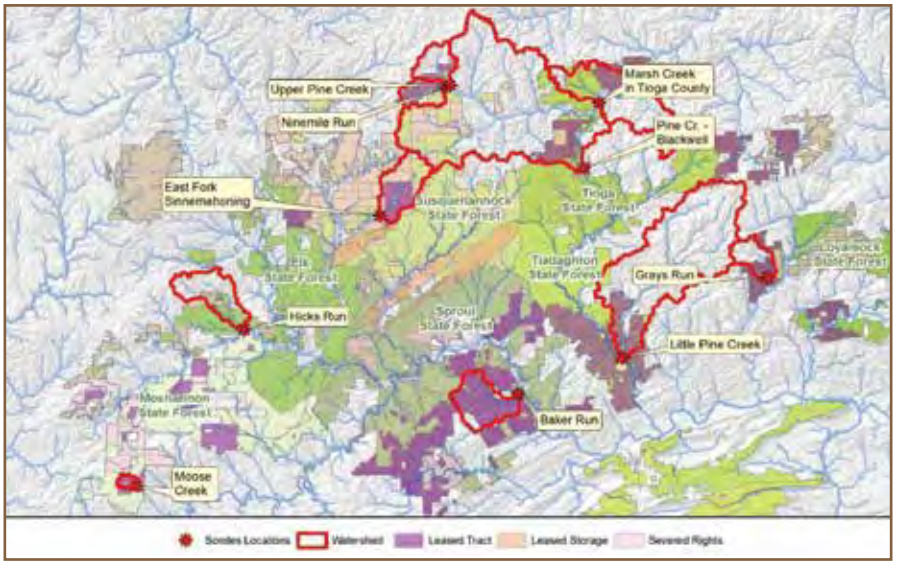


Figure 5.7. Susquehanna River Basin Commission Remote Water Quality Monitoring Network stations on state forest land.

Watershed	Percent Forest Cover	Percent of Watershed Comprised of State Forest Land	Monitored Drainage Area (mi²)
(sonde located on state forest land)			
Baker Run	99	86	35
East Fork Sinnemahoning Creek	89	94	33
Grays Run	94.5	34	16.2
Hicks Run	92	34	34.1
Little Pine Creek	83	13	180
Marsh Creek in Tioga County	71.5	34	78
Moose Creek	95	98	3.3
Ninemile Run	84.5	73	15.7
Pine Creek	80.4	36	385
Upper Pine Creek	75	28	18.6
(sonde located off of state forest land)			
Hunts Run	90.8	74	30.7
Kettle Creek	80.4	68	81.2
Pleasant Stream	88.8	82	20.6
Sterling Run	89.5	11	24.5
West Branch Pine Creek	86.4	67	70
Young Womans Creek	96.8	98	41

Table 5.7. Susquehanna River Basin Commission Remote Water Quality Monitoring Network stations on or near state forest land.

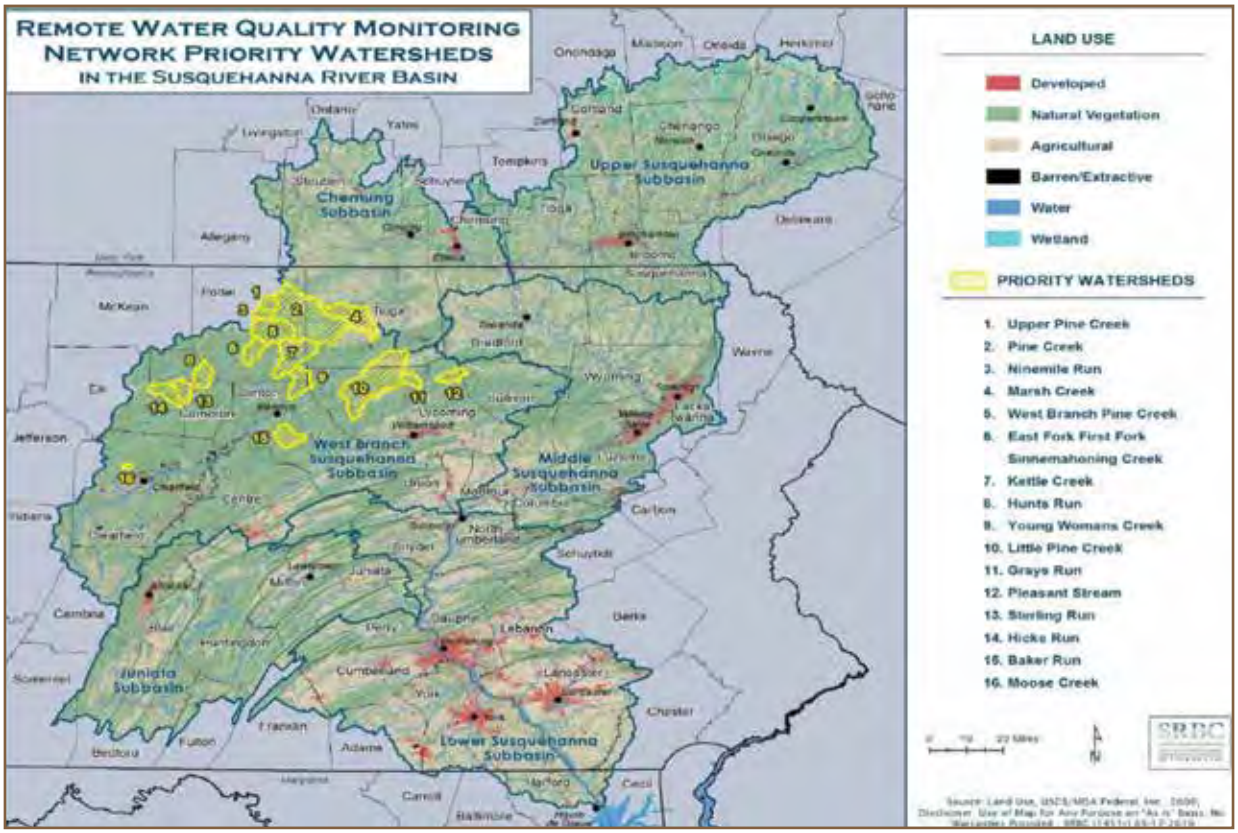


Figure 5.8. Susquehanna River Basin Commission Remote Water Quality Monitoring Network stations in the shale gas region on or near state forest land.

SRBC has brought three of the five continuous parameters collected at these stations to the forefront of the discussion regarding natural gas drilling in the Susquehanna River Basin: specific conductance, turbidity, and water temperature (Table 5.8). Overall, continuous parameter levels captured from the Sondes were found to be consistent with anticipated levels of the densely-forested watersheds where the stations are located. The few stations that showed some drift from "normal" were understood by taking a closer look at the natural circumstances surrounding the watershed. For example, Marsh Creek in Tioga County showed an average specific conductance value of 175 µS/cm. However, the station is located downstream of Wellsboro which has numerous permitted discharges. This is not an unexpected observation. Marsh Creek also features the highest average turbidity value at 20.595 NTU. It is a slow, meandering stream impacted by agriculture and urban influences. For more information about the other stations showing some drift from "normal" see RWQMN – DCNR Technical Summary (June 2016)[4].

Watershed	Specific Conductance (µS/cm)	Turbidity (NTU)	Temperature (°C)
(sonde located on state forest land)			
Baker Run	28	4.35	9.201
East Fork Sinnemahoning Creek	43	2.939	9.47
Grays Run	31	2.911	9.262
Hicks Run	53	8.441	9.841
Little Pine Creek	119	4.506	11.488
Marsh Creek in Tioga County	175	20.595	10.644
Moose Creek	150	2.192	8.909
Ninemile Run	59	6.796	9.357
Pine Creek	89	23.843	10.198
Upper Pine Creek	79	3.457	9.437
(sonde located off of state forest land)			
Hunts Run	35	2.639	8.899
Kettle Creek	56	4.205	9.728
Pleasant Stream	38	5.559	8.845
Sterling Run	78	5.647	9.625
West Branch Pine Creek	47	5.415	10.412
Young Womans Creek	39	2.012	9.149

Table 5.8. Average continuous parameter values from Susquehanna River Basin Commission Remote Water Quality Monitoring Network stations.

Along with CIM at these stations, quarterly water grab samples are also collected. These samples represent a point-in-time and are analyzed for metals, nutrients, major cations and anions, and radionuclides to monitor stream conditions. A total of 26 water chemistry parameters are analyzed in the grab samples (Table 5.9).

Water Chemistry Parameters	
Alkalinity	Lithium
Alkalinity, Bicarbonate	Magnesium
Alkalinity, Carbonate	Manganese
Aluminum	Nitrate
Barium	pH
Bromide	Phosphorus
Calcium	Potassium
Carbon Dioxide	Sodium
Chloride	Specific Conductance
Gross Alpha	Strontium
Gross Beta	Sulfate
Hot Acidity	Total Dissolved Solids
Iron	Total Organic Carbon

Table 5.9. List of water chemistry parameters tested from grab samples collected at Susquehanna River Basin Commission Remote Water Quality Monitoring Network stations.

Of the 26 water chemistry parameters collected, only three parameters exceeded the level of concern. Nitrate exceeded the level of concern at two stations and sodium was found exceeding the level of concern at one station.

These occurrences were found in watersheds with particular circumstances that influence these results. For example, Moose Creek in Clearfield County was found exceeding the water quality standard for sodium (20 mg/L). It had an average concentration of 21.9 mg/L. One source of sodium to water includes road salt. Considering land use and activities in Moose Creek, road salt is the likely source of sodium to the system as Interstate 80 borders the watershed. In addition, low alkalinity (<20 mg/L) was found at 14 of the 16 stations, but this is not unexpected due to the naturally low buffering capacity of most headwater streams. For more details see RWQMN – DCNR Technical Summary (Jun2016)[4].

Dam Run in the Tiadaghton State Forest, Lycoming County.

BOF Widespread Sampling

In 2011, 345 sampling points were established across state forest land in the core gas forest districts to get an initial qualitative visual inspection of many stream reaches along with basic field chemistry measurements. Locations were selected based on geographic extant and proximity to existing or planned shale gas development pads (Figure 5.9). From 2012 to 2016, new sites were added, and original sites have been revisited based on field crew availability (Table 5.10). Since 2011, there has been a total of 807 individual site visits among 368 sample locations. As of 2016, a revisit schedule has been developed to ensure each watershed that may be affected by gas development is entered annually and no sampling location goes longer than three years between visits.

Stream reach characteristics and field chemistry data are collected during the visits. The qualitative visual assessment of the stream reach includes noting stream bank erosion, odors, or any stream characteristics that are out of the ordinary. This is extremely important as many of the sampling locations are in areas that are not traversed by bureau staff on a regular basis. Additionally, parameters such as pH, conductivity, and temperature are collected using an YSI Professional Plus device along with a surrogate measure of stream flow (estimated by measuring stream width and average stream depth). Alkalinity was collected for a brief time using handheld colorimeters, but due to the naturally very low alkalinity concentrations found in most of the streams in the shale gas region and error observed in colorimeters, it will be very difficult to establish long-term trends. Therefore, the bureau no longer uses colorimeters to collect alkalinity at widespread sampling points.

Water testing at a widespread sampling location.

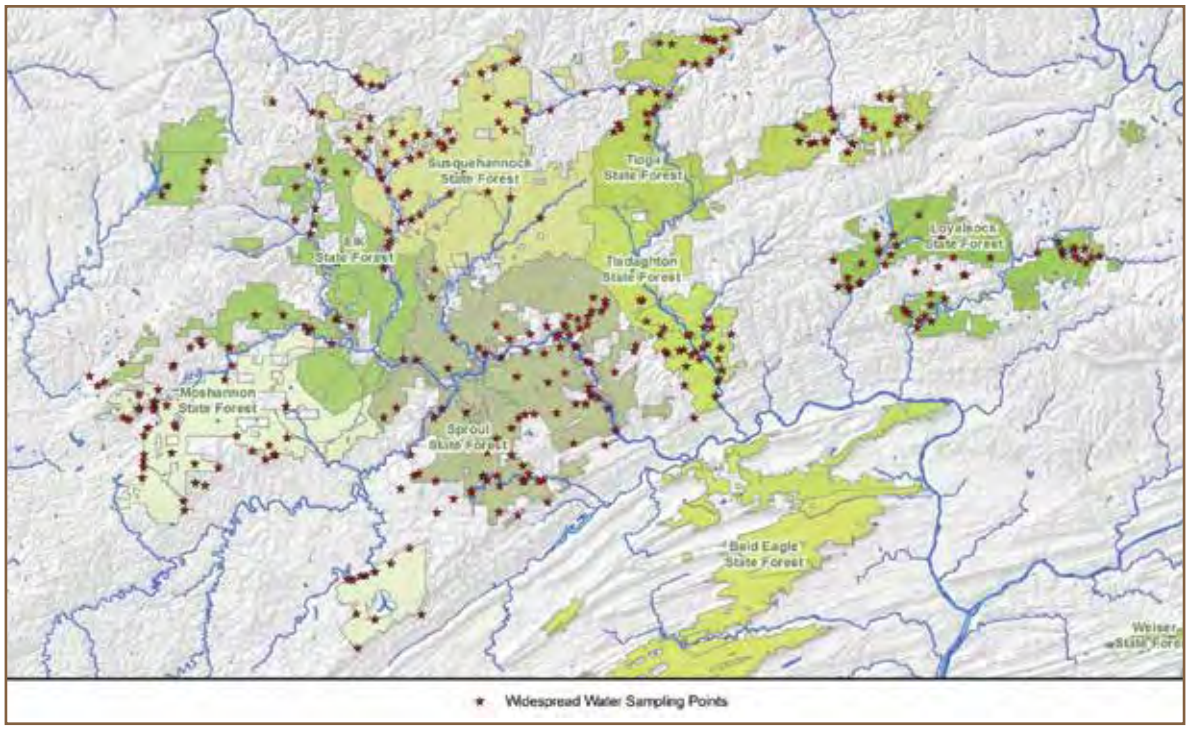


Figure 5.9. Widespread water sampling point locations on state forest lands.

Forest District	Year						Total Number of Sampling Sites	Total Number of Visits
	2011	2012	2013	2014	2015	2016		
Moshannon	50		23	20	20	11	51	124
Sproul	83	1	30	20	35	22	84	191
Tiadaghton	28	16	5	8	12	5	40	74
Elk	38		14	17	18	12	40	99
Susquehannock	56		11	14	23	12	56	116
Tioga	49	5	18	6	19	16	52	113
Loyalsock	41		8	8	17	16	45	90
Total	345	22	109	93	144	94	368	807

Table 5.10. Sampling frequency of widespread water sampling points by forest district.

From the visual qualitative stream reach inspections, there have not been any issues noted that have warranted a more intensive inspection of the stream.

During the most recent visit to the 368 sample locations, measurements indicate that most of the streams were within acceptable pH ranges (Table 5.11). Greater than 75 percent of the site locations fall within the circumneutral (pH 6.5 – 7.5) range. The extremes were a high of 8.17 and a low of 2.82. Sites where pH measures below five, were in streams that DEP has deemed impaired. This suggests that the low pH values are attributed to abandoned mine drainage or atmospheric deposition.

In general, a large majority of streams in the shale gas forest districts experience conductivity levels below 100 µS/cm. During the most recent visit to the 368 sample locations, conductivity measurements indicate that

approximately 99.5 percent of the most recent conductivity measurements were under 500 µS/cm (Table 5.12 and Figure 5.10). The 500 µS/cm threshold is commonly considered the high end for supporting diverse aquatic life in freshwater streams. The two sites that were over 500 µS/cm were streams that are listed by DEP as being impaired. The distribution of conductivity is shown graphically in Figure 5.10.

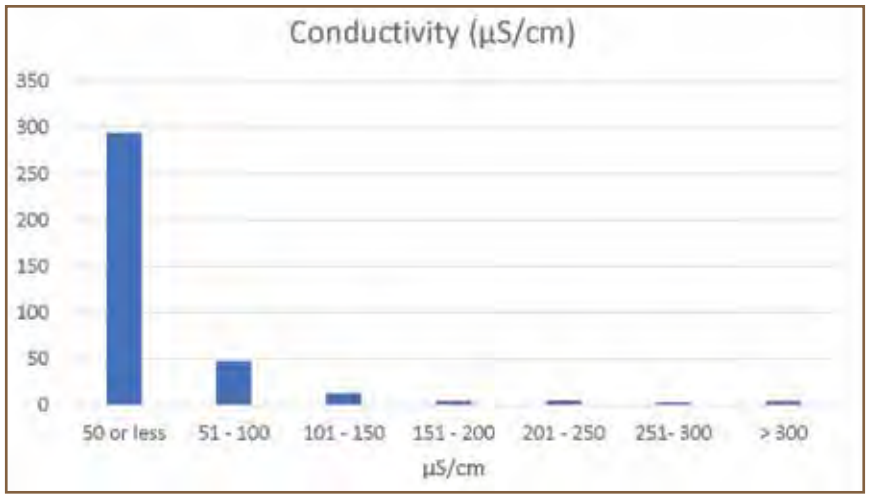


Figure 5.10. Conductivity measurements at water sample points collected since baseline year 2011.

Forest District	Circumneutral 6.5 - 7.5 pH Range	6.5 - 8.0 pH Range	5.0 - 9.0 pH Range
Moshannon	57%	57%	88%
Sproul	73%	74%	90%
Tiadaghton	88%	90%	98%
Elk	90%	90%	98%
Susquehannock	96%	100%	100%
Tioga	67%	67%	85%
Loyalsock	76%	78%	98%
All Locations	77%	79%	93%

Table 5.11. Percentage of water sample points within acceptable pH ranges by forest district.

	µS/cm							
Forest District	50 or less	51 - 100	101 - 150	151 - 200	201 - 250	251- 300	> 300	Total Sites
Moshannon	34	8	3	2	2		2	51
Sproul	69	6	3		3	1	2	84
Tiadaghton	32	5	3					40
Elk	31	7	1	1				40
Susquehannock	41	15						56
Tioga	43	5	2	1		1		52
Loyalsock	44	1						45
All Locations	294	47	12	4	5	2	4	368

Table 5.12. Conductivity measurements at water sample points, by forest district, since baseline year 2011.

Macroinvertebrate Sampling

Varying species of benthic macroinvertebrates (i.e., bottom-dwelling organisms in a stream that lack backbones and are visible to the naked eye) can tolerate a wide variety of water conditions. Sensitive species require prolonged periods of high quality water with very low concentrations of pollutants (like sediments, metals, and nutrients) to maintain healthy and diverse communities. Other species can thrive in and dominate communities where water conditions are relatively heavy with pollutants.

By examining the macroinvertebrate communities in a stream, an IBI score can be calculated to determine the health of the community and thereby infer the quality of the stream water. IBI scores range from 0-100, with higher scores indicating a healthy and diverse community and lower scores indicating a compromised community. In 2013, DEP developed a macroinvertebrate IBI for use in evaluating the biological health of Pennsylvania's wadable freestone, riffle-run streams which dominate the shale gas forest districts (PADEP, 2013).

The life cycles of benthic macroinvertebrates vary seasonally with larval growth occurring through some seasons and adult emergence occurring in others. As a result, benthic IBI scores indicating healthy conditions can vary depending upon the season. In general, a biological community sampled from May to September will usually have lower diversity and abundance reflected by a lower IBI score. A biological community sampled from November through May typically have higher diversity and abundance reflected by a higher IBI score (PA DEP 2013b, PA DEP 2015).

As mentioned previously, over 85 percent of streams throughout the shale gas forest districts are classified with special protection status (i.e., Exceptional Value (EV) and High Quality (HQ)). For complete criteria that qualifies a surface water for EV or HQ special protections, see Chapter 93 Section 4b of the Pennsylvania Code for Water Quality Standards[5].

Baseline macroinvertebrate IBI scores have been established for these streams. To determine if any degradation has occurred, DEP indicates that special protection surveys must be conducted between November and May. Any macroinvertebrate IBI score calculated for a stream during a special protection survey is compared to the baseline IBI score. In general, impairment is indicated if a resulting IBI score that is greater than a precision estimate of 10.0 points below the baseline IBI score. DEP can apply a more restrictive 8.0- or 9.0-point precision estimate if certain conditions are met (PADEP, 2013). Regardless of the baseline IBI score, any IBI score calculated for an EV or HQ stream less than 63.0 will be considered impaired without compelling reasons otherwise (PA DEP, 2015).

If a stream being assessed is not EV or HQ, a resulting macroinvertebrate IBI score is run through a rigorous methodology to determine impairment. This methodology uses the sampling season in conjunction with a series of qualifier questions to evaluate whether the stream is impaired (PADEP, 2013).

A kicking sequence during a macroinvertebrate collection.

Bureau staff collected 64 benthic macroinvertebrates samples in 56 streams on state forest lands (Figure 5.11) from 2014 through 2016 using DEP Instream Comprehensive Evaluation Survey (ICE) protocol (PA DEP, 2013a). Samples were collected in the Mosquito Creek basin (Clearfield County), Sinnemahoning Creek basin (Clearfield, Elk, and Potter Counties), Hyner Run basin (Clinton County), Pine Creek basin (Potter, Tioga, and Lycoming Counties), Lycoming Creek basin (Lycoming County), Loyalsock Creek basin (Lycoming County), and the Tioga River basin (Tioga County). A total of 33 samples were collected in the spring and fall of 2014, nine samples in the spring of 2015, and 22 samples in the spring of 2016. Samples from the spring of 2016 were part of an ongoing project with USGS.

DEP is responsible for monitoring and assessing water quality across the commonwealth. DEP has collected benthic macroinvertebrate samples as part of ongoing statewide monitoring and assessment efforts that coincide with some of the stream reaches targeted by bureau staff. This provides an opportunity to assess water quality and measure any changes in water quality over time.

A review of aquatic life use assessments and existing/designated uses was performed for stream segments sampled by the bureau. DEP has completed recent aquatic life use assessments for the Mosquito Creek basin (2012), Sinnemahoning Creek basin (2011), Hyner Run basin (2011), Lycoming Creek basin (2011-2012), Loyalsock Creek basin (2010), and the Tioga River basin (2008). An effort to sample and assess the Pine Creek basin has been underway in the past few years, but a complete assessment may not be available until 2020.

The Mosquito Creek basin has a designated use of HQ-CWF (Cold Water Fishes) except for Cole Run and Twelvemile Run tributaries, which are designated EV. The bureau collected a single sample on a tributary to Gifford Run in the spring of 2016 that coincides with a spring 2012 DEP sample (Table 5.13). IBI scores are within precision estimates and are interpreted as

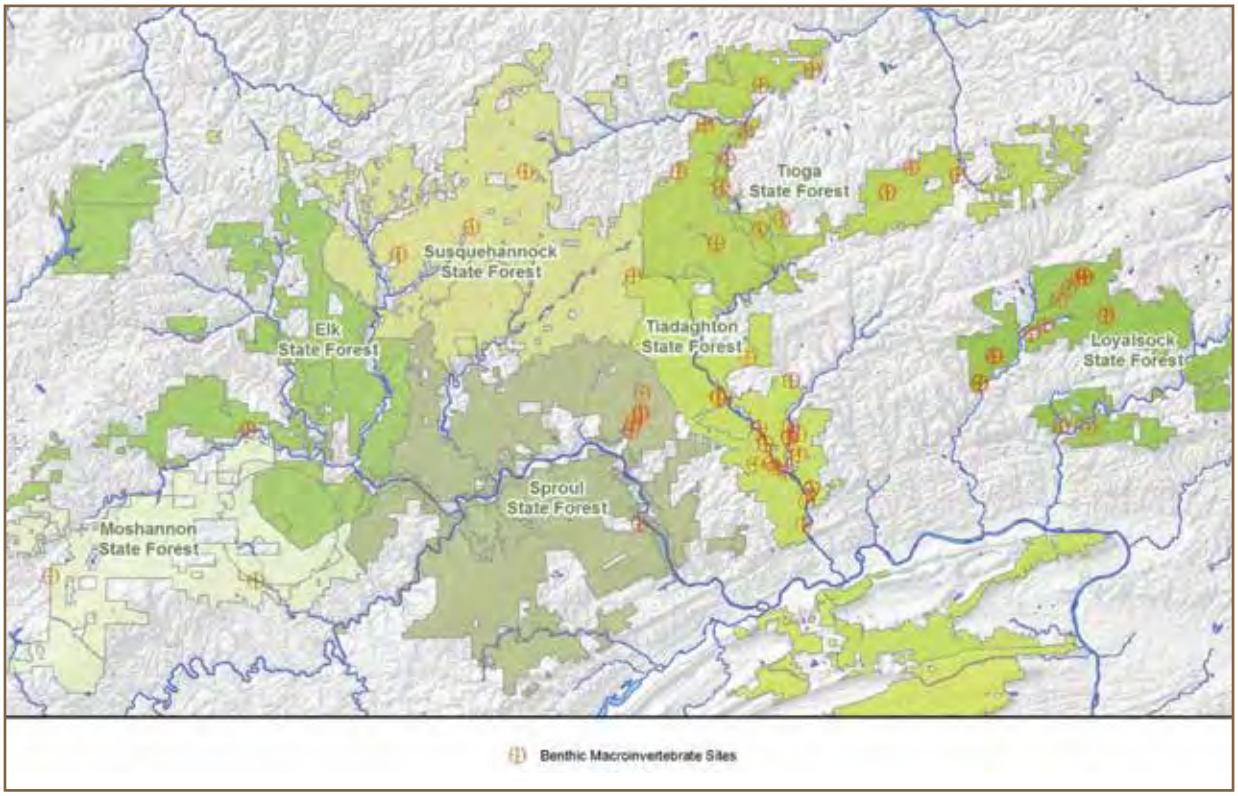


Figure 5.11. Location of benthic macroinvertebrate samples collected by DNCR staff.

no change in water quality over the period (PA DEP, 2015).

Emptying a net after a kicking sequence during a macroinvertebrate collection

The entire Hyner Run basin currently has an existing use of EV, this determination was made based on a 2011-2012 DEP survey that included samples collected at five locations throughout the basin. The bureau collected samples at six locations throughout the basin. All DEP and bureau samples indicate attainment of the EV aquatic life use (Table 5.13). Three bureau sample locations coincide with DEP sample locations including Baker Run, Right Branch Hyner Run, and the East Branch of Hyner Run. IBI scores are within precision estimates (PA DEP, 2015).

A significant portion of the Sinnemahoning Creek basin has an existing/designated use of HQ or EV. The bureau collected a single sample on both Bark Camp Run and Hicks Run within the Bennett Branch Sinnemahoning Creek subbasin as well as samples from Right Branch Big Nelson Run and East Fork Sinnemahoning within the First Fork Sinnemahoning Creek subbasin (Table 5.13). Bark Camp Run is currently listed as impaired due to metal contamination from acid mine drainage. The IBI score of 54.0 is above the impairment threshold for CWF waters and should be further evaluated by DEP. Hicks Run, Right Branch Big Nelson Run, and the East Fork Sinnemahoning Creek samples coincide with DEP samples from 2011. IBI scores for the East Fork Sinnemahoning Creek are not within precision estimates and should be further evaluated by PA DEP.

The Lycoming Creek basin is currently undergoing a Stream Redesignation Evaluation because of a petition received by DEP from the Lycoming Creek Watershed Association in 2009. The petition is to redesignate portions of the basin from an aquatic life use for CWF to a protected use of EV. Basin-wide surveys in response to the petition were conducted in 2009, 2011 and 2012. The surveys indicate that the existing use for various reaches throughout the basin were inconsistent with the designated use (see DEP website for discussion of existing and designated uses). The surveys also indicated that significant tributary reaches did not meet the aquatic life use because of acid deposition. The bureau collected 11 samples in the spring of 2014 and two samples in the spring of 2016 (Table 5.13). One sample collected on Doe Run had an IBI score of 58.4, which is below the IBI impairment threshold of 63 for samples collected on HQ and EV streams. Another sample collected on Buck Run in the spring of 2014 is also below the IBI impairment threshold. The small watershed area of Buck Run and the lack of prior samples may indicate ephemeral or intermittent conditions and should be evaluated further. Four bureau samples collected in the spring of 2014 and two collected in spring of 2016 coincide with DEP sample locations including Hawk Run, Bovier Run, Potash Hollow Run, Grays Run, and Hagerman Run. IBI scores from Hawk Run, Potash Hollow Run, and Grays Run are within precision estimates. IBI scores from Bovier Run and Hagerman Run are not within precision estimates and should be further evaluated by DEP. A follow-up investigation by DEP in 2017 on Hagerman Run had an IBI score of 91.1.

Most of the Loyalsock Creek basin has an existing

use of EV and is attaining the aquatic life use. The bureau collected samples from Little Bear Creek and Wallis Run in the spring of 2016 (Table 5.13). Wallis Run has had four samples collected by DEP prior to the 2016 bureau sample. Wallis Run was targeted by DEP in 2008 in response to a petition requesting redesignation of portions of Loyalsock Creek, and 2011-2012 as part of a CIM effort (DEP CIM reports[2]). Decreasing IBI scores from 2008-2012 were noted in the DEP CIM report. The bureau sample collected in 2016 had an IBI score of 95.7.

The Pine Creek basin is currently undergoing a Stream Redesignation Evaluation due to the results of the recent DEP aquatic life use monitoring and assessment efforts. Portions of the basin currently have an existing use of EV including most of Pine Creek mainstem, Elk Run (Tioga Co.), portions of Babb Creek basin, and portions of Little Pine Creek basin. The bureau collected 37 samples in 2014 through 2016 throughout the Pine Creek basin. A total of 29 samples coincide with prior DEP samples and samples from nine sites have IBI scores that are not within precision estimates of baseline scores and should be reevaluated (Table 5.13). Follow-up investigations by DEP in 2016 on Lower Pine Bottom Run and in 2017 on Upper Pine Bottom Run had IBI scores within precision estimates.

The Tioga River basin has an existing use of HQ-CWF in the farthest upstream reaches. Additionally, other named sub-basins have an existing use of EV, but most of the basin has a designated use of CWF. The bureau collected a sample on Boone Run in the spring of 2016 (Table 5.13) that does not coincide with any prior DEP samples. Boone Run has a designated use of CWF and the IBI score from the 2016 survey is above the impairment threshold of 43 for CWF streams.

Processing and sub-sampling a macroinvertebrate sample before identification.

Basin	Stream Name	Season/Year	IBI	Aquatic Life Use	Existing/ Designated Use
Mosquito Creek	Gifford Run	Spring 2016	85	Attaining	HQ-CWF
	Gifford Run	Spring 2012*	78.5	Attaining	HQ-CWF
Hyner Run	Cougar Run	Spring 2014	90.4	Attaining	EV
	Abes Run	Spring 2014	88.5	Attaining	EV
	R. Br. Hyner Run	Spring 2014	92.1	Attaining	EV
	R. Br. Hyner Run	Spring 2012*	92.5	Attaining	EV
	Long Fork	Spring 2014	91.5	Attaining	EV
	E. Br. Hyner Run	Spring 2014	85.8	Attaining	EV
	E. Br. Hyner Run	Spring 2011*	93.9	Attaining	EV
	Baker Run	Spring 2016	90.4	Attaining	HQ-CWF
	Baker Run	Spring 2011*	97.5	Attaining	HQ-CWF
Sinnemahoning Creek	Bark Camp Run	Spring 2016	54	Impaired	CWF
	Hicks Run	Spring 2016	78.4	Attaining	HQ-CWF
	Hicks Run	Spring 2011*	79.1	Attaining	HQ-CWF
	RB Br. Big Nelson Run	Spring 2016	81.4	Attaining	EV
	RB Br. Big Nelson Run	Fall 2011*	84.9	Attaining	EV
	East Fork Sinnemahoning	Spring 2016	79.7	Attaining	EV
	East Fork Sinnemahoning	Spring 2011*	92.1	Attaining	EV
Lycoming Creek	N. Br. Rock Run	Spring 2014	86.3	Attaining	EV
	Rock Run	Spring 2014	93.1	Attaining	EV
	Hawk Run	Spring 2014	86.1	Attaining	EV
	Hawk Run	Fall 2009*	87.8	Attaining	EV
	Doe Run	Spring 2014	58.4	Impaired	HQ-CWF
	Buck Run	Spring 2014	37.8	Attaining	EV
	Pleasant Stream	Spring 2014	82.1	Attaining	EV
	Bovier Run	Spring 2014	75.7	Attaining	EV
	Bovier Run	Fall 2009	94.5	Attaining	EV
	Potash Hollow Run	Spring 2014	90	Attaining	EV
	Potash Hollow Run	Fall 2009*	93.6	Attaining	EV
	Bear Trap Hollow	Spring 2014	80.5	Attaining	EV
	Dry Run	Spring 2014	82	Attaining	HQ-CWF
	Grays Run	Spring 2016	86.1	Attaining	HQ-CWF
	Grays Run	Fall 2013*	93.6	Attaining	HQ-CWF
	Hagerman Run	Spring 2017*	91.1	Attaining	HQ-CWF
	Hagerman Run	Spring 2016	82.6	Attaining	HQ-CWF
	Hagerman Run	Spring 2014	81.8	Attaining	HQ-CWF
	Hagerman Run	Fall 2009*	96.1	Attaining	HQ-CWF

Basin	Stream Name	Season/Year	IBI	Aquatic Life Use	Existing/ Designated Use
Loyalsock Creek	Little Bear Creek	Spring 2016	84.9	Attaining	EV
	Wallis Run	Spring 2016	95.7	Attaining	EV
	Wallis Run	Spring 2012*	86	Attaining	EV
	Wallis Run	Fall 2011*	93.3	Attaining	EV
	Wallis Run	Spring 2011*	95.3	Attaining	EV
	Wallis Run	Fall 2008*	95.1	Attaining	EV
Pine Creek	Sunken Branch	Spring 2016	80.1	Attaining	HQ-CWF
	Sunken Branch	Spring 2011*	74.3	Attaining	HQ-CWF
	Elk Run	Spring 2015	83.3	Attaining	EV
	Elk Run	Spring 2014*	89.8	Attaining	EV
	Painter Run	Spring 2016	84	Attaining	HQ-CWF
	Painter Run	Spring 2015	85	Attaining	HQ-CWF
	Painter Run	Fall 2012	98	Attaining	HQ-CWF
	Baldwin Run	Spring 2015	94.1	Attaining	HQ-CWF
	Straight Run	Spring 2015	80	Attaining	HQ-CWF
	Straight Run	Spring 2012*	94.8	Attaining	HQ-CWF
	Darling Run	Fall 2014	76.6	Impaired	HQ-CWF
	Darling Run	Fall 2012*	88.9	Impaired	HQ-CWF
	Fourmile Run	Fall 2014	82.5	Attaining	HQ-CWF
	Fourmile Run	Spring 2013*	93.9	Attaining	HQ-CWF
	Little Slate Run	Fall 2014	89.8	Attaining	HQ-CWF
	Pine Island Run	Fall 2014	86	Attaining	EV
	Pine Island Run	Spring 2013*	86	Attaining	EV
	Sand Run	Spring 2015	62.6	Attaining	EV
	Babb Creek	Spring 2016	78.8	Attaining	EV
	Babb Creek	Spring 2015	92.6	Attaining	EV
	W. Br. Stony Fork	Fall 2014	79.1	Attaining	EV
	W. Br. Stony Fork	Spring 2010*	81.9	Attaining	EV
	Francis Br. Slate Run	Spring 2016	78.4	Attaining	EV
	Sebring Branch	Spring 2016	80.4	Attaining	EV
	Trout Run	Spring 2016	75.4	Attaining	HQ-CWF
	Trout Run	Spring 2014	77.2	Attaining	HQ-CWF
	Trout Run	Spring 2012*	89.7	Attaining	HQ-CWF
	Callahan Run	Spring 2014	95.1	Attaining	HQ-CWF
	Callahan Run	Spring 2012*	86.9	Attaining	HQ-CWF
	Browns Run	Spring 2016	95.4	Attaining	HQ-CWF
	Browns Run	Fall 2014	92.9	Attaining	HQ-CWF
	Browns Run	Fall 2013*	89.2	Attaining	HQ-CWF
	Browns Run	Spring 2013*	89.7	Attaining	HQ-CWF
	Browns Run	Spring 2012*	92.9	Attaining	HQ-CWF
	Ott Fork	Spring 2014	92.2	Attaining	HQ-CWF
	Ott Fork	Spring 2012*	86.6	Attaining	HQ-CWF

Basin	Stream Name	Season/Year	IBI	Aquatic Life Use	Existing/ Designated Use
Pine Creek	Upper Pine Bottom Run	Spring 2017*	95.1	Attaining	HQ-CWF
	Upper Pine Bottom Run	Fall 2014	81.2	Attaining	HQ-CWF
	Upper Pine Bottom Run	Spring 2012*	96.1	Attaining	HQ-CWF
	Lower Pine Bottom Run	Spring 2016*	90.5	Attaining	HQ-CWF
	Lower Pine Bottom Run	Spring 2014	74.3	Attaining	HQ-CWF
	Lower Pine Bottom Run	Spring 2012*	91.6	Attaining	HQ-CWF
	Bull Run	Spring 2015	94	Attaining	HQ-CWF
	Bull Run	Spring 2012*	88.9	Attaining	HQ-CWF
	Hacket Fork	Fall 2014	93.6	Attaining	EV
	Love Run	Fall 2014	87.4	Attaining	EV
	Love Run	Spring 2010*	96	Attaining	EV
	English Run	Spring 2015	96.8	Attaining	EV
	English Run	Spring 2010*	97.4	Attaining	EV
	Boone Run	Spring 2016	96.8	Attaining	EV
	Boone Run	Fall 2014	97.4	Attaining	EV
	Boone Run	Spring 2010*	94.7	Attaining	EV
	Dam Run	Spring 2016	91.7	Attaining	EV
	Dam Run	Spring 2015	87.6	Attaining	EV
	Dam Run	Spring 2010*	89	Attaining	EV
	Ramsey Run	Spring 2016	86.3	Attaining	HQ-CWF
	Ramsey Run	Spring 2014	80	Attaining	HQ-CWF
	Ramsey Run	Spring 2012*	93.3	Attaining	HQ-CWF
	Bonnell Run	Fall 2014	76.1	Attaining	HQ-CWF
	Bonnell Run	Spring 2012*	90.8	Attaining	HQ-CWF
	Cedar Run	Spring 2016	88	Attaining	EV
	Cedar Run	Spring 2015*	86.3	Attaining	EV
	Gamble Run	Fall 2014	89.3	Attaining	HQ-CWF
	Gamble Run	Spring 2012*	93.5	Attaining	HQ-CWF
Tioga River	Boone Run	Spring 2016	58.7	Attaining	CWF

Streams highlighted in red have fallen out of precision estimates based off previous samples and may require additional follow-up.

An “attaining” aquatic life use indicates the stream is attaining water quality standards for its existing/designated use.

* indicates data collected by DEP

Table 5.13. Benthic macroinvertebrate Index of Biotic Integrity, aquatic life use assessment and existing/designated use for all sampled streams in river basins within shale gas forest districts.

SRBC assessed the macroinvertebrate communities at all ten RWQMN sites located on state forest lands in the month of October between 2012 and 2015. Most of these streams are EV or HQ, and all but one of the 54 calculated macroinvertebrate IBIs scores were higher than the absolute minimum score of 63.0 for HQ and EV streams (Figure 5.12). Macroinvertebrate IBI scores from two of the other three sites that are not EV or HQ consistently scored lower throughout most of the study period. The Little Pine Creek site is a large watershed with the study site located downstream of a reservoir. The Marsh Creek site is impaired from urban runoff and has 12 permitted wastewater treatment plants located upstream. Refer to RWQMN – DCNR Technical Summary (June 2016)[4] for more information.

Bureau staff collected discrete water chemistry field measurements, surface water grab samples, and flow measurements with the 42 macroinvertebrate samples from 2014 and 2015. In addition, eleven sites in the Pine Creek basin were referred to as "screening sites" (Figure 5.13). These collections were made (as described in the BOF CIM section) to complement any future trends observed in the macroinvertebrate samples. The 22 sites from the spring of 2016, as part of the work with USGS, included similar measurements and will be published and posted with their report when completed.

For surface water grab samples, the DEP Bureau of Labs Standard Analysis Code (SAC) 046 was selected for the analysis at 42 macroinvertebrate sites while a SAC

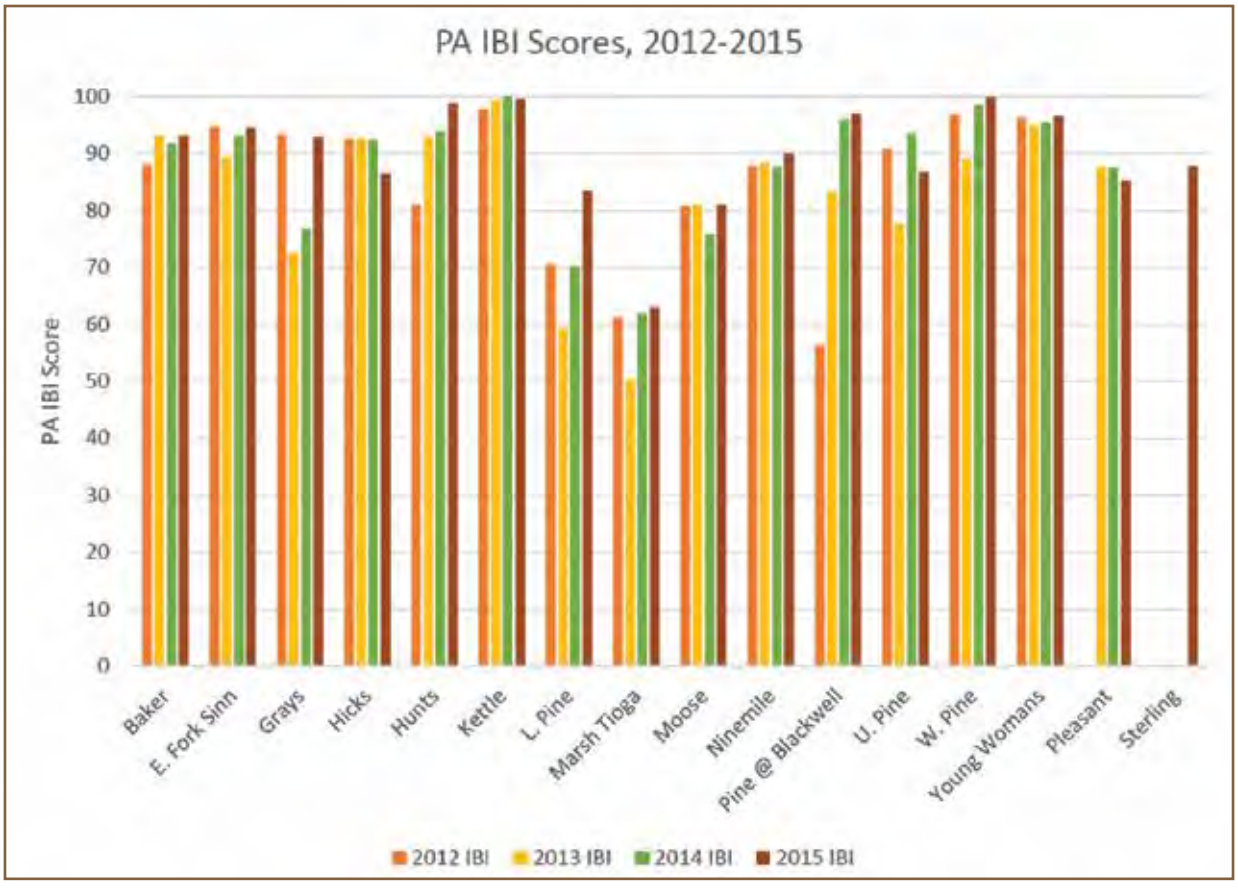


Figure 5.12. Summary of Index of Biotic Integrity scores from the Susquehanna River Basin Commission Remote Water Quality Monitoring Network stations in the shale gas region.

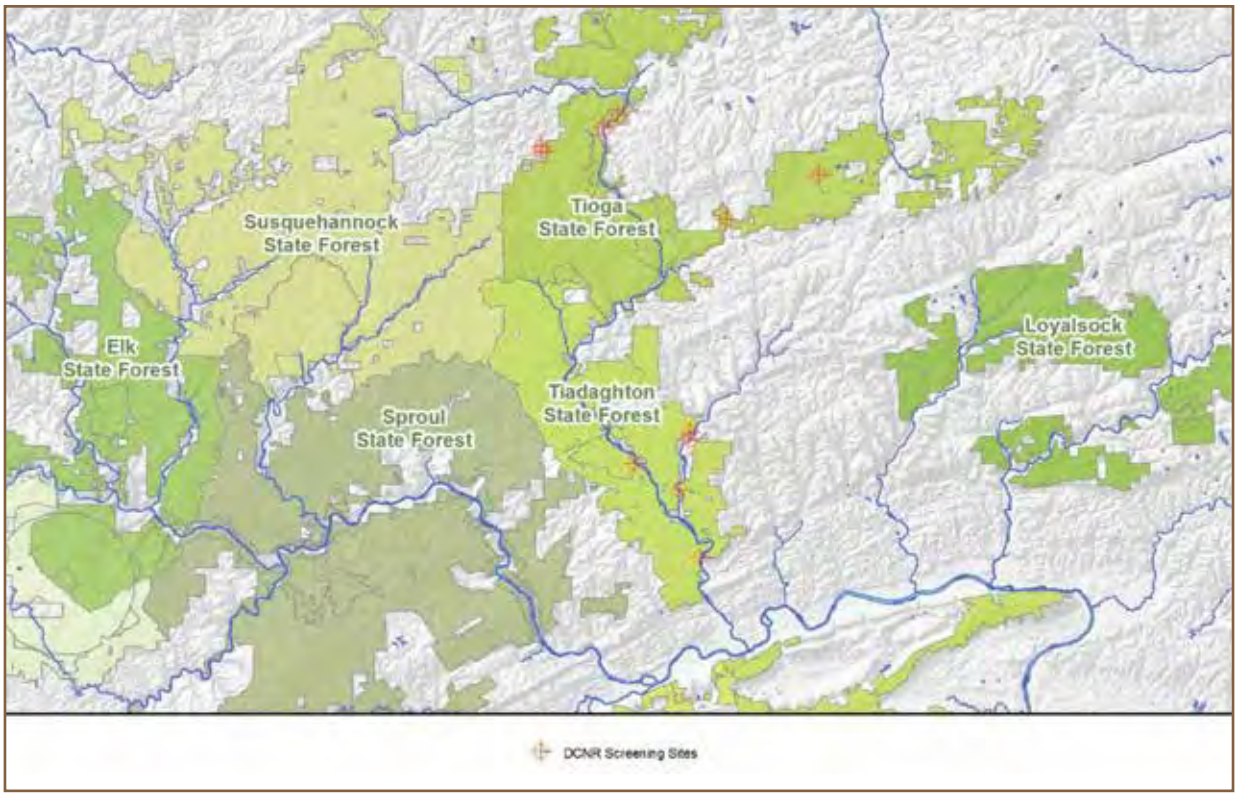
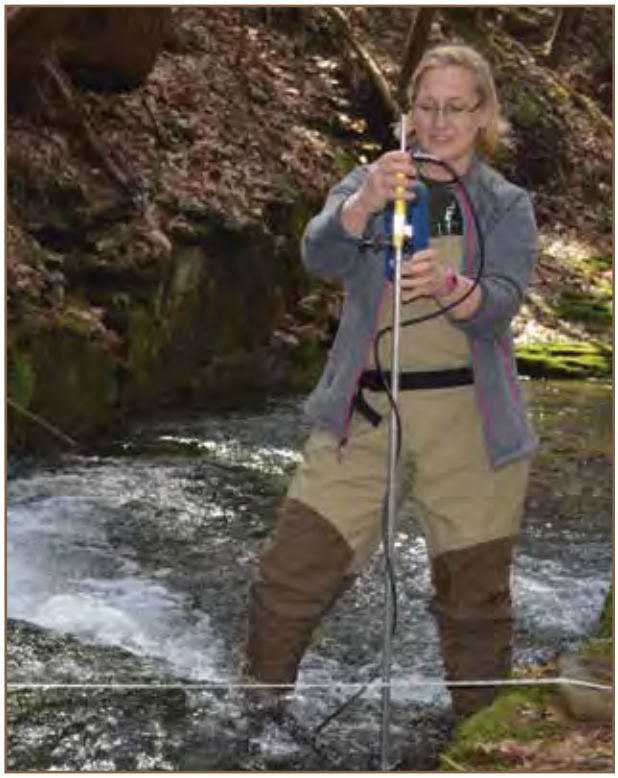


Figure 5.13. Location of screening sites visited by DNCR staff.

972 was selected for the eleven screening sites. These tests were chosen based on recommendations from DEP. A suite of 29 tests within a SAC 046 and twelve tests within a SAC 972 were analyzed and included both inorganic parameters and metals. Included are some parameters consistent with natural gas drilling that have been at the forefront of discussions regarding the potential effects to water quality. Specific conductance (SPC) and total dissolved solids (TDS) are found in flowback water at extremely high levels. Strontium (Sr), Barium (Ba), and Bromide (Br) prove useful to monitor as they are highly specific signatures of flowback and produced waters; whereas other parameters, though useful, can originate from other sources.

Surface water grab samples collected at all 42 macroinvertebrate sites are summarized in Table 5.14. All specific conductance values were found significantly under the bureau's level of concern of 800 µs/cm. Barium, strontium, and bromide levels were all found well below their levels of concern of 2,000 µg/L, 4,000



Measuring flow at a BOF screening site.

µg/L, and 0.5 mg/L, respectively. TDS levels fall well under the 500 mg/L level of concern except for one reading of 920 mg/L found on Pine Island Run, Tioga County. Only one well, which is located on private lands, exists in this basin. A follow-up was completed by DEP Oil & Gas personnel who determined that oil and gas activity associated with this well pad could be ruled out as a reason for this high reading of TDS. The bureau and DEP will continue to monitor this site on Pine Island Run.

Surface water grab samples collected at the eleven screening sites are summarized in Table 5.15. All specific conductance values were found to be less than the level of concern of 800 µS/cm. Most were found well below this level except for one outlier of 673 µS/cm recorded at Basswood Run, Tioga County. This is a stream with historical acid mine drainage (AMD) influence. TDS levels fall well under the 500 mg/L level of concern and the highest reading of 378 mg/L was observed at Basswood Run. Barium, Strontium, and Bromide levels were all found below their levels of concern of 2,000 µg/L, 4,000 µg/L, and 0.5 mg/L, respectively.

Results from discrete water field chemistry and flow measurements recorded at macroinvertebrate sites (Table 5.16) and screening sites (Table 5.17) were found consistent with grab samples for specific conductance and pH, with some outliers being attributed to AMD or agricultural runoff. The remaining measurements are consistent with expected levels in these streams.

Parameter	Units	Min	Max	Count
ALKALINITY	MG/L	0.00	58.40	42
ALUMINUM Total	UG/L	200.00	225.00	42
AMMONIA-Total as Nitrogen	MG/L	0.02	0.03	42
ARSENIC Total	UG/L	3.00	3.00	42
BARIUM Total	UG/L	10.00	55.00	42
BORON Total	UG/L	200.00	200.00	42
BROMIDE	MG/L	0.20	0.20	42
CALCIUM Total	MG/L	0.94	19.80	42
CBOD5 - Biochemical Oxygen Demand	MG/L	0.20	1.70	42
CHLORIDE -IC	MG/L	0.50	10.82	42
HARDNESS Total	MG/L	4.00	69.00	42
IRON Total	UG/L	20.00	239.00	42
LITHIUM Total	UG/L	25.00	25.00	42
MAGNESIUM Total	MG/L	0.35	4.98	42
MANGANESE Total	UG/L	10.00	109.00	42
METHANE	UG/L	1.60	12.00	42
MOLYBDENUM Total	UG/L	70.00	70.00	42
Nitrate & Nitrite Nitrogen	MG/L	0.05	1.96	42
OSMOTIC PRESSURE	MOSM	1.00	4.00	42
pH	pH units	5.00	8.00	42
PHOSPHORUS Total	MG/L	0.01	0.46	42
SELENIUM Total	UG/L	7.00	7.00	42
SODIUM Total	MG/L	0.32	6.43	42
SPECIFIC CONDUCTANCE @ 25.0 C	µS/cm	18.39	173.10	42
STRONTIUM Total	UG/L	10.00	61.00	42
SULFATE - IC	MG/L	4.63	12.01	42
TOTAL SUSPENDED SOLIDS	MG/L	5.00	12.00	42
TOTAL DISSOLVED SOLIDS (@180C -USGS)	MG/L	20.00	920.00	42
ZINC Total	UG/L	10.00	17.00	42

Table 5.14. Results using Standard Analysis Code 046 from grab samples collected at Bureau of Forestry macroinvertebrate sampling sites.

Parameter	Units	Min	Max	Count
ALKALINITY	MG/L	0	43	11
BARIUM Total	UG/L	10	43	11
BROMIDE	MG/L	0.2	0.2	11
CHLORIDE -IC	MG/L	0.5	0.98	11
ETHANE	UG/L	12.4	12.4	11
METHANE	UG/L	1.73	16.5	11
pH	pH units	3	7.8	11
PROPANE	UG/L	14.2	14.2	11
SPECIFIC CONDUCTANCE @ 25.0 C	µS/cm	30	673	11
STRONTIUM Total	UG/L	12	55	11
TOTAL SUSPENDED SOLIDS	MG/L	5	24	11
TOTAL DISSOLVED SOLIDS (@180C -USGS)	MG/L	26	378	11

Table 5.15. Results using Standard Analysis Code 972 from grab samples collected at Bureau of Forestry screening sites.

	Temperature (°C)	Dissolved Oxygen (mg/L)	Specific Conductance (µS/cm)	pH	Turbidity (NTU)	Flow (cfs)
Min	2.10	6.40	19.30	4.11	0.13	0.10
Max	14.30	13.93	221.20	8.33	3.43	25.41
# obs (n)	35	35	35	35	33	30

Table 5.16. Summary of discrete field chemistry measurements collected at Bureau of Forestry macroinvertebrate sampling sites.

	Temperature (°C)	Dissolved Oxygen (mg/L)	Specific Conductance (µS/cm)	pH	Turbidity (NTU)	Flow (cfs)
Min	6.70	10.22	29.30	2.81	0.26	0.20
Max	15.30	13.72	788.00	7.64	14.10	1.67
# obs (n)	11	11	11	11	11	8

Table 5.17. Summary of discrete field chemistry measurements collected at Bureau of Forestry screening sites.

U.S. Geological Survey Toxic Substance Hydrology Program

As part of the bureau's three-tiered approach to monitoring, the bureau partnered with the U.S. Geological Survey (USGS) and its Toxic Substances Hydrology Program (TSHP) to examine the potential for Marcellus shale gas development to impact water quality on state forest lands. This collaborative effort began in the spring of 2016 and is scheduled to continue into the fall of 2018.

The project and methods were introduced and developed by USGS personnel who were interested in partnering with a group who had the technical experience and "on-the-ground" familiarity with state forest lands to help them plan and complete the necessary field work. This provided an opportunity for the bureau's Shale Gas Monitoring Team. Both parties, along with DEP, met early in 2016 to identify the monitoring sites. As part of the selection process, USGS provided a tool (Entrekin et al., 2015) to assign a vulnerability to a HUC (Hydrologic Unit Code) based on variables identified to have the potential for the HUC to be affected by Marcellus shale gas operations. Variables included, but were not limited to: slope, land cover, amount of development, wetlands, and presence/absence of historic mines. For each HUC 12

on state forest lands experiencing gas development, a vulnerability was calculated and the HUCs were ranked and placed into one of five categories (None, Low, Moderate, High, and Highest) with the highest ranked being the most likely to be affected by gas development. Twenty-five locations were selected in which to conduct the study (Figure 5.14).

Sites are currently being visited twice a year in the spring and fall seasons. Spring visits involve water (discrete and grab) and sediment sampling using USGS methodology testing for a suite of parameters (Table 5.18). Additionally, benthic macroinvertebrate collections are conducted using the same DEP methodology used by the Shale Gas Monitoring Team. All macroinvertebrate identification is completed by DEP personnel, complementing their own water quality database. Fall visits involve a repeat of the water and sediment sampling done in the spring, as well as stream flow measurements.

Work is ongoing, and the results of this work must be reviewed and published by USGS prior to distribution. The collaboration between the bureau, DEP, and USGS has proved productive for all agencies. Fostering relationships with individuals and organizations possessing the expertise and experience with specific values has strengthened the bureau's monitoring program. The work completed on this project will provide stakeholders with information on water quality in some of the most developed and least developed watersheds in the shale gas region and can inform the bureau's water monitoring efforts in the future.

Overall, water chemistry analysis from the various continuous water monitoring and the widespread monitoring locations has not provided evidence to suggest that shale gas development has degraded water quality on state forests in the core gas forest districts during the respective data collection periods. A few

Collecting filtered grab samples during USGS TSHP project.

locations did highlight some concerns, but they were not related to shale gas development.

Bureau staff and partners will continue monitoring water quality in the shale gas forest districts to identify any long-term trends. The productive partnerships and extensive sampling locations will be valuable in monitoring water quality into the future.

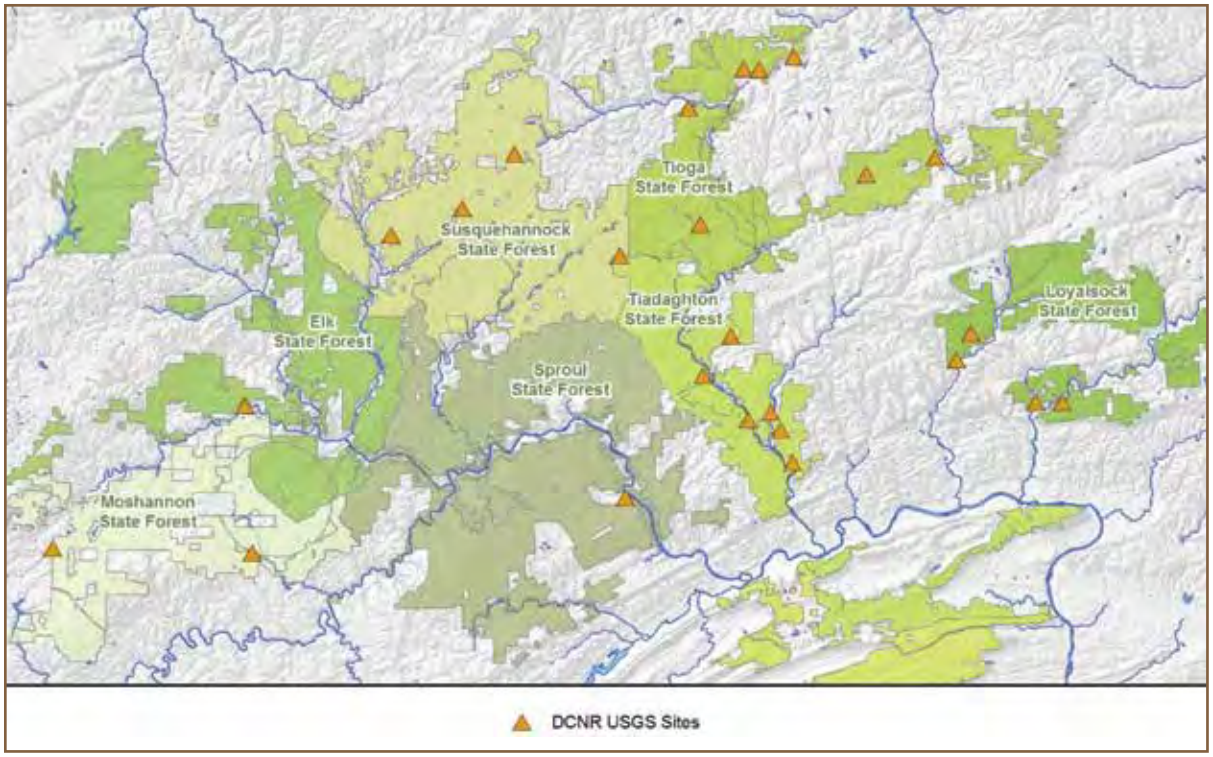


Figure 5.14. Locations of the U.S. Geologic Survey- Bureau of Forestry cooperative project. Sites are shown within boundaries of the shale gas forest districts.

Method/Equipment	Parameter
YSI ProPlus (Field)	pH, Specific Conductance µS/cm, DO mg/L, ORP (mV)
Shimadzu DOC Analyzer	Non-Volatile Dissolved Organic Carbon
Autotitrator	Alkalinity
Ion Chromatography	Cl^-, Br^-, NO_3^-, PO_4^{3-}, SO_4^{2-}
ICP-OES (ICP-OES: Inductively Coupled Plasma-Optical Emission Spectroscopy)	Ca, Mg, Sr, Na, K, Fe, Si, Ba, Cu, Zn, Li, B, Al, Mn
ICP-MS (ICP-MS: Inductively Coupled Plasma-Mass Spectrometry)	Cu, Zn, Li, Be, B, Al, V, Cr, Mn, Co, Ni, Rb, Sr, Mo, Ag, Cd, Sb, Sn, As, Se, Cs, Ba, La, Ce, W, Tl, Pb, Bi, Th, U
HPLC (High Performance Liquid Chromatography)	Lactate, Acetate, Propionate, Formate, Butyrate, Pyruvate, Benzoate
Dichloromethane Extraction followed by Gas Chromatography-Mass Spectrometry (GC-MS)	Non-Volatile Hydrocarbons
Solid Phase Microextraction followed by GC-MS	Semi-Volatile Hydrocarbons
Purge and Trap Gas Chromatography	Trace Light Hydrocarbons (C1-C6, methane to hexane)
Isotope Ratio Mass Spectrometry	Strontium Isotope Composition
16S MiSeq Sequencing	Microbial Community Analysis

Table 5.18. Parameters collected for the U.S. Geologic Survey- Bureau of Forestry cooperative project.

Air

Clean air is a fundamental requirement for the health and well-being of plants, animals, and people. Furthermore, good air quality is an expectation of state forest users. This is true from human health and aesthetic perspectives. Visitors expect to breathe clean, "fresh" air during activities on state forest lands, and they anticipate that the views along state forest roads and trails will not be marred by smog, dust, or other air pollutants.

The mission of DEP is to protect Pennsylvania's air, land, and water from pollution and to provide for the health and safety of its citizens through a cleaner environment. DEP works as partners with individuals, organizations, governments, and businesses to prevent pollution and restore natural resources. DEP's Annual Report[6] summarizes detailed information and trends on Pennsylvania's oil and gas industry.

The bureau works with DEP on issues related to air and water quality, as well as land development related to the oil and gas industry. The bureau relies on DEP (which has jurisdictional authority for air quality) to assess potential effects of air emissions from the shale gas industry and to require applicable air permits for shale gas operations.

DEP Monitoring Efforts/Results

DEP's Bureau of Air Quality[7] is responsible for safeguarding the health of Pennsylvanians by achieving the goals of the federal Clean Air Act and the Pennsylvania Air Pollution Control Act. The Bureau of Air Quality develops air quality regulations, conducts meteorological tracking, and air quality modeling studies and reviews; and develops transportation control measures and other mobile source programs. The Bureau of Air Quality also helps to improve the economic climate for firms to locate and expand in Pennsylvania through programs such as the Small Business Assistance Program.

DEP currently operates and maintains 69 air monitoring sites in 38 counties in the commonwealth. Additionally, the Allegheny and Philadelphia County Health Departments operate air monitoring networks in their jurisdictions consisting of 14 and 11 monitoring sites, respectively.

In response to shale gas development in the commonwealth, DEP has installed air quality monitors at several locations in northern Pennsylvania including Bradford, Clarion, Lycoming, McKean, and Tioga counties. This expansion of the network includes sampling for ozone and nitrogen oxides (NOx), ambient air concentrations, and fine particulate matter in Tioga and Bradford Counties. Volatile organic compound (VOC) monitors are also operating in Susquehanna and Wyoming Counties. In southwestern Pennsylvania, monitoring for fine particulate matter was added to Greene County.

DEP intended to install PM2.5 monitors in Fayette, Indiana, Lycoming, Susquehanna, and Wyoming counties by the end of 2016 and install monitors in Clarion, Jefferson, and McKean counties by the fall of 2017. The original time line has been extended due to challenges in developing the infrastructure to support these sites in very rural portions of the state. Challenges include the hiring and training of additional staff to support and operate the sites, coordinating quality assurance mechanisms to audit the sites and validate these data, and provide supervisory personnel to manage the additional staff. DEP continues to work toward installing these additional samplers.

DEP Air Emissions Related Data from the Shale Gas Industry

i. Long-Term Ambient Air Monitoring Study of Shale Gas Development
**These data are still in the review process by various partners and governmental agencies

ii. 2016 Oil and Gas Report[8]

iii. Overview of the Emission Inventory from 2012-2014 for Unconventional Natural Gas and Other Industries[9]

iv. Ambient Air Quality Update for 2016[10]

v. Commonwealth of Pennsylvania Department of Environmental Protection 2017 Annual Ambient Air Monitoring Network Plan[11]

Air Permitting for Shale Gas Operations (Air Quality Permit Information[12])

The DEP Bureau of Air Quality regulates air emissions through four different mechanisms: permit exemptions, general permits, plan approvals, and operating permits. A permit exemption sets forth detailed emission control and monitoring conditions that a pollution source must meet to be exempt from permitting requirements; this does not exempt the source from compliance with applicable standards. A general permit is a pre-determined permit for a general category of pollution sources that sets forth detailed emissions control and monitoring requirements that must be met for the general permit to be applicable. General permits make the permitting process more efficient for common types of pollution sources, as the general permits must be authorized by the Bureau of Air Quality within 30 days of application. If a general permit does not apply, then an individual plan approval and operating permit must be obtained. The plan approval is the construction permit for the pollution source, and the operating permit is the approval for emissions once the source is operational.

Depending on the details of the pollution source, one or more of these regulatory mechanisms may apply to shale gas operations. For the most part, shale gas drilling and hydraulic fracturing operations will fall under the Category Number 38 Permit Exemption for Oil and Gas Exploration, Development, Production Facilities, and Associated Equipment. Well sites are eligible for the exemption if the operations meet emission control and monitoring criteria. These Pennsylvania requirements are stricter than federal air quality rules for controlling wellhead emissions. The DEP exemption criteria include practices, e.g., a leak detection and repair program for the entire well pad facility rather than just the storage vessels as required by federal rules. Emissions of volatile organic compounds and hazardous air pollutants must also be controlled beyond levels required by the federal rules. Even with the exemption, drilling and hydraulic fracturing operations are subject to federal reporting requirements for volatile organic compounds and they must be included in an operator's annual report for DEP's emissions inventory.

General Permit Revisions

The General Permits establish Best Available Technology (BAT) requirements and other applicable Federal and State requirements including air emission limits, source testing, leak detection and repair, recordkeeping, and reporting requirements for the applicable air contamination sources. DEP has proposed a new General Plan Approval and/or General Operating Permit for Unconventional Natural Gas Well Site Operations (BAQ-GPA/GP-5A or GP-5A). The proposal will revise the existing General Plan Approval and/or General Operating Permit for Natural Gas Compressor Stations, Processing Plants, and Transmission Stations (BAQ-GPA/GP-5 or GP-5) issued in February 2013 (modified January 2015) and the Air Quality Permit Exemptions document (275-2101-003) of February 4, 2017.

The proposed GP-5A was developed under the authority of section 6.1(f) of the Air Pollution Control Act (35 P.S. § 4006.1(f)) and 25 Pa. Code Chapter 127, Subchapter H (relating to general plan approvals and operating permits) and will be applicable to unconventional natural gas well site operations and remote pigging stations. Remote pigging stations are defined as a pigging station not located at an unconventional natural gas well site, natural gas compressor station, natural gas processing plant, or natural gas transmission station that emits more than 200 tons per year (tpy) of methane, 2.7 tpy of volatile organic compounds (VOC), 0.5 tpy of any individual hazardous air pollutant (HAP) or 1.0 tpy of total HAP.

The revised GP-5 was developed under the authority of section 6.1(f) of the Air Pollution Control Act and 25 Pa. Code § Chapter 127, Subchapter H, and will remain applicable to natural gas compressor stations and

processing plants and add applicability to natural gas transmission stations. The proposed GP-5A and GP-5 can be accessed at the following link[13].

Comments on both proposed GPs and revised exemption criteria were accepted until June 5, 2017. DEP received more than 10,000 comments from industry, non-government organizations, and the public. After the comments and response document is finalized, both General Permits will be revised.

Additional VOC Regulation

DEP has begun the development of a proposed rulemaking to regulate existing oil and natural gas industry sources. The proposed rulemaking will establish emission limitations and other requirements codified in 25 Pa. Code Chapter 129 consistent with the reasonably available control technology (RACT) recommendations of the Control Techniques Guidelines for the Oil and Natural Gas Industry (CTG) finalized by the United States Environmental Protection Agency (EPA).

The proposed rulemaking will establish RACT requirements for volatile organic compounds (VOC) and other pollutants from existing oil and natural gas production facilities, compressor stations, processing plants, and transmission stations. At a minimum, the proposed rulemaking will address VOC emissions from storage vessels, compressors, pneumatic controllers, pneumatic pumps, fugitive emission components from well sites, compressor stations, and processing plants. The control of VOC emissions will also achieve collateral methane emission reductions. However, in accordance with the Governor's Methane Reduction Strategy, DCNR will examine whether additional reduction of methane emissions from oil and natural gas industry sources can be achieved. The proposed rulemaking, if adopted by the Environmental Quality Board and published in the Pennsylvania Bulletin as a final rulemaking, will be submitted to the EPA for review and approval as a revision to the Commonwealth's State Implementation Plan (SIP).

Additional Methane Regulation

Pennsylvania will reduce methane emissions during development and gas production, processing, and transmission by requiring leak detection and repair (LDAR) measures, efficiency upgrades for equipment, improved processes, implementation of best practices, and more frequent use of leak-sensing technologies.

This includes:

1. To reduce leaks at new unconventional natural gas well pads, DEP will develop a new general permit for oil and gas exploration, development, and production facilities, requiring Best Available Technology (BAT) for equipment and processes, better record-keeping, and quarterly monitoring inspections.
2. To reduce leaks at new compressor stations and processing facilities, DEP will revise its current general permit, updating best-available technology requirements and applying more stringent LDAR, and other requirements to minimize leaks.
3. To reduce leaks at existing oil and natural gas facilities, DEP will develop a regulation for existing sources for consideration by the Environmental Quality Board.
4. To reduce emissions along production, gathering, transmission and distribution lines, DEP will establish best management practices, including leak detection and repair programs.

Short-term studies by DEP have demonstrated that gas-related compounds, particularly odor-causing compounds, are present near shale gas operations. DEP continues to review and update its ability to monitor and regulate air emissions from shale gas operators through the permitting processes and the establishment of additional collection sites near shale gas operations.

Although shale gas development may emit these various pollutants through the various processes involved, the natural gas produced through shale gas development also has the potential to create an overall positive effect on

Category	Year	Carbon Monoxide (TPY)	Nitrogen Oxides (TPY)	PM10 (TPY)	Sulfur Oxides (TPY)	VOCs (TPY)
All Point Sources	2008	117,978	318,134	38,317	924,194	28,675
All Point Sources	2015	77,786	213,650	19,225	259,711	27,991
Difference		40,192	104,485	19,093	664,483	684
Shale Gas Development	2015	8,664	20,063	671	182	6,420
Net Difference		31,527	84,421	18,422	664,301	-5,737

Table 5.19. Statewide pollution inventory data and emissions data from shale gas development, in tons per year (TPY).

air quality in Pennsylvania and the nation. This is mainly because natural gas emits fewer core emissions when compared to coal that is widely used in power generation in Pennsylvania and surrounding states. As of June 2017, DEP released annual air emissions inventory data that demonstrates a decrease in numerous pollutants from 2008 (the time that shale gas development began at a high level) to 2015. Emissions inventory data specific to shale gas development also was presented. These data are shown in Table 5.19. There has been a marked decrease in several major air pollutants, including sulfur oxides, nitrogen oxides, and carbon dioxide. This is due, in part, to the increased use of natural gas for power generation, the shutdown of several major facilities, and the installation of air pollution control equipment.

The bureau will continue to monitor the air quality studies being performed by DEP and make efforts to address identified concerns of state forest users and neighbors. At present time, the bureau does not have plans to initiate its own air quality monitoring program.

Soil

Healthy soils are essential to a healthy forest ecosystem. Forest soils sustain biological activity, diversity, and productivity by providing habitat for plants, animals, and other organisms. Soils regulate water storage and flow; store and cycle nutrients essential for all forest life; and filter, buffer, immobilize, and detoxify potential pollutants. The bureau strives to maintain the highest possible soil quality on all state forests. This is achieved by evaluating the potential effects of management decisions on soil resources and employing best management practices to minimize effects to soils during timber harvesting, road construction, and other forest management activities.

Shale gas development often involves soil disturbing activities that require careful planning and oversight to minimize potential negative effects on soil quality. The construction or improvement of roads increases soil compaction in the road corridors and runoff from roads presents a risk for erosion and sedimentation. Pipelines create similar corridor impacts and often can involve soil disturbance on steep slopes where erosion and stormwater control can be a challenge. Pad construction clears the topsoil (stockpiling it for future use) and causes severe compaction of soils beneath the pad infrastructure, which must be mitigated when pads are no longer in use and site rehabilitation is going to take place. Spills of chemicals or fuels can also threaten soil quality.

DEP regulates all activities that involve soil disturbance within Pennsylvania. Therefore, the bureau collaborates with DEP to manage and monitor soil resources related to shale gas development on state forests. Most soil-disturbing activities involving gas development require an erosion and sediment control plan or permit from

DEP. Disturbances of greater than 5,000 square feet (0.11 acres) require an erosion and sediment control plan, while disturbances greater than five acres require an erosion and sediment control permit. These plans or permits specify the erosion and sediment control best management practices that must be implemented for compliance. The bureau provides DEP input on erosion and sediment control plans and permits with the goal of ensuring that practices are designed appropriately for a forested environment as opposed to practices more suited for an urban or commercial setting.

Gas operators are required to self-monitor their erosion and sediment control practices and make any necessary improvements or corrections. DEP inspectors regularly check active work sites to verify compliance with the plan or permit. The bureau's gas foresters assist by also monitoring for signs of non-compliance and report any potential problems to the operators; and if necessary, DEP.

Shale Gas Infrastructure and Soils

The bureau works with gas companies to place gas infrastructure in areas with the least impact on the forest. Soil characteristics in these areas is one of the important factors that are considered. The key soil attributes include how well the soil drains, surface runoff potential, and erosion hazard. This information is obtained from the Soil Survey Geographic Database (SSURGO) that is maintained by the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS).

Soils can be categorized by drainage class, an indicator of the soil's wetness. Most pads, impoundments, and compressors have been constructed on soils that are well drained or moderately well drained (Table 5.20). This demonstrates that wet areas have largely been avoided for placement of infrastructure.

Soils can also be rated based on their suitability for certain land use. One of the ratings available is for erosion hazard from forest road or trail construction. This rating for shale gas roads is shown in Table 5.22.

Over 75 percent of road construction between 2013-2016 was performed along areas with moderate or slight erosion hazard. Sometimes road construction is necessary on steeper slopes or grades where erosion hazard exists to minimize overall forest fragmentation or to avoid sensitive resources, such as wetlands or threatened and endangered species and their requisite habitat.

Table 5.20. Percent of total area disturbed by pads, impoundments, and compressors, and percent of total length disturbed by new pipelines and roads by soil drainage class.

Drainage Class	2008 to 2012				2013 to 2016			
	Percent Total Land Area in Core Gas Forest Districts	Percent of Area of Pad Disturbance	Percent Length of Pipeline	Percent Length of Road	Percent Total Land Area in Core Gas Forest Districts	Percent of Area of Pad Disturbance	Percent Length of Pipeline	Percent Length of Road
Excessively drained	1.21	0.05	0.21	0.27	1.21	0.00	0.00	0.00
Somewhat excessively drained	2.59	1.70	1.40	0.26	2.59	0.00	0.80	0.00
Well drained	68.65	83.81	74.59	80.24	68.65	77.51	78.33	80.20
Moderately well drained	19.41	11.40	20.35	18.19	19.41	19.73	14.57	12.97
Somewhat poorly drained	3.36	2.15	2.26	1.02	3.36	0.92	0.63	0.00
Poorly drained	3.39	0.84	1.10	0.00	3.39	1.83	5.06	6.83
Very poorly drained	1.39	0.05	0.09	0.02	1.39	0.00	0.60	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

For comparison, the percent of total land area within the core gas forest districts in each runoff class is presented. Analysis based on SSURGO data (Soil Survey Staff 2016).

Table 5.21. Percent of total area disturbed by pads, impoundments, and compressors, and percent of total length disturbed by new pipelines and roads by soil index of surface runoff.

Soil Index of Surface Runoff	2008 to 2012				2013 to 2016			
	Percent Total Land Area in Core Gas Forest Districts	Percent of Area of Pad Disturbance	Percent Length of Pipeline	Percent Length of Road	Percent Total Land Area in Core Gas Forest Districts	Percent of Area of Pad Disturbance	Percent Length of Pipeline	Percent Length of Road
Very high	10.75	6.21	7.70	3.37	10.75	3.48	7.91	7.31
High	20.21	14.18	18.67	17.49	20.21	15.79	8.67	14.39
Medium	41.95	29.40	33.32	37.45	41.95	32.85	36.99	27.39
Low	20.62	30.78	28.92	26.37	20.62	40.70	37.10	43.55
Very low	4.14	19.42	11.37	15.32	4.14	7.19	9.33	7.36
Negligible	2.33	0.00	0.02	0.00	2.33	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

For comparison, the percent of total land area within the core gas forest districts in each runoff class is presented. Analysis based on SSURGO data (Soil Survey Staff 2016).

Topsoil Stockpiling on Pads

Well pads and compressor stations require a solid base. To achieve this base, existing vegetation is removed, topsoil is scraped off and stockpiled, and the subsoil is compacted prior to laying gravel on the pad. The topsoil is then stored at the edges of the pad and seeded to prevent erosion. The stockpiles sit undisturbed until the commencement of site rehabilitation activities on the pad.

Stockpiling can alter nutrient cycling, increase the bulk density (compaction), reduce the viable seed bank, and reduce biological activity over time. Oxygen levels can also decrease in the center of the pile. Biological activity rebounds quickly (within three years) once re-spread over the reclaimed area (Idaho Transportation Department 2012, Mason et al. 2011, Natural Resource Conservation Service 2004, Strohmayer 1999, White et al. 2008, and Wick et al. 2008). The current guidelines pertaining to soil stockpiling at development sites are effective in ensuring effective site rehabilitation.

Subgrade Soils Stabilization

In 2010, a three-acre pad was constructed in the Sproul State Forest using subgrade soil stabilization. Subgrade soil stabilization is a method that improves a soil's engineering properties through the incorporation of Portland cement directly into the soil. The resulting surface is referred to as soil cement and is a hard, durable surface that is less prone to heaving from freeze/thaw cycles. Typically, well pads are constructed using a compacted rock base. To construct a rock base pad on this site it was estimated that it would require over 5,000 cubic yards of base material (~450 tri-axle dump truck loads), approximately 4,800 cubic yards of R4 rock base (~400 tri-axle dump truck loads), a geotextile layer, and approximately 2,400 cubic yards of 2A stone (4 to 6-inch topcoat).

The typical subgrade soil stabilization well pad is constructed in a series of steps. First, the site is prepared by removing the topsoil and grading as is typically done with a rock base method. Cement is then spread over

Table 5.22. Percent of newly constructed length of road by erosion hazard from forest road or trail construction.

Erosion Hazard from Forest Road or Trail	Percent of Total Road Miles
Slight	30.6
Moderate	47.8
Severe	21.6
Total	**100.0**

Analysis based on SSURGO data (Soil Survey Staff 2016).

the entirety of the pad at approximately 80 lb/cubic yard at 1 ft. deep. Water is then added with a reclaimer machine that mixes the cement and soil to a depth of approximately 1-3 ft. depending on the depth to bedrock. The soil cement is then compacted with a roller and allowed to set for 24 hours. The last step involves adding a topcoat of 2A stone to a depth of 4-6 inches.

Completed well pad subject to subgrade stabilization.

Given the novel nature of this construction technique for a well pad, the bureau tested the site to determine if the soil cement proved difficult to reclaim and to see if the incorporated cement had any effect on pH levels of the pad or surrounding forest soils. The pad reclamation began with the removal of the topcoat of 2A stone. Once the top coat was removed, a reclaimer machine pulverized and ripped the soil cement to the depth of the bedrock layer. The well pad site was then graded to the specifications of the pad reclamation plan and the topsoil was spread over the reclaimed pad site. Personnel were on site during the ripping phase of the well pad reclamation to observe and document the progress along with any difficulties associated with preparing the site because of the Portland cement. The removal and ripping of the three-acre site was conducted in one day. From observations, it does not appear that the use of Portland cement impeded the progress in preparing this site for rehabilitation. Portland cement mixed at approximately 80 lbs./cubic yard does not present a detriment to surface ripping for site rehabilitation. However, ripping does require the use of a reclaimer machine to pulverize the soil cement.

Soil samples were taken post site preparation to address the pH questions associated with the use of Portland cement. A total of seven soil samples were collected at different locations in the surrounding forest and on the pad. Samples were collected in the forest at 50 ft. and 100 ft. from the pad edge on three sides of the pad and one sample was collected in the middle of the pad (Figure 5.15). Samples were collected by digging 12 holes spaced 5 to 10 feet apart to a depth of approximately six inches at each sampling location. The soils at the site were then mixed to create a composite sample for each sampling location. Overall, the sample taken within the pad itself did exhibit higher pH, soil magnesium, phosphorus, calcium, and potassium than in the surrounding forest soils (Table 5.23).

The data and experiences gathered from this project indicate that subgrade soil stabilization shows some merit in certain situations. The biggest benefit in subgrade soil stabilization and soil cementing is the reduction in fill and heavy hauling. The quantity of stone and associated truck traffic was greatly reduced by utilizing subgrade soil stabilization over the traditional rock base method. It is estimated that approximately 5,000 cubic yards of base material and 4,800 cubic yards of R4 rock base were not needed in the construction of the pad. This is a savings of approximately 850 tri-axle dump truck trips to the site during construction alone. Additionally, another 850 truck trips would have likely been required to move this material off the site during the rehabilitation process.

Flora

Foresters work to enhance existing vegetation communities, prevent non-native invasive species from overwhelming these communities, and help to

Figure 5.15. Locations of soil samples taken at subsoil stabilization site

	PAD	A1	A2	B1	B2	C1	C2
Soil pH	5.4	4.5	4.6	4.4	4.3	4.4	4.5
Phosphorus (ppm)	13	5	4	3	3	4	6
Potassium (ppm)	94	35	44	38	27	27	37
Magnesium (ppm)	37	9	8	14	11	10	10
Calcium (ppm)	812	54	35	61	40	28	24
Acidity (meq/100g)	6.9	11.1	11.1	12.3	11.1	11.7	12.9
Zinc (ppm)	2.8	3.9	2.5	1.6	1.3	1.2	2.8
Copper (ppm)	0.4	1.1	0.8	0.8	0.7	0.8	0.7
Sulfur (ppm)	25	23.5	37.2	36.1	28.6	19.8	27
CEC (meq/100g)	11.5	11.5	11.5	12.8	11.5	12	13.2
% Saturation of CEC							
K	2.1	0.8	1	0.8	0.6	0.6	0.7
Mg	2.7	0.7	0.6	0.9	0.8	0.7	0.6
Ca	35.3	2.3	1.5	2.4	1.8	1.2	0.9

Table 5.23. Soil chemistry test results at subsoil stabilization project site.

conserve rare plant species on state forest land. Plants serve as keystone species in almost every ecosystem by providing food, habitat, and by shaping site conditions such as temperature, water quality, light, and air quality. Plants also provide valuable economic resources, such as timber, and shape or influence many recreational experiences. Approximately 3,000 plant species have been found in the commonwealth. Approximately 1,900 are native and 1,100 are species not native to Pennsylvania. These species have been further classified into 136 unique plant community types (78 palustrine and 49 terrestrial) by Zimmerman, et al. (2012).

DCNR has listed 228 plant species in Pennsylvania as Endangered, 78 as Threatened, and an additional 41 as Rare. Of these Plant Species of Special Concern, approximately 60 species are known to exist on state forest subject to current shale gas development activities. The bureau oversees the protection of PA Plant Species of Special Concern on state forest lands by reviewing proposed shale gas development projects. Recommendations for avoiding or minimizing effects to Endangered, Threatened or Rare plant species are provided to managers. Biologists and foresters in the bureau work with operators to minimize potential impacts to plant communities and state-listed plant species near development projects early in the planning stages, as well as during construction of shale gas infrastructure. In addition, the bureau has developed periodic monitoring protocols to ensure that infrastructure construction and gas extraction does not have any long-term effects on the viability of populations of Plant Species of Special Concern, along with common native species, on state forest lands.

Since the onset of development and construction of facilities for extraction of natural gas on state forest lands, the bureau has been interested in how these operations could affect native vegetation communities. Shale gas development has converted many areas of mature, interior forest into early-successional communities or forest edge habitat. While this may negatively affect forest interior species, early-successional habitat can often result in a higher diversity of plant species than mature forest. In addition, once utilization of forest acreage by energy companies is complete, opportunities to reclaim or restore these sites may exist to improve or provide unique habitats for plant and wildlife species.

The increase in forest disturbance and traffic on state forest roads increases the potential to spread non-native invasive plant species into interior forest or wetland habitats that were once less likely to be invaded. Barlow (2017) suggest that "[unconventional oil and gas] development predisposes forested landscapes to plant invasion." Before development takes place, the bureau provides information to each lessee providing guidance on pre-construction prevention practices to slow the spread of invasive plants. Following construction, monitoring for invasive plants is conducted by bureau personnel. Furthermore, operators subject to recent leases or surface use agreements are mandated to monitor and control prioritized invasive plant species found within their project limits of disturbance. Collaborative approaches between operators and the bureau have increased the effectiveness of these efforts for both parties.

Shale Gas Infrastructure and Forest Types

Bureau foresters classify each state forest stand by forest community based on on-the-ground conditions and the dominant tree species. Typing data exists for the entire state forest land base, including areas utilized for gas extraction, and can be analyzed to determine which communities have been disturbed most often because of gas infrastructure development on state forest land.

Between 2013-2016, the amount of state forest land cleared for natural gas development fell sharply (Table 5.24). From the onset of gas development on state forest lands, much of the forest disturbance occurred in the dry oak – heath forest type. Between 2013-2016, 103 acres of dry oak – heath forest (the most common type on state forest lands) were converted to natural

gas infrastructure, which accounted for approximately 34 percent of the total conversion over that period. The black cherry – northern hardwood forest type had 27.1 acres disturbed between 2013-2016, the second highest total among forest types. The third highest type converted to shale gas infrastructure between 2013-2016 was a non-forested type; the well site type (gas, oil, or water). A total of 61 acres of existing well sites were converted or reconfigured to accommodate shale gas infrastructure. All other forest types had less than 30 acres converted between 2013-2016 (Figure 5.16). The well site and human-made impoundment typing categories are included to indicate locations where new shale gas infrastructure utilized areas of forest that had been previously developed. The "Unknown" typing category is used for newly acquired state forest land or areas that have yet to be thoroughly typed. Evaluating the composition of the forest acres converted for natural gas development allows bureau staff to take a landscape-level approach to siting and placement of infrastructure.

Table 5.24. Acres converted from the top 10 Forest Comminity Types prior to 2013 and from 2013-2016 for shale gas development infrastructure, arranged by forest community type.

Forest Community Type	Percentage of Area in Core Gas Forest Districts	Pre 2013	2013-2016	Total
Dry Oak - Heath Forest	27	555.8	103.4	659.2
Well Site (Gas, Oil, Water)[1]	<1	130.5	60.6	191.1
Dry Oak - Mixed Hardwood Forest	10	145	9.9	154.9
Red Maple Forest	5	135.2	18.1	153.3
Red Oak- Mixed Hardwood Forest	8	115.7	20.8	136.5
Northern Hardwood Forest	25	114.3	10.7	125
Black Cherry - Northern Hardwood Forest	5	45.1	27.1	72.2
Woodland	<1	41.2	7.3	48.5
Unknown	7	20.8	14.2	35
Human-made Impoundment / Pond[2]	<1	12	27	39
Total	**89**	**1315.5**	**299.1**	**1615**

[1]This category includes all sites used for wells of any type on state forest lands, including conventional and unconventional gas development.
[2] This category includes any man-made ponds or impoundments created for any use on state forest lands.

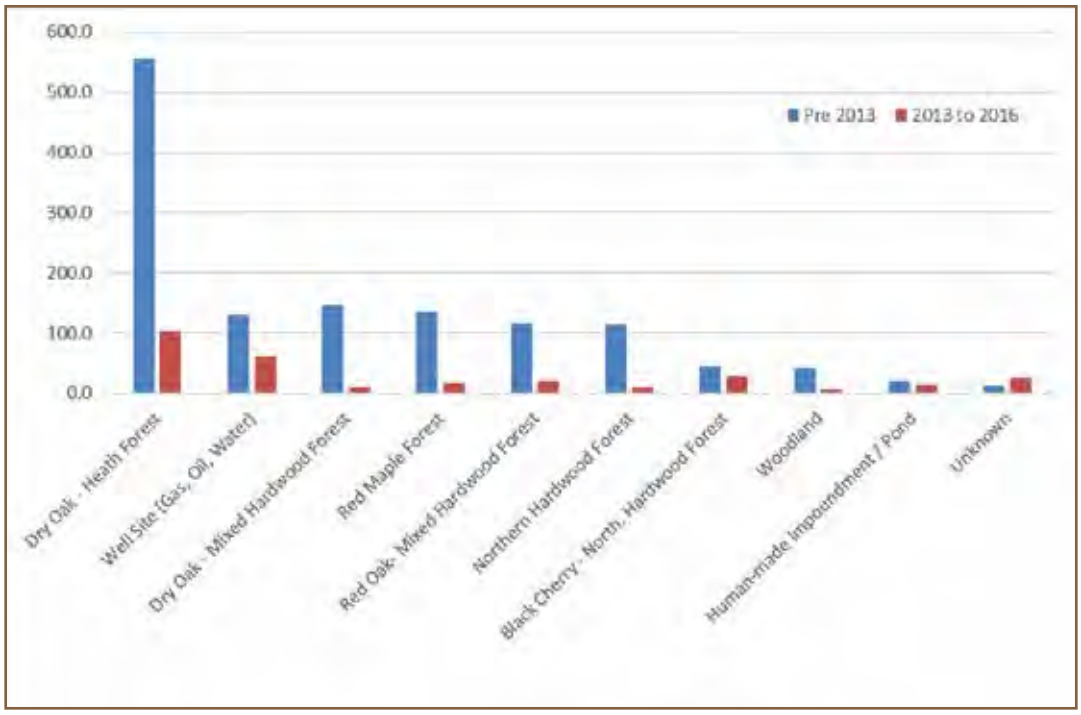


Figure 5.16. Acres cleared prior to 2013 and from 2013-2016 for shale gas development infrastructure, arranged by forest community type.

Monitoring Efforts

The purpose of the plant monitoring program is to recognize any potential effects to vegetation communities within areas utilized for gas extraction, as well as monitoring for observable long-term changes in the composition of these communities. Another focus is reducing the size and number of new infestations of invasive plants near shale gas infrastructure. DCNR defines invasive plants as any plant species that is not native to Pennsylvania, can grow or spread aggressively, and can displace native vegetation. Vegetation data have been used to develop more adaptive management practices that allow for the development of gas resources while protecting and enhancing native plant communities on state forest lands.

The importance placed on native flora and vegetation communities by the bureau is reflected in the vegetation monitoring efforts as part of the shale gas monitoring program. The three components of the plant monitoring program are: 1) evaluating vegetation communities immediately adjacent to shale gas infrastructure, including areas adjacent to well pads, roads, and rights of way; 2) monitoring tracts subject to shale gas development for non-native, invasive plant species; and 3) conducting vegetation inventories in areas of potential future gas extraction to assess the composition of vegetation communities prior to shale gas development. The evaluation of vegetation communities immediately adjacent to shale gas development also includes any communities that contain state-listed rare plant species.

1. <u>Evaluating Vegetation Communities Adjacent to Shale Gas Infrastructure</u>

As gas infrastructure is constructed, forest is cleared and many acres of interior forest habitat are converted to forest edge. As this conversion occurs, it is important for the bureau to monitor how plant communities adjacent to these sites may change over time. Assessment and monitoring of adjacent vegetation communities currently takes place on existing well pads, state forest roads used heavily for gas-related traffic, and pipeline rights-of-way.

Well Pad Vegetation Assessments

The well pad vegetation assessment protocols have been created to provide a means to assess how plant communities at the immediate edge of well pads are changing and how adjacent, undisturbed communities are affected by nearby forest disturbance. The bureau is interested in which, if any, opportunistic weed species that colonize the disturbed edges of the well pads are moving into adjacent interior forest. Similarly, learning which native forest species are first to re-colonize the disturbed well pad edges can guide site rehabilitation and restoration efforts or provide a relative time scale to natural re-forestation efforts at these disturbed forest edges. This careful examination of vegetation at well pad edges also provides an opportunity to understand the establishment success of species typically used in seed mixes. As of December 2016, 179 shale gas well pads have been constructed on state forest lands. In 2012 and 2013, 36 well pads were assessed using this protocol. In 2014, 15 of these pads were chosen for permanent vegetation plots, which are to be surveyed once every three years. An attempt was also made to ensure that the cohort of pads selected were representative of the variety of lessees operating on state forest lands. In addition, some pads were chosen due to their placement near less-frequently affected vegetation community types, or their proximity to adjacent rights-of-way or timber harvests.

The vegetation plot data collected during the well pad assessment protocol categorize plant species into three types of communities found immediately adjacent to a well pad: undisturbed forest, disturbed native vegetation (usually cleared of trees), and disturbed areas planted to erosion and sedimentation seed mixes. Vegetation inventories are taken within milacre (1/1000 acre) plots positioned on three sides of the well pad with two milacre plots inventoried on each side (the side of the pad with the access road is excluded). One milacre is placed 25 feet from the edge of the well pad and another 25 feet into the undisturbed forest. If the first milacre plot on a side is in undisturbed forest, a second plot is not completed. The relative percent cover of all species is recorded within each milacre plot, as well as a tally of all tree regeneration present.

The "undisturbed forest" community type was present on all 15 pads with permanent plots and was found on a total of 46 milacre plots. Hay-scented fern (*Dennstaedtia punctilobula*) had the highest average percent cover, 15.1 percent (Table 5.24). As would be expected, hay-scented fern was found on nearly every well pad in this protocol. This is a very common species in northern Pennsylvania and is widespread throughout the state forest system. In fact, all species listed in Table 5.25 that had the highest mean percent cover across multiple pads were common species that would be expected in most of the forest vegetation communities in northcentral Pennsylvania. These results are all somewhat expected based on historical observations and forest inventory data. These data also indicate that to this point, there is little substantial change in composition of dominant forest plant species in undisturbed forests adjacent to well pad edges.

Species	Number of Pads	Percent Cover
Hay-scented fern (*Dennstaedtia punctilobula*)	13	15.1
Black huckleberry (*Gaylussacia baccata*)	11	10.6
Mountain laurel (*Kalmia latifolia*)	11	5.3
New York fern (*Thelypteris noveboracensis*)	4	3.3
American beech (*Fagus grandifolia*)	8	3.3
Striped maple (*Acer pensylvanicum*)	10	2.7
Swamp dewberry (*Rubus hispidus*)	2	2.4

Table 5.25. Highest mean percent cover values per pad for "undisturbed forest" plots.

Species	Number of Pads	Percent Cover
Hay-scented fern (*Dennstaedtia punctilobula*)	4	16.9
Allegheny blackberry *(Rubus allegheniensis)*	2	8.2
Coltsfoot (*Tussilago farfara*)	1	6.9
Black cherry (*Prunus serotina)*	3	6.3
Rough-stemmed goldenrod (*Solidago rugosa*)	3	5.7
Sweet vernalgrass (*Anthoxanthum odoratum*)	2	4.9
Meadow fescue (*Festuca elatior*)	1	4.8
Redtop (*Agrostis gigantea*)	2	4.2

Table 5.26. Highest mean percent cover values per pad for "disturbed native" vegetation plots.

The "disturbed native" vegetation type was present on six of 15 pads. These areas were typically used for staging of equipment during well pad construction and were cleared of trees. However, the native vegetation was not removed entirely from the site and supplemental plantings were not always necessary. Again, hay-scented fern (*Dennstaedtia punctilobula*) had the highest average percent cover, 16.9 percent (Table 5.26). All species listed in Table 5.25, that had the highest mean percent cover across multiple pads, were common woody species that would be expected in most of the forest edge vegetation communities in northcentral Pennsylvania. Early successional species like Allegheny blackberry and black cherry are not unexpected, as they are typically among the first woody species to re-establish following a disturbance. Species like coltsfoot, rough-stemmed goldenrod, and redtop probably spread to these areas that were cleared of trees by way of gas access roads and state forest road corridors.

The "erosion and sedimentation" vegetation type was present on 13 of 15 pads. Deer-tongue grass had the highest average percent cover, 7.4 percent (Table 5.27). Red fescue (4.3 percent average cover), timothy (4.2 percent), white clover (3.3 percent), and partridge pea (3.3 percent) are species used extensively in reseeding immediately following construction to reduce the potential for soil erosion and sedimentation impacts.

Both sweet-fern and hay-scented fern are common species in northcentral Pennsylvania. Sweet-fern especially prefers dry, open, savannah-like habitat and benefits from the conditions created at well pad edges.

Overall, the species that had the highest percent cover in all three types of communities (undisturbed forest, disturbed native vegetation, and disturbed) were expected. This indicates that in the first five to eight years following construction of the well pads, no unusual shifts have been detected in the vegetation communities adjacent to well pad edges. These early results also indicate that the vegetation communities and forest types in which these 15 pads have been placed are somewhat resilient to rapid changes in species composition following disturbance. However, this does not mean that there have not been areas where invasive plants have colonized following disturbance. It is likely that after the initial colonization by early successional species, both native and non-native, it may be some time before significant vegetation shifts are noticeable. Operationally, this is useful in that at this point, portions of a well pad that can be reclaimed could shift back to the pre-disturbance vegetation community. After the permanent well pad vegetation plots have all been surveyed for a second time, the bureau will be better able to quantify the smaller-scale changes in vegetation that are inevitably taking place on each pad edge.

In addition to permanent milacre vegetation plots, two types of surveys were conducted as part of the larger well pad assessment protocol. One survey focused on non-native, invasive plant species presence. The other survey focused on native and non-native species at the interface of disturbed and undisturbed forest. Monitoring staff walk three sides of the pad at the point in which the non-disturbed forest edge meets the limits of disturbance at the pad. Monitoring staff then observe any native species that are "volunteering" from the forest onto the disturbed pad edge, as well as non-native species that are spreading off the disturbed pad edge into the undisturbed forest. In total, 45 well pad edges (three edges each on 15 well pads) have been subject to this survey.

After comparing the well pad edges, the native species that were found most often volunteering on the disturbed edge (Table 5.28) were hay-scented fern (17 sides), sweetfern (16 sides), and goldenrods (14 sides). The most common native grass was deertongue (13 sides), the most common shrub was Allegheny blackberry (13), and the most common forbs were white snakeroot (10 sides) and common milkweed (8 sides). It is important to note that while population size estimates were taken, these are the average population sizes on sides where the plant was found, not an average of all 45 sides. Many of these species were expected to be found volunteering as they are common on any disturbed site with open light and dry, rocky soils.

Species	Number of Pads	Percent Cover
Deer-tongue grass (*Panicum clandestinum*)	10	7.4
Sweet vernalgrass (*Anthoxanthum odoratum*)	4	4.7
Red fescue (*Festuca rubra*)	3	4.3
Timothy (*Phleum pratense*)	10	4.2
Sweet-fern (*Comptonia peregrina*)	3	3.7
White clover (*Trifolium repens*)	9	3.3
Partridge pea (*Chamaechrista fasciculata*)	5	3.3
Hay-scented fern (*Dennstaedtia punctilobula*)	4	3.1

Table 5.27. Highest mean percent cover values per pad for "erosion and sedimentation" vegetation plots.

Species	Number of Pad Sides	Average Population Size
Hay-scented fern (*Dennstaedtia punctilobula*)	17	674
Sweet-fern (*Comptonia peregrina*)	16	428
Goldenrod species (*Solidago* species)	14	493
Deertongue grass (*Panicum clandestinum*)	13	742
Allegheny blackberry (*Rubus alleghiensis*)	13	534
White snakeroot (*Eupatorium rugosum*)	10	679
Swamp dewberry (*Rubus hispidus*)	8	367
Bracken fern (*Pteridium aquilinum*)	8	102
Woolgrass (*Scirpus cyperinus*)	8	58
Common milkweed (*Asclepias syriaca*)	8	418

Table 5.28. Average population size of native herbaceous and shrub species found volunteering on disturbed well pad edges.

During the surveys, monitoring staff took care to collect data regarding which native tree species were most prevalent as volunteers on disturbed pad edges. As expected, early successional species like black birch, quaking aspen, and fire cherry were prevalent (Table 5.29). Black birch was found the most on pad edges (8 times) and red maple was found on six pad sides. One surprising species that was found on two pad edges was Sycamore, which is a somewhat unusual volunteer given the upper elevation where many of the well pads are found. It may be possible that sycamore seed was present in equipment or fill that was brought up from more bottomland areas along stream corridors.

In addition to recording what native species were volunteering on disturbed well pad edges, the monitoring staff observed several non-native species spreading into the undisturbed forest edge (Table 5.30). Orchardgrass was found on the most edges (8 sides) spreading into the adjacent forest. Invasive species like reed canary grass, bull thistle, and Japanese barberry were all found on six sides spreading into the adjacent forest. One species, Japanese stiltgrass, which was expected to be found in many locations spreading into adjacent forest habitats, was only found spreading into the forest edge on two sides, both on the same well pad. In addition, 18 of the 45 well pad sides included in this protocol were

Species	Number of Pad Sides	Average Population Size
Black birch (*Betula lenta*)	8	86
Red maple (*Acer rubrum*)	6	191
Quaking aspen (*Populus tremulodies*)	3	23
Fire cherry (*Prunus pensylvanica*)	2	250
Black locust (*Robinia psuedoacacia*)	2	16
Sycamore (*Platanus occidentalis*)	2	16
Bigtooth aspen (*Populus grandidentata*)	2	27
Black cherry (*Prunus serotina*)	2	133
Yellow birch (*Betula alleghaniensis*)	1	75
Striped maple (*Acer pennsylvanicum*)	1	38

Table 5.29. Average population size of native tree species found volunteering on disturbed well pad edges.

Species	Number of Pad Sides	Average Population Size
Orchardgrass (*Dactylus glomerata*)	8	189
Reed canary grass (*Phalaris arundinacea*)*	6	161
Timothy (*Phleum pretense*)	6	105
Bull thistle (*Cirsium vulgare*)*	6	23
Japanese barberry (*Berberis thunbergii*)*	6	7
Multiflora rose (*Rosa multiflora*) *	5	6
Crown-vetch (*Coronilla varia*) *	4	279
Sweet vernalgrass (*Anthoxanthum odoratum*)	3	692
Queen Anne's lace (*Daucus carota*)	3	94
Free of non-native species	18	

**invasive*

Table 5.30. Average population size of non-native herbaceous and shrub species found volunteering on non-disturbed well pad edges.

found to be free of non-native species spreading into adjacent forested habitats. Or, 27 sites (60 percent) did have invasive plants spreading into adjacent forest. In some pad locations, it appears that species like mountain-laurel and sweet-fern are serving as an effective physical barrier to colonization of adjacent forest by non-native plant species.

By carefully studying the native vegetation volunteering on the disturbed forest edge, the bureau can better guide site reclamation efforts. When armed with the knowledge that on slightly less than half of pad edges, hay-scented fern or sweet fern is likely to begin growing on the disturbed edge, care can be given to choose species in restoration seed mixes that will not be out-competed by these aggressive species. Furthermore, knowing that wildflower species like goldenrod, white snakeroot, and common milkweed can volunteer on disturbed forest sites, allows the bureau to either 1) augment these volunteers with additional seed of these species in the seed mix, or 2) focus on other native forb species in reclamation mixes knowing that one of these three species are likely to volunteer over time. The same type of planning is informed by having observational data about which native tree species are the first to volunteer on disturbed sites. The addition of black birch, red maple, or quaking aspen—three species that seem to volunteer successfully on disturbed sites—to planting plans can help improve planted tree survivorship during site reclamation. Other species that are not found volunteering naturally may be less suited for use on well pad reclamation projects due to growing conditions.

Since gas development often converts interior forest to forest edge or non-forest habitat, it is critical to have an understanding about what species benefit from this conversion are more readily colonizing adjacent interior forest. If non-native species like orchardgrass and timothy are spreading into forest habitats, it is prudent to further restrict their use in reseeding of disturbed sites to meet erosion and sedimentation regulations. Invasive species like Japanese barberry and multiflora rose are aggressively controlled on most state forest lands, supporting the need for continued monitoring and control. The bureau is aware that species like bull thistle and crown-vetch are problematic at these forest edge habitats. Unfortunately, these species are quite widespread and difficult to control efficiently. However, as more high-threat species are eradicated, it may be prudent to focus further invasive control efforts on bull thistle and crown-vetch. Certainly, as site rehabilitation efforts are undertaken, strategies that reduce thistles, knapweeds, and crown-vetch will be a critical component of restoration planning.

Right-of-Way Vegetation Assessments

Within the core gas forest districts, 188 miles of pipelines were constructed because of shale gas development. Of those 188 miles, approximately 22 percent have been co-located within an existing utility ROW. Most shale gas pipelines on state forest lands were installed prior to 2013 (164 miles). Approximately, 696 acres of forest have been cleared for shale gas pipelines, with 572.4 acres cleared prior to 2013 and 124.1 acres were cleared from 2013-2016. The Elk State Forest was the only state forest with more new pipeline miles from 2013-2016 than prior to 2013.

ROW corridors provide ideal habitat conditions for the establishment and spread of not only early successional plant species, but also invasive plant populations to interior forest communities. Due to the limited access and remote locations of some of these corridors, it is important to monitor for invasive plant infestations before they can become established and spread further into adjacent forest habitats. Additionally, areas that intersect these corridors, referred to as "hot-spots," provide an increased likelihood for invasive plants to disperse from the ROW to areas of adjacent forest. These "hot-spots" on state forest land include: stream crossings, timber sales, burned areas, road/trail crossings, and wetland habitats.

In 2015, 26.25 miles of pipeline ROW were surveyed. Of the 105 sections surveyed, only ten segments did

not have at least one invasive species present. Based on the analysis of the 2015 section data, the most abundant invasive plant species (based on average percent cover) were Japanese stiltgrass, crown-vetch, and Canada thistle. The most common invasive species (based on number of occurrences) were Japanese stiltgrass (52 sections), bull thistle (50), and Canada thistle (42). In 2016, 27.5 miles of pipeline ROW were surveyed. Of the 110 sections surveyed, all but one had at least one invasive species present. Based on the analysis of the 2016 section data, the most abundant invasive plants (based on average percent cover) were Japanese stiltgrass, crown-vetch, and tall fescue. The most common invasive species (based on number of occurrences) were bull thistle (86 sections), crown-vetch (58), and Japanese stiltgrass (56) (Table 5.31).

In 2015, 112 "hot-spots" were encountered along the 26.25 miles of pipeline ROW surveyed. Within these "hot-spot" areas, the most abundant invasive plant species (based on average percent cover) were Japanese stiltgrass, reed-canary grass, and crown-vetch. The most common invasive plants (based on number of occurrences) were Japanese stiltgrass, Japanese barberry, and bull thistle. In 2016, 79 "hot-spots" were encountered along the 27.5 miles of pipeline ROW surveyed. Within these "hot-spot" areas, the most abundant invasive plant species (based on average percent cover) were Japanese stiltgrass, Oriental lady's thumb, and crown-vetch. The most common invasive plants (based on number of occurrences) were Japanese stiltgrass, bull thistle, and Oriental lady's thumb (Table 5.32).

	2015 Assessment	2016 Assessment
Highest incidence (# of sections)	Japanese stiltgrass (52)	Bull thistle (86)
	Bull thistle (50)	Crown-vetch (58)
	Canada thistle (42)	Japanese stiltgrass (56)

Table 5.31. Most abundant invasive plant species across all right-of-way monitoring sections, 2015 & 2016.

	2015 Assessment	2016 Assessment
Highest incidence (# of hotspots)	Japanese stiltgrass (56)	Japanese stiltgrass (21)
	Japanese barberry (23)	Bull thistle (12)
	Bull thistle (20)	Oriental lady's thumb (11)

Table 5.32. Most abundant invasive plant species across all right-of-way monitoring "hot-spots", 2015 & 2016.

	2015 Assessment	2016 Assessment
Highest incidence (# of occurrences)	White clover (25)	Orchardgrass (14)
	Deertongue grass (15)	Deertongue grass (13)
	Red clover (13)	Bird's foot trefoil (10)

Table 5.33. Most abundant plant species across all right-of-way intensive monitoring swaths, 2015 & 2016.

Within the ROW assessment areas, a subset of 40 sections in 2015 and 35 sections in 2016 were chosen for more intensive vegetation data collection. In 2015, within areas subject to more intensive data collection, the most abundant species (based on average percent cover) were orchardgrass, white clover, and red clover. The most common plant species (based on number of occurrences) were white clover, deertongue grass, and red clover. In 2016, within areas subject to more intensive data collection, the most abundant species (based on average percent cover) were orchardgrass, bird's foot trefoil, and deertongue grass. The most common plant species (based on number of occurrences) were orchardgrass, deertongue grass, and bird's foot trefoil (Table 5.33). The intensive vegetation monitoring data, which were collected to evaluate species composition, seems to indicate that all the most common species were those typically used in reseeding mixes planted to meet erosion and sedimentation regulations.

Most new pipeline ROW corridors are located adjacent to pre-existing state forest roads. This co-location approach helps minimize the creation of new fragmenting features across the forest landscape. Logistically, this approach also allows for utilization of the road surface for temporary workspace during construction, lowers construction costs for operators, and simplifies access for continuing inspections and periodic vegetation maintenance. One of the downsides to this approach is the increased width of these road/ROW corridors. In time, this increased width along state forest roads could provide more habitat for invasive plants to colonize than typical state forest roads. This assessment further demonstrates that the points at which pipeline corridors intersect or parallel state forest roads greatly facilitate the spread of non-native, invasive plants — especially early successional species like bull thistle, Canada thistle, spotted knapweed, and crown-vetch. Some pipeline corridors have been planted with a mix of non-native cool season grasses and native warm season grasses. In these areas, initially only the cool season grasses and white clover were present. However, in the last few years more native warm season grasses have established in these corridors. As this shift continues, some native species may become more abundant along pipeline corridors.

Roadside Vegetation Assessments

With increased truck traffic to facilitate development comes the potential for changes in the composition of the vegetation communities growing on state forest roadsides. Often disturbed corridors like roads and roadside shoulders can be colonized by non-native weed species and invasive plant species. This increases the risk of spread into interior forest habitat.

Acres of roads constructed and modified for gas development declined from 220.5 total miles (2008-2012 to 42.3 total miles (2013-2016). The Elk State Forest was the only forest district where the miles of new roads constructed or modified increased for those periods.

The bureau evaluates the current conditions of roadside vegetation communities on state forest roads utilized for shale gas development and compares them to roadside communities that are not subject to shale gas related traffic, widening, or improvements. Two types of public use roads were identified for evaluation, those with high gas traffic (High Gas roads) and those with no regular gas traffic (Non-Gas roads). Two roads of each type were selected in each core gas forest district. A total of 28 roads were chosen. These are state forest roads that are not maintained by PennDOT or municipalities. Consideration was made to minimize the chance that Non-Gas roads would be utilized by new gas development in the future. Within each three-mile road section, three pairs of milacre (1/1000 acre) vegetation plots were established on both sides of the road at one mile increments (Figure 5.17). In addition, the nearest culvert to the paired plot locations was also monitored for invasive plants species. A version of this protocol was piloted in 2012 and the first round of data collection occurred during the 2013 field season. At that time, only 24 of 28 selected roads were surveyed. The four roads in the Elk State Forest were not included due to the lack

of gas development activity during this time. In 2016, all 28 roads were surveyed.

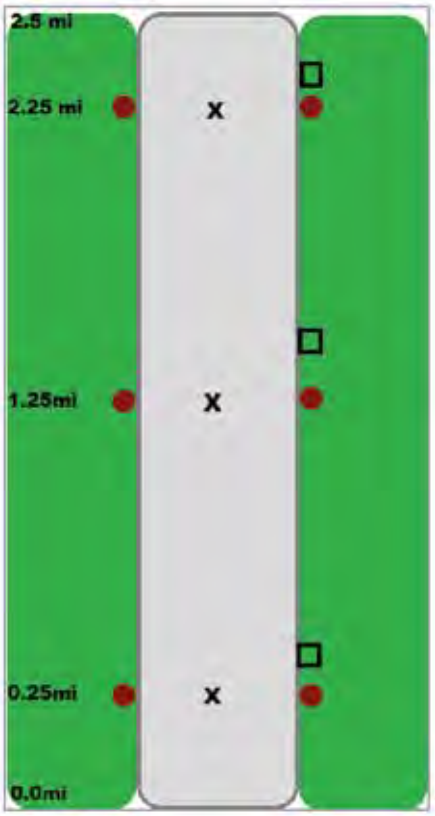


Figure 5.17. Location of roadside vegetation plots (red circles) and closest culverts (squares) within roads targeted for vegetation monitoring.

In 2013, the High Gas roads had less overall plant diversity with a total of 186 species compared to the Non-Gas roads which had 208 species. This may be due to some plots on the High Gas roads which fell in co-located pipeline rights-of-way, which are dominated by species planted after completion of the pipeline construction to meet erosion and sedimentation guidelines. Typically, these seed mixes are similar and contain a mix of native and non-native species. Surprisingly, during the 2016 measurements, this result changed, with more total species (244) found on the High Gas roads, compared to the Non-Gas roads (238). The average number of species per milacre plot on High Gas roads increased from 14.6 to 18.1 species per plot from 2013-2016. However, during the same period the average number of species per plot on Non-Gas roads, 16.6 species, stayed the same. It is possible in the three years since initial measurement of the High Gas roads the seed mixes used on co-located pipelines became fully established. In addition, it is likely that there has been an influx of both native pioneer species and non-native weed species on roadsides. It should be noted that two of the most common species on High Gas roads are non-native: Coltsfoot and dandelion species (Table 5.34). In 2013, 47 of the 186 species (25 percent) found on High Gas roads were non-native, compared to 37 out of 208 species (18 percent) on Non-Gas roads. In 2016, 69 of the 244 species (28 percent) found on High Gas traffic roads were non-native, compared to 52 out of 238 species (22 percent) on Non-Gas roads. From 2013-2016, the increase of non-native plant species on roadside plots was steady for both High Gas and Non-Gas roadsides, which indicates that in the first three-year period between measurements, the amount of gas traffic may not be affecting the proportion of the vegetation community composed of non-native species. In addition, the number of invasive plant species on High Gas roads increased from eight to 13 between 2013-2016, a 63 percent increase. On Non-Gas roads, the total number of invasive species was six in 2013 and increased by 50 percent to nine in 2016 measurements.

Initially, observational findings made clear the physical differences between most High Gas roads and Non-Gas roads. To minimize forest fragmentation, the bureau encouraged the co-location of pipeline corridors along some state forest roads. This created a road with a 20 to 40-foot-wide pipeline corridor immediately adjacent to the running surface, planted with a mix of native and non-native species, such as timothy (*Phleum pratense*), white clover (*Trifolium repens*), orchardgrass (*Dactylis glomerata*), switchgrass (*Panicum virgatum*), and black-eyed susan (*Rudbeckia hirsuta*). This accounts for some of the increased non-native plant species present on High Gas roadsides, as does the increased early successional habitat created by the additional pipeline corridor. Furthermore, roads utilized for High Gas traffic often

must be upgraded to accommodate larger trucks and more traffic, which means an increase in limestone road surface material. Over time, this material often gets pushed off the road base onto the vegetated edge. This increases the alkalinity of the soils near the road which can alter the plant composition by creating favorable soil conditions for seed germination. Vegetation communities on Non-Gas roads seem to be more stable and are being invaded by weedy, non-native species or invasive plant species at a slightly slower rate. This is likely due to the lack of widening or additional disturbance.

Over the first two measurements, some differences in the vegetation communities or changes in species composition were slight. However, it is critical to continue this monitoring. Differences in measurements may not have been as great as hypothesized, but certainly the change in habitat between High Gas and Non-Gas roads is notable. The open, early successional habitat found along many state forest roads utilized for gas traffic and pipeline corridors will continue to serve as ideal habitat for additional non-native weeds or invasive species to colonize these areas. Developing a better understanding of potentially vulnerable vegetation communities will yield further insights that will aid in future planning and infrastructure management activities. Furthermore, required routine maintenance activities on pipeline corridors increase the likelihood of new invasions from propagules carried in on equipment. This maintenance also limits the ability of some native, early successional species to establish on roadsides and corridors. By continuing to monitor roadside vegetation, future maintenance activities can be scheduled to avoid flowering and fruiting periods of native species that are found to be establishing on these disturbed corridors. Additionally, the bureau attempts to update recommended native seed mixes based on which native species are be able to successfully recolonize disturbed sites naturally. This may lead to more successful site rehabilitation activities within portions of the state forest subject to natural gas development activities.

State-listed Species Monitoring Efforts

State forest lands provide a protected landscape that harbors many state-listed rare plants, as well as many unique wetland or palustrine forest habitats. These species are listed, or proposed to be listed, as PA Endangered, PA Threatened, and PA Rare. In the past, many of these plant occurrences or wetland habitats were "secure" based on their remote, interior forest location on state forest lands. During the planning stages of placing gas infrastructure on state forest lands, the bureau goes to great lengths to avoid impacts to state-listed plant species and unique habitats. Populations of many Pennsylvania rare plants, such as creeping snowberry (*Gaultheria hispidula,* PA Rare), yellow-fringed orchid (*Platanthera ciliaris,* Proposed PA Threatened), great spurred violet (*Viola*

2013 Assessment 144 plots	High Gas (HG) Roads *(Species, # of plots)*	Non-Gas (NG) Roads *(Species, # of plots)*
	Coltsfoot (*Tussilago farfara*), 34	Violet species (*Viola spp.*), 44
	Goldenrod species (*Solidago spp.*), 28	Aster spp. (*Symphyotrichum*), 36
2016 Assessment **168 plots**		
	Dandelion species (*Taraxacum spp.*), 40	Violet species (*Viola spp.*), 45
	Coltsfoot (*Tussilago farfara*), 39	Red maple (*Acer rubrum*), 42
	Violet species (*Viola spp.*), 33	Sedge species (*Carex spp.*), 31

Table 5.34. Most abundant plant species in 2013 and 2016 roadside vegetation assessment plots.

selkirkii, PA Rare), and northeastern bulrush (*Scirpus ancistrochaetus,* PA Threatened, Federally Endangered), are known to exist near shale gas development on state forest lands. Identifying occurrences of these state-listed species and monitoring for threats or declines due to development on state forest land is a high priority.

After conducting a desktop analysis, seven populations of state-listed plants or plant communities were found within 1,000 feet of shale gas infrastructure development projects. Between 2012 and 2015, these seven populations were visited to assess potential threats. Survey methodology was based on Goff et al. (1982) and "Protocols for Conducting Surveys for Plant Species of Special Concern" (PA DCNR, 2011). In all cases, no evident threats to the populations from shale gas development were observed. Again, it should be stressed that these populations are typically not immediately adjacent to any existing infrastructure.

2. Monitoring tracts subject to shale gas development for non-native, invasive plant species

DCNR defines invasive plants as any plant species that is not native to Pennsylvania, can grow or spread aggressively, and displace native vegetation. Invasive plants have the potential to inhibit tree regeneration in young forest stands, exclude native species from plant communities, disrupt wetland habitats, and arrest successional pathways within forests. Forest clearing or disturbance that occurs during the construction of shale gas infrastructure can provide ideal habitat and growing conditions for the establishment of new invasive plant populations. Furthermore, invasive plant material or propagules can be brought onto the state forest on construction vehicles, as well as in fill, quarry material, or mulch used for construction projects. The bureau is committed to controlling the spread of invasive plant species across all state forest lands, which requires adaptive management and landscape-level prioritization based on efficiency, availability of resources, and perceived threat of each species population to ecosystem health. At the landscape level, rarely is it as simple as adopting a strategy of eradicating all known invasive plant populations. Many of these methods require an understanding of the current levels of infestations across a given landscape. Given the distribution of gas infrastructure on state forest lands in northern Pennsylvania, it is necessary to take both a site-level and landscape-level approach to invasive plant species monitoring.

From the onset of natural gas development on state forest lands, it was clear that managing and minimizing the spread of invasive plants would require three main components:

1) A concerted effort to understand how all invasive plants were spreading across natural gas infrastructure.
2) A targeted Early Detection and Rapid Response (EDRR) protocol that efficiently addressed the highest-threat invasive plant species found on state forest lands.
3) Partnerships, both formal and informal, with natural gas operators to treat infestations found to have occurred because of natural gas development.

Pad Invasive Surveys

By surveying the disturbed edges of all pad infrastructure, invasive plant species brought in by construction activities or taking advantage of new forest disturbance have been tracked. The bureau has been able to evaluate and prioritize treatment for all invasive plants based on how species have been found to spread from disturbance-to-disturbance across the landscape. As the spread of certain invasive plants are monitored over time, new insights have been gained into which species are treatment priorities based on their ability to out-compete native species, spread into adjacent forest stands, or limit the success of ecological site rehabilitation efforts.

To date, 265 pads have been constructed on state forest lands for shale gas production. This includes 179 well pads, 38 freshwater impoundments, 17 compressor stations, and 31 additional miscellaneous infrastructure

pads. It is also likely that moving forward, additional pads will be constructed. Infrastructure pads on state forest lands are visited on a three-year cycle. During a survey, monitoring staff walk the entire edge of each pad, documenting any invasive plant species present at the site. As of December 2016, 238 infrastructure pads and an additional 66 associated access roads have been surveyed for invasive plant species. Of the 238 surveyed pads, there were 168 well pads, 33 freshwater impoundments, 14 compressor station pads, and another 23 miscellaneous pads that include pads for monitoring, storage wells, and meter stations. Furthermore, of these 238 surveyed pads, 127 have now been visited at least twice since 2011. This allows for a comparison of site invasion by invasive plants over time. If certain pads have active construction taking place, they are not subject to surveys due to safety concerns. Newer pads are not surveyed for the first time until they have had one complete growing season for vegetation to become established. During the survey, the population size for each species present is recorded.

Looking first at the combination of all infrastructure pads (Table 5.35), bull thistle was found on 142 pads - the most by a wide margin. Three other species that typically colonize recently disturbed sites with open growing conditions - crown-vetch, spotted knapweed, and Canada thistle - were also found on a high number of pads. Due to the disturbed nature of these non-forested sites, it is not surprising that these species are those being located on the highest number of pads. Some invasive grass species, like reed canary grass (64 pads), tall fescue (49 pads), and Japanese stiltgrass (47 pads), also easily out-compete most species used for revegetation on disturbed pad edges. This has led to their spread on these sites. While Japanese stiltgrass was not the species found on the most pad edges, it did have the highest mean population size of 749 individuals. An annual grass, this species is extremely difficult to eradicate once well established in populations like those found at many pad edges. Only 29 infrastructure pads out of 238, or 12.1 percent of all pads, were found to be free of invasive plant species.

Species	Number of Pads	Average Population Size
Bull thistle (*Cirsium vulgare*)	142	63
Crown-vetch (*Securigera varia*)	98	409
Spotted knapweed (*Centaurea stoebe*)	91	224
Canada thistle (*Cirsium arvense*)	89	370
Reed canary grass (*Phalaris arundinacea*)	64	273
Tall fescue (*Schedonorus arundinaceus*)	49	292
Japanese stiltgrass (*Microstegium vimineum*)	47	749
Multiflora rose (*Rosa multiflora*)	47	8
Velvetgrass (*Holcus lanatus*)	46	343
Autumn-olive (*Elaegnus umbellata*)	34	11
Oriental ladys-thumb (*Persicaria longiseta*)	33	322
PADS WITH NO INVASIVES	**29**	

Table 5.35. Most common invasive plants found during surveys – all infrastructure pads.

As the infrastructure is broken down by pad type, some trends become apparent. For instance, when well pads are separated from other pad types (Table 5.36) bull thistle again is found on the most well pad edges (114). The same is true when examining data from only the well pad access road edges (Table 5.37). The well pad edges and the well pad access road edges had the same five species found most often: bull thistle, crown-vetch, Canada thistle, spotted knapweed, and reed canary grass. This supports research conducted by Barlow (2017) which found a positive correlation between invasive plants on pad access roads and subsequent presence on the well pads themselves. Of those five, on both pad and road edges, crown-vetch had the largest average population size. The proportion of un-infested well pad edges was the same, 10.7 percent, as the proportion of all infrastructure pads combined.

The same five invasive plant species were found most often on compressor station pads and freshwater impoundment pads (Tables 5.38 and 5.39): bull thistle, Canada thistle, crown-vetch, reed canary grass, and spotted knapweed. While there are far fewer compressors and impoundments, the invasive plant infestations are very similar. In the case of both pad types, crown-vetch had the largest mean population size (279 plants on compressors, 363 plants on impoundments).

Species	Number of Pads	Average Population Size
Bull thistle (*Cirsium vulgare*)	114	69
Crown-vetch (*Securigera varia*)	79	429
Canada thistle (*Cirsium arvense*)	77	409
Spotted knapweed (*Centaurea stoebe*)	75	242
Reed canary grass (*Phalaris arundinacea*)	49	303
PADS WITH NO INVASIVES	**18**	

Table 5.36. Most common invasive plants found during well pad surveys.

Species	Number of Pad Access Roads	Average Population Size
Bull thistle (*Cirsium vulgare*)	87	59
Crown-vetch (*Securigera varia*)	70	478
Canada thistle (*Cirsium arvense*)	58	305
Spotted knapweed (*Centaurea stoebe*)	47	291
Reed canary grass (*Phalaris arundinacea*)	47	163
ACCESS ROADS WITH NO INVASIVES	**16**	

Table 5.37. Most common invasive plants found during well pad access road surveys.

Species	Number of Pads	Average Population Size
Bull thistle (*Cirsium vulgare*)	6	17
Canada thistle (*Cirsium arvense*)	5	233
Reed canary grass (*Phalaris arundinacea*)	5	34
Crown-vetch (*Securigera varia*)	4	279
Spotted knapweed (*Centaurea stoebe*)	4	110
COMPRESSORS WITH NO INVASIVES	**4**	

Table 5.38. Most common invasive plants found during compressor pad surveys.

Species	Number of Pads	Average Population Size
Bull thistle (*Cirsium vulgare)*	16	83
Crown-vetch (*Securigera varia*)	11	363
Spotted knapweed (*Centaurea stoebe*)	10	167
Reed canary grass (*Phalaris arundinacea)*	9	75
Canada thistle (*Cirsium arvense*)	8	152
IMPOUNDMENTS WITH NO INVASIVES	**8**	

Table 5.39. Most common invasive plants found during freshwater impoundment pad surveys.

Change	Number of Pads
Number of invasives declined	6
Number of invasives remained unchanged	15
Number of invasives increased by 1 or 2 species	44
Number of invasives increased by 3 or 4 species	31
Number of invasives increased by 5-7 species	23
Number of invasives increased by 8-10 species	8

Table 5.40. Change in number of species detected per well pad for 127 well pads surveyed twice between 2011 and 2016.

Many of the infrastructure pads on state forest land have been subject to two surveys between 2011 and 2016, which allows for a comparison regarding the way invasive plants are spreading across the landscape via infrastructure pads. On the 127 well pads that have been subject to two surveys, the number of detected invasive species per pad has increased (Table 5.40) on almost all sites. Only on 21 well pads have the number of invasive species declined or remained constant.

Looking further into the changes in invasive plant species on the 127 well pads subject to two surveys, it is possible to quantify the average change in population size for many of the species (Table 5.41). The species with the greatest change in average population size was velvetgrass, which increased on average by 561 individuals. This is due, at least in part, to the fact that this species was not tracked as an invasive plant in the first two years of monitoring. Rather, it was added in later iterations of pad surveys. Invasive plant species like Canada thistle (average increase of 403 individuals) and Japanese stiltgrass (average increase of 343 individuals) that prefer disturbed, open sites all showed average increases in population size. The species with the highest average decline was brown knapweed (average declined by 110 individuals). Overall, invasive shrub species like multiflora rose (average declined by 26 individuals), autumn-olive (average declined by 20 individuals), Japanese barberry (average declined by 6 individuals), and Japanese knotweed (average declined by 3 individuals) all showed declines, likely due to the prioritization of these species for immediate treatment.

From 2011 to 2016, it is evident from the pad surveys that many invasive plant species populations have spread to new sites on state forest land and populations first found from 2011-2013 have expanded at many sites. This is due primarily to the aggressive nature of invasive plants. However, disturbance associated with the construction of gas infrastructure within state forest land has clearly increased their spread. Invasive plant material and seed can be brought onto a site in

Species	Change in Average Population Size
Velvetgrass (*Holcus lanatus*)	+561
Canada thistle (*Cirsium arvense*)	+403
Japanese stiltgrass (*Microstegium vimineum*)	+343
Tall fescue (*Schedonorus arundinaceus*)	+310
Crown-vetch (*Securigera varia*)	+255
Oriental bittersweet (*Celastrus orbiculatus*)	+250
Oriental lady's-thumb (*Persicaria longiseta*)	+224
Small-flowered willowherb (*Epilobium parviflorum*)	+197
Reed canary grass (*Phalaris arundinaceae*)	+134
Cheatgrass (*Bromus tectorum*)	+121
Brown knapweed (*Centaurea jacea*)	-110
Multiflora rose (*Rosa multiflora*)	-26
Autumn-olive (*Eleagnus umbellata*)	-20
Japanese barberry (*Berberis thunbergii*)	-6
Japanese knotweed (*Fallopia japonica*)	-3
Goat's-rue (*Galega officinalis*)	-3

Table 5.41. Change in invasive plant species average population size for 127 well pads surveyed twice between 2011 and 2016.

contaminated fill or seed, as well as on equipment or vehicles that are not cleaned prior to being driven to a new infrastructure site. Furthermore, wildlife (especially birds) are attracted to forest edges and open, disturbed sites. This helps to further spread invasive seed from one infrastructure site to another. The conditions at most infrastructure pads – disturbed soils, reduced plant competition, and open light – all benefit invasive plant species and aid in their spread across a site. Once populations are established, species like Canada thistle, bull thistle, and spotted knapweed have seeds that are spread passively via wind and move across pad sites or from access roads onto new pad sites.

While several invasive plant species' prevalence on gas infrastructure pads has increased, there are successes to be found in the species not found among the list of most common. Some species, such as mile-a-minute, tree-of-heaven, goat's-rue, poison hemlock, and Japanese knotweed, have been prioritized by the bureau for immediate treatment and eradication. These Early Detection and Rapid Response protocols have led to a steep decline in existing populations of these high-threat species since 2011. Similarly, many invasive shrubs, such as Japanese barberry, autumn-olive, and multiflora-rose, have also been targeted for treatment due to the high threat they pose to forest ecosystems.

Typically, the species that are most prolific on newly disturbed, open sites such as crown-vetch, thistles, and knapweeds cannot spread easily into adjacent forest stands. Because of this, these species have received the lowest priority for treatment in most areas of gas development on state forest lands and have continued to spread across gas infrastructure sites. While these species are not prioritized for treatment and control currently, when site rehabilitation occurs and pads enter the reclamation stage, it will be necessary to treat invasive plants like Canada and bull thistle, spotted knapweed, and crown-vetch prior to planting native species. Furthermore, the proliferation of these species has allowed for the allocation of specialist and equipment resources to test new herbicides and treatment techniques that could prove to be effective in efficiently slowing the spread of these lower-priority invasive plants.

Notes from the Field:

Tract-level Invasive Plant Management

The Elk State Forest is home to 40,802 acres of severed rights gas ownership found in the E. Branch Dam and Clermont Area. Because of the severed rights environment, constant and open communication with the oil and gas companies and their contractors, along with routine inspections, are key in the successful management of shale gas development on state forest land.

This combination of constant communication, routine inspections, and cooperation of the gas operator have been integral to the success in combating invasive plants, specifically goat's rue (*Galega officinalis L.*) in this portion of the Elk State Forest.

Goat's rue was first observed on the edge of a Marcellus well pad in June of 2015 during a routine inspection. Shortly after, it was also found along several road edges and a reclaimed stone pit in the same area of the forest. Immediately, work was conducted in cooperation with the gas and pipeline companies to determine the source and potential vectors of these populations. After many phone calls and e-mails, it was determined that the goat's rue had come from contaminated hay that was used by the pipeline company during their construction of several miles of new pipeline in 2014.

A survey was conducted of the areas associated with the pipeline project and populations were mapped. Once the entire project area was surveyed, the bureau developed a treatment plan. The initial treatment plan was to hand pull the smaller populations that consisted of single plants and small clumps of plants and coordinate with the gas company to treat the larger populations with herbicide.

Once the plan was developed, a meeting was arranged with the gas and pipeline companies to coordinate the herbicide treatment. During the 2015 growing season the larger populations were treated with one round of herbicide in August. This treatment was timed to have the largest effect as possible on the plants as well as prevent any seed from setting. Once the treatment was completed, weekly monitoring was done to determine the effectiveness of the herbicide.

In the spring of 2016, a follow-up plan of treating the plants several times during the growing season was developed based on the 2015 observations. This strategy allowed for the continuous treatment of new germinates that were showing up from the seed bank after the larger plants died out. In addition to the multiple herbicide treatments, hand pulling of any new satellite or single plants that were observed or that germinated in the smaller populations was conducted.

Initial Goats Rue population found in June of 2015 at the edge of a well pad.

Large goat's rue infestation in Elk State Forest.

The 2016 treatments proved to be very effective and it was determined that if properly timed, the number of treatments, man hours, and chemical introduced into the environment, could be reduced to two treatments during the growing season. Therefore, during the 2017 growing season the populations were treated twice with herbicide and several small populations were hand pulled as necessary.

Over the past three years there has been a dramatic reduction in the overall size and health of the populations. Areas that were once infested with goat's rue are now only sparsely populated. The bureau's ability to work closely with the gas and pipeline companies, as well as the bureau's ability to remain flexible and adapt treatment strategies, has proven to be quite effective.

In the end, this process has been successful because of effective, open and timely communication, diligent monitoring, and cooperative efforts. Although goat's rue is still a concern, the bureau is optimistic that eradication of goat's rue on the Elk State Forest is possible.

Early Detection and Rapid Response Efforts

Early Detection and Rapid Response (EDRR) protocols maximize both sampling efficiency and discovery opportunities for new invasive plant species. This protocol was adapted from the approach created by Keefer et al. (2010) for US National Park Service lands. New forest clearing or disturbance due to gas development provides ideal habitat and growing conditions for invasive plant species. Tracking all novel populations and treating them promptly is essential to slowing the spread of invasive plants on state forest lands. The focus of this protocol is on high priority species that are either new or uncommon to a particular state forest; or are currently found outside state forest land, but have the potential to colonize within a state forest. In addition to tracking these species, this strategy also allows for the immediate (based on seasonality) treatment of these populations when found. One main assumption of EDRR is that new occurrences, when found, are relatively small and if immediately treated, could be eradicated with minimal effort, time, and cost. Since these populations will be tracked over time, the effectiveness of treatments can also be evaluated.

EDRR protocols provide a brief (less than 5 minutes) reporting procedure that is carried out by all personnel on the Shale Gas Monitoring Team. Prior to implementation of this protocol, a list of ten high priority invasive species was developed for the core gas forest districts. The list is re-evaluated annually based on the latest survey data.

The following species were considered targets for EDRR from 2013 through 2016:

- Tree-of-heaven (*Ailanthus altissima*)
- Japanese angelica tree (*Aralia elata*)
- Poison hemlock (*Conium maculatum*)
- Glossy buckthorn (*Frangula alnus*)
- Goat's rue (*Galega officinalis*)
- Mile-a-minute (*Persicaria perfoliata*)
- Common reed (*Phragmites australis ssp. australis*)
- Japanese & Giant knotweed (*Polygonum cuspidatum & P. sachalinense*)
- Black swallow-wort (*Vincetoxicum nigrum*)
- Pale swallow-wort (*V. rossicum*)

Having four years of full field implementation of the EDRR protocols allows for many comparisons to be made among the 2013, 2014, 2015, and 2016 data. One interesting result is that the number of new populations found continues to only slightly increase (16 in 2013, 17 in 2014, 18 in 2015, and 20 in 2016). This nearly equivalent result also confirms that the level of survey intensity has remained constant from 2013-2016. It is reasonable to expect that at the current level of survey

intensity, approximately 17 high-threat populations per year may be located. During the 2016 field season, an additional 20 populations of high-priority invasive species were located (Table 5.42). This included the first detection of Phragmites in the Elk State Forest and the first detection of poison hemlock in the Tiadaghton State Forest. Tree-of-heaven was the species found most often, with 21 populations in three state forests (Sproul, Tiadaghton, and Loyalsock). To date, 13 populations have been referred to district staff for more intensive treatment. Of those, ten have had treatments conducted by either district staff or gas operator contractors. These EDRR efforts clearly demonstrate to gas operators that the bureau is committed to limiting the spread of these high-threat species. Gas operators have been willing to conduct treatments and have benefitted from the monitoring team's survey data and expertise in controlling these species. Ultimately, this partnership will result in fewer seed sources for new infestations across the entire landscape over time. Since its adoption as a monitoring protocol, some EDRR populations have been found outside gas infrastructure sites, but were treated promptly, further limiting their spread.

As of the 2016 field season, 19 populations of high-priority invasive plant species that were originally detected in 2013 and 2014 have been eradicated (Table 5.43). The bureau considers a population of an invasive plant species eradicated when it has not been detected for two consecutive growing seasons following treatment. In 2016, another eleven populations were found to have no individuals present at the site one growing season following treatment.

Four years of full field implementation allows for a thorough review of the efficacy of initial invasive plant removals and treatments. After four years, monitoring data indicate that all knotweed treatments and nearly all tree-of-heaven treatments have been effective at controlling populations found by EDRR protocols. This is likely due to the small population sizes at all locations, but nevertheless, a positive result. Phragmites treatments have shown mixed results after three years. One population, in the Moshannon State Forest was removed completely. However, other initial populations that have been treated (mostly hand-pulled and dug) needed two years of treatment, but are now appearing to be significantly reduced at each site. Based on these experiences, the treatment technique of cutting stems, then returning eight weeks later and applying herbicide to the re-growth appears to be an effective treatment.

The bureau is continuing treatments of poison hemlock populations, which will likely yield new field observations regarding the most efficient treatments. If a poison hemlock population has had a chance to develop seed, the seed bank may prove difficult to exhaust.

Treatment of goat's rue populations have also shown mixed results, but this is likely due to the large sizes of some populations. Smaller populations seem to be easier to completely remove, while just slightly larger populations (25 plants) are likely to take more than one growing season of treatment. At some sites where goat's rue has been established for several years and a seed bank has developed, four years of treatment has yet to eradicate the population.

Overall, the treatment results to date are promising. In 2013, the focus was on the amount of effective treatment possible only by digging or hand-pulling. In 2014 and 2015, this trend was continued in some cases. However, for a few species targeted and timely herbicide treatment has proven to be the most effective and efficient means to remove these plants. Field treatments in 2016 and 2017 became far more efficient as insight was gained into scheduling the treatments of active cases at the appropriate time during the growing season to maximize results.

District	Species	Closest Road /Location	2016 Pop. Size	2015 Pop. Size	2014 Pop. Size	2013 Pop. Size
Moshannon	Japanese knotweed	US Rt 322 Powerline	16	16		
	Japanese knotweed	US Rt 322 Powerline (Site 2)	20			
	Phragmites	**Bark Camp Road**	**R**	**100+**	**100+**	**100+**
	Phragmites	Quehanna Highway	3	1	100	100
	Phragmites	PA Route 153	100+			
	Poison hemlock	Weiss Grade Road	12	7		
Sproul	**Glossy buckthorn**	**Tract 285 Compressor & ROW**	**R**	**100+**	**100+**	
	Glossy buckthorn	**Dutchmans Road**	**100+**			
	Goat's rue	Old View Road	4			
	Phragmites	**Jews Run Rd / Dominion ROW**	**R**	**500+**	**100+**	**100+**
	Phragmites	Tract 706, Pad 8	40			
	Phragmites	Tract 706, Pad 10	12			
	Phragmites	March Creek Trail	30			
	Poison hemlock	**Jews Run Rd / Dominion ROW**	**R**	**100**		**8**
	Poison hemlock	Young Woman's Creek	100+			
	Tree-of-heaven	Tract 252, Eagleton Rd (Site 1)	0	1		
	Tree-of-heaven	Tract 252, Eagleton Rd (Site 2)	0	1		
	Tree-of-heaven	Tract 252, Eagleton Rd (Site 3)	1			
	Tree-of-heaven	Tract 231A, Kato Orviston Rd	0	1		
Tiadaghton	Mile-a-minute	Bull Run Spur 1 Pipeline		1		
	Mile-a-minute	Tract 289, Pad D	50			
	Phragmites	Tract 728, Pad B	25			
	Poison hemlock	Moore Road Ext	80			
	Poison hemlock	RT 44, Upper Pine Bottom Rd	3			
	Porcelainberry	Railroad St., Cammal	0	2	25	
	Japanese angelica tree	Route 414, Pine Creek Rail Trail		1	25	100
	Pale swallow-wort	**US 220 & PA-44**	**R**	**R**	**100+**	
	Tree-of-heaven	Huntley Road	0	3		
	Tree-of-heaven	Lone Walnut Club Rd (Site 1)	0	1		
	Tree-of-heaven	Lone Walnut Club Rd (Site 2)	0	5		
Elk	**Goat's rue**	**Briggs Hollow Road**	**R**	**12**		
	Goat's rue	**Straight Creek Road**	**R**	**100+**		
	Phragmites	Neverlost Road	25			
Susquehannock	Goat's rue	Horton Run Colony Road	1	11	8	25
	Goat's rue	**Big Fill Hollow Road (Site 1)**	**R**	**1**		
	Goat's rue	**Big Fill Hollow Road (Site 2)**	**R**	**4**		
	Goat's rue	**Big Fill Hollow Road – Monit. Pad**	**R**	**20**		
	Goat's rue	**Big Fill Hollow Road – Pad H**	**R**	**234**		
Tioga	**Glossy buckthorn**	**Landrus Rd & Powerline**		**25**		
	Phragmites	Tract 1040, Pad 822 Acc Rd	75			
Loyalsock	Goat's rue	Chapman Road, Tract 724	0	1	17	25
	Japanese knotweed	Hagerman Run Road	1			
	Mile-a-minute	**T100 Compressor**	**R**	**100+**	**1000+**	
	Mile-a-minute	**T100, Kenney Ridge ROW**	**R**	**100+**	**1000+**	
	Tree-of-heaven	Narrow Mountain Road (Site 1)	1	0	2	
	Tree-of-heaven	Narrow Mountain Road (Site 3)	0	1		
	Tree-of-heaven	Narrow Mountain Road (Site 4)	0	1		
	Tree-of-heaven	Hefner Hollow Trail	15	8	1	

*Populations highlighted in yellow were newly located in 2016.

* Populations in bold are considered too large for Rapid Response treatment. Monitoring and Ecological Services staff are working with District staff and Operators to address these populations referred to the districts.

Table 5.42. 2016 Early Detection Rapid Response Results Summary Table – Active and Referred Cases

District	Species	Closest Road /Location	2016 Pop. Size	2015 Pop. Size	2014 Pop. Size	2013 Pop. Size
Moshannon	Phragmites	COP 323 Pad 2 Impoundment		0	0	25
	Giant knotweed	US Rt 322	0	0	30	
Sproul	Phragmites	Tract 285 Pad C		0	0	5
	Japanese knotweed	Tract 706, Rt 144		0	0	1
	Japanese knotweed	Tract 678 Pad B		0	0	1
Tiadaghton	Glossy buckthorn	Narrow Gauge Road	0	0	1	
	Goat's rue	Huntley Road, Tract 293 ROW		0	0	1
	Phragmites	Tract 289 Pad D	0	0	17	25
	Phragmites	Tract 289, ROW & Lebo Road	0	0	25	
	Phragmites	Tract 322, Bark Cabin Road	0	0	5	
	Phragmites	T 356, Moore Road	0	0	25	
	Japanese knotweed	Tract 685 Compressor	0	0	1	
	Japanese knotweed	Tract 728 Pad D	0	0	0	5
	Tree-of-heaven	Okome Fire Road	0	0	5	
Loyalsock	Tree-of-heaven	Bodine Mtn Road (Site 1), Tract 100		0	0	1
	Tree-of-heaven	Hagermans Run Road, Tract 100		0	0	1
	Tree-of-heaven	Bodine Mtn Road (Site 2)	0	0	2	
	Tree-of-heaven	Brown Road	0	0	2	
	Tree-of-heaven	Narrow Mountain Road (Site 2)	0	0	1	

Table 5.43. Invasive Plant Populations Eradicated as of 2016.

Notes from the Field:

The importance of appropriate timing and diligence required to carry out Early Detection and Rapid Response protocols is well illustrated in this case study from the Tiadaghton State Forest.

This population of poison hemlock was initially located by the gas forester in the early spring of 2016. An existing pipeline ROW had been disturbed with the installation of an additional pipeline the previous year and had been reseeded and mulched with straw during the fall of 2015. Unfortunately, either the equipment used for the work — or more likely the bales of straw themselves — contained seeds of poison hemlock. The gas monitoring foresters were asked to help survey the area and determine the extent of the problem. Due to invasive plant surveys already conducted in the area, the bureau is confident that no poison hemlock was growing in the immediate area prior to this date. Small populations (one to six poison hemlock basal rosettes) were found at six individual locations and one larger population of 50-100 rosettes throughout the pipeline corridor upon additional surveys in 2016. Each plant was treated with a foliar application of glyphosate, which successfully controlled all plants.

Small poison hemlock plants found along Hemlock Road in 2017.

More poison hemlock was found in the spring of 2017. Fortunately, the populations were smaller and three of the 2016 sites showed no new plants. However, monitoring foresters were disappointed to find two new locations with additional plants. They were again sprayed with herbicide at that time, and again a month later when a handful of newly germinated plants were found at the sites.

Cooperation and detailed communication between the monitoring team and the Tiadaghton State Forest gas forester allowed the district to accomplish more with the extra sets of hands and eyes. The cooperation also allowed the gas monitoring field crews to have a better idea where to look for additional infestations, since the gas forester brings insights into where new work was carried out at gas infrastructure sites. In this case, monitoring staff could focus efforts on the entire area that was disturbed and reseeded and not just where initial infestations of poison hemlock were found, preventing staff from potentially missing new plants.

This infestation has taught the bureau that timing is key for any kind of success. This starts with looking for plants when they are easy to observe to prevent missing populations. Timing treatments in early spring for poison hemlock due to its early growth compared to other surrounding vegetation is also critical. Timing the treatment when they are small rosettes requires less effort and uses less herbicide, and most importantly, finding and treating plants before they flower and fruit prevents re-stocking of the seed bank. Diligence is also key, because it is going to take time to eradicate the population. Poison hemlock seeds will not all germinate the next year after they are planted. Treating once and walking away would most certainly end with a large population of poison hemlock that would be nearly impossible to eradicate due to seeds that take time to germinate. Treatments will continue at this site until the existing seeds either germinate or become non-viable. These areas require consistent monitoring not just because of the existing populations, but because new plants can establish anywhere that is subject to disturbance.

Poison hemlock EDRR treatment in Spring 2017.

The bureau's invasive plant management program has benefitted tremendously from the field experience gained conducting EDRR protocols in areas subject to gas development. Since the protocol's pilot in 2013, the same protocols, with unique regional high-priority target species lists, have been initiated in four other state forest districts – Forbes, Gallitzin, Rothrock, and Weiser. Furthermore, recommended treatment protocols for EDRR species have been refined and are now used across all state forest lands. The bureau's identification field guides have also been improved with more "early detection" photos that show immature plants or senesced plants found outside the field season. This addition allows for better identification and detection. Finally, a careful approach to the monitoring and treatment of these species has also provided insights that have led to a revised Invasive Plant Species List for DCNR.

While the bureau has a well-developed invasive plant management and monitoring program, partnerships, both formal and informal, with natural gas operators to treat infestations has been extremely effective. Recent leases,

SUAs, and ROWs mandate that operators monitor and control prioritized invasive plant species within applicable limits of disturbance. This has led to a process where the bureau reviews monitoring inventory results, then provides a detailed list of invasive plant populations prioritized for treatment, as well as the most effective treatment protocols for each prioritized species. To further increase the positive impact of these treatments, bureau staff have partnered with operators to treat high-threat species found immediately outside the limits of disturbance in conjunction with the mandated treatments within the limits of disturbance. In a more informal manner, many gas foresters have had success bringing a particular species population to the attention of an operator for immediate treatment. This "rapid response" style treatment is especially useful in areas where high-threat species have been found to be brought in by fill material. The evaluation of operator-sponsored monitoring inventory reports and treatment efforts has further informed the way the bureau prioritizes species for treatment across state forest land and how bureau biologists classify the threat each invasive plant species pose to forest and wetland ecosystems across Pennsylvania.

The proliferation and colonization of invasive plant species is one of the greatest threats to the health and viability of state forest ecosystems. Certainly, natural gas development is not the only forest use which increases the risk of these species spreading onto state forest land. However, the nature of the type of forest disturbance necessary to develop natural gas resources has increased the opportunity for invasive plants to colonize otherwise robust forest habitats. While populations of invasive plants have increased because of gas development, the level of awareness across the bureau has also increased. The lengths the bureau goes to identify novel populations and eradicate existing infestations has increased. While this work will continue, more attention is necessary on private lands subject to gas development, which are unlikely to be subject to the same robust invasive plant detection and treatment programs.

3. Conducting Vegetation Inventories in Undeveloped Tracts.

The majority of recent shale gas development was already underway when the Shale Gas Monitoring Team was organized. To date, only one area has been subject to pre-disturbance vegetation inventories. This pre-development work was conducted on tracts within the Loyalsock State Forest. The area encompasses approximately 26,000 acres of state forest land.

Sample locations consist of a cluster of one primary plot and three secondary plots. Of the 53 clusters initially generated, 33 clusters (132 plots) were completed during the 2013-2014 field seasons. Additionally, 38 Continuous Forest Inventory (CFI) plots that were located within the area were also included in the analysis to increase the rigor of these data. The most common forest community in this tract is the northern hardwood forest type (Table 5.44).

Analysis of these data were limited due to the one-time nature of the data collection. However, detailed forest cover data are available for all clusters. If development does occur on these Loyalsock tracts, these same data will be collected and then compared to the original cluster plot data.

Some noteworthy observations were made over the course of the pre-development data collection. Within the oak-heath stands, no non-native or invasive plant species were encountered on any of the 14 plots. Unique species like trilliums and purple-fringed orchid (*Platanthera grandiflora*) were found in some northern hardwood stand plots. Also noteworthy was the species richness of ferns throughout the tracts. A total of 18 fern species were found during the vegetation analysis. The northern hardwood communities had the highest species richness with nine fern species. A more thorough, tract-level review of on-the-ground conditions near potential development sites has allowed for an updated description of forest types and a careful delineation of potentially sensitive areas.

Sampling of invasive plants along the state forest roads within this tract of the Loyalsock State Forest was also conducted. State forest roads within the tract, as well as several gated haul roads, were surveyed during the 2014 field season for a total of 21 roads (41.6 miles). These included Big Hollow Road, Cascade Road, Hillsgrove Road, John Merrell Road, John Merrell Extension, Lutz Road, Mill Creek Road, and Bodine Mountain Road. The most abundant (by population size) invasive species found along these roadsides was Japanese stiltgrass and the most common species were Japanese stiltgrass, multiflora rose, and oriental lady's thumb. Other invasive shrubs present along these roadways included autumn olive, Japanese barberry, and Amur honeysuckle. These data were then organized spatially into "heat maps" (Figures 5.18 and 5.19) which show infestations from highest densities (red) to lowest densities (green). If development occurs on these tracts, these invasive roadside data can be compared before and after construction. Knowing which invasive plants were present prior to any gas development will aid in developing post-construction treatment guidelines for gas operators. These spatial invasion data can also inform priorities for certain portions of the tract that are less-invaded than others. Since some roads in this study were gated and others were not, the differences in invasion between gated and ungated roads could also be explored if development occurs.

Forest Community Type	# of Monitoring Plots	# of CFI Plots	Total
Northern hardwood (BB)	79	26	105
Woodland (O5)	19	0	19
Oak-heath (AH)	12	2	14
Red maple stands (CC)	12	4	16
Black cherry – Northern hardwood forest (BC)	5	2	7
Emergent Wetland (U4)	4	0	4
Hemlock – white pine forest (FB)	1	1	2
Red oak – mixed hardwood (AR)	0	2	2
Mixed oak – mixed hardwood forest (AD)	0	1	1

Table 5.44. Number of Plots in each Forest Community Type in Loyalsock State Forest BACI study.

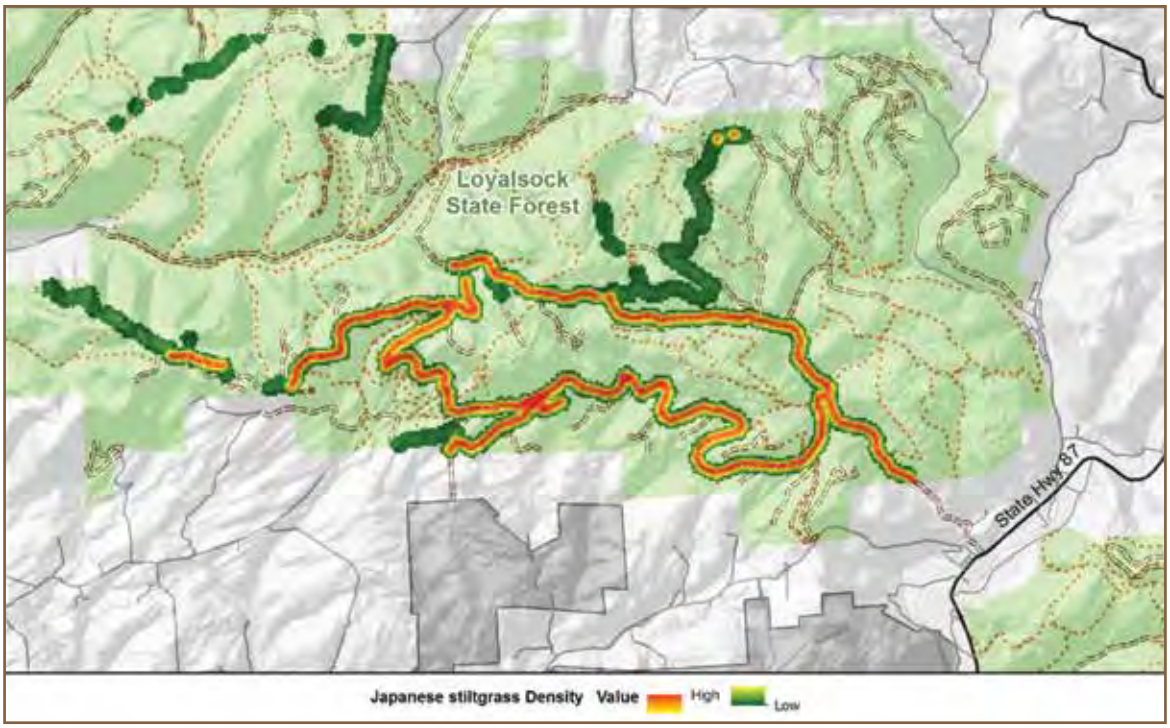


Figure 5.18. "Heat map" showing infestation levels of Japanese stiltgrass along roadsides within Loyalsock State Forest.

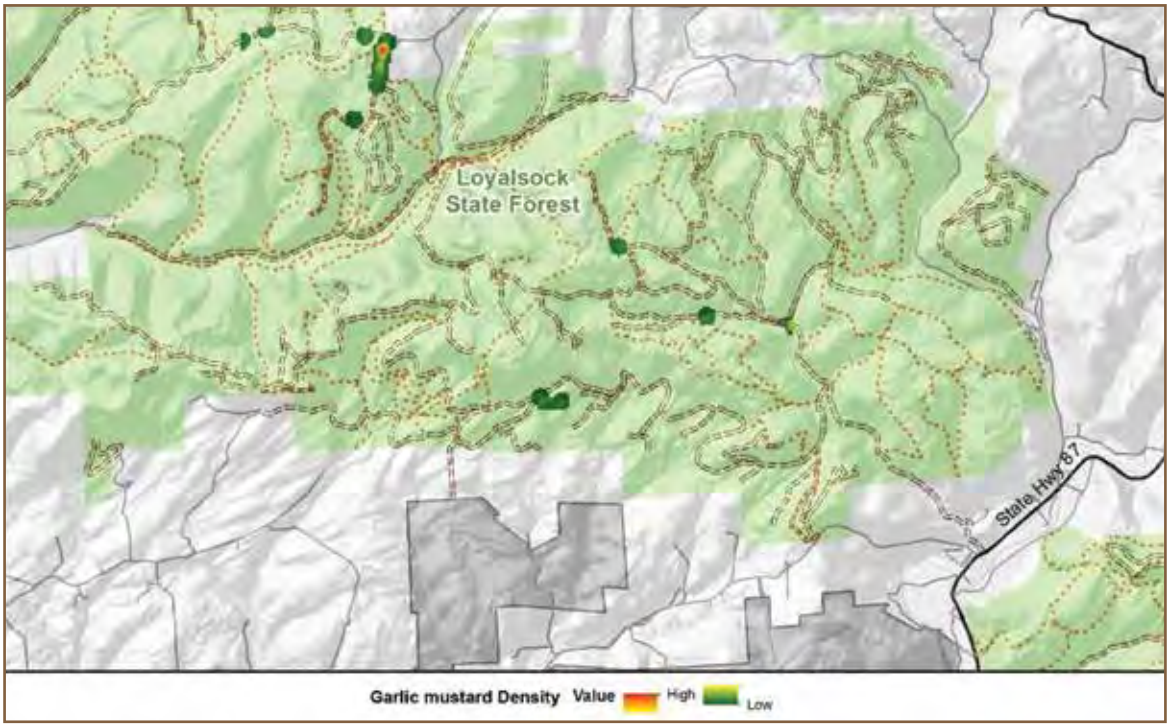


Figure 5.19. "Heat map" showing infestation levels of garlic mustard along roadsides within Loyalsock State Forest.

Fauna

As with any type of development, there is potential for shale gas development on state forest lands to affect wildlife populations and habitats. The disturbance due to gas activity typically sets succession back to an artificial state and can be somewhat permanent. This same disturbance generally leads to a reduction in forest habitat, a reduction in forest interior habitat, and an increase in edge habitat and forest fragmentation. Any alteration of habitat could lead to a shift in wildlife communities such as forest interior species, grassland birds, amphibian, and aquatic organism populations.

Forest Interior Species

Clearing forests for shale gas development increased forest fragmentation and created forest edge habitat. The increased fragmentation and edge can affect the habitat quality for some wildlife species. The bureau collects basic forest wildlife habitat data (i.e., basal area, canopy cover, tree diameter (DBH), species, snags, and tree height) on completed shale gas pads within the state forest using the Habitat Suitability Index (HSI) protocol to better understand the impacts of well pad construction on wildlife. These plots are paired with one being close to infrastructure and the other being 300 feet away from infrastructure. HSI data collected over time will increase understanding of the ecological effects of shale gas development on state forests. Using HSI models for barred owl and downy woodpecker, mean HSI values for interior and edge points were calculated (Allen 1987, Schroeder 1982). An HSI model uses habitat characteristic data to calculate a suitability index which ranges from 0-1, with zero being not suitable and 1 being ideal. Barred owl and downy woodpeckers were selected due to the existence of HSI models for these species that are considered representative forest interior species in Pennsylvania. The interior points averaged HSI values of 0.6 for downy woodpecker and 0.9 for the barred owl. The edge points averaged HSI values of 0.8 for the downy woodpecker and 0.7 for the barred owl. These values are very similar, but this may change over time as the edge effect has time to influence forest development. The interior points had higher average basal area (123 vs. 109), more snags per acre, higher canopy coverage (84 percent vs. 79 percent), and a larger average dbh (14.2 vs. 13.8).

Many of the physical features of the habitat of the interior and edge points are very similar. Some variables such as canopy cover, snags per acre, basal area, and average diameter may change over time between the interior and edge. Other factors such as light, temperature, moisture, and wind are expected to differ between the edge and interior, which may lead to differences in the measured habitat variables over time. The edge effect alone may make otherwise suitable habitat unsuitable for forest interior species. Even though the edge and interior points currently have similar HSI values, interior species will avoid the edge habitat. Greater differences in habitat values over time are expected.

Grassland Nesting Birds

Pipeline rights-of-way require a portion to be maintained as long-term openings. Pipeline corridors are maintained in a manner primarily to ease monitoring and maintenance by the pipeline company. Monitoring the pipeline corridors for the existence of grassland nesting bird nests was conducted to determine if the corridors were being utilized by this group of birds. This included counting grassland bird nests along a transect centered within the pipeline corridor.

No grassland bird nests were detected on the eight monitored pipeline corridors over a two-year period. These transects were located on pipeline corridors in the Moshannon, Sproul, Tiadaghton, Susquehannock, and Loyalsock State Forests. Typically, grassland birds will not utilize grassy pipeline corridors within a forest matrix due to the narrow width and the abundance of neighboring trees. Pipeline corridors are too narrow to function as acceptable nesting habitat for grassland nesting birds despite the presence of grassland habitat. Many scrub-shrub wildlife species can and do use narrow habitat patches. Therefore, the bureau is advocating scrub-shrub habitat where feasible on

pipeline corridors to benefit a wider range of wildlife.

Amphibians

Amphibians are good indicators of environmental conditions because they are relatively sensitive to changes. The impact of shale gas development on amphibians at permanent pad monitoring locations and on PCSM features were monitored.

At the permanent pad monitoring locations (the same 15 selected for the permanent vegetation plots), cover boards were used to monitor terrestrial amphibian population trends. Coverboards were placed near the forest edge and the interior forest coincident with the permanent habitat plots. This allows comparisons between the number of species and individuals found between these areas. This protocol was piloted in 2014 and expanded in 2015 and 2016.

The abundance of salamanders detected using coverboards was low for both sites. Edge habitat coverboards yielded three salamanders total, while the interior habitat yielded four salamanders. To get a larger representative sample, the monitoring effort was expanded by increasing the number of coverboards at each location. There is a lag time between coverboard placement and utilization by salamanders. Coverboards are more attractive as refuge after at least two years of weathering to provide the proper moisture and soil characteristics under the boards. Over time, a better comparison of salamanders in edge habitat and interior habitat should be possible. It appears that resilient and adaptable species like the redback salamander utilize both the edge and forest interior habitats.

PCSM features, such as infiltration basins, rain gardens, and infiltration berms are designed to allow water to infiltrate within 72 hours. This short amount of time holding water should be too short for amphibians to find and try to reproduce. Ten structures were monitored to find whether amphibians were utilizing them for breeding purposes. Three of ten PCSM structures contained amphibian eggs. This indicates that water was being held in the structure long enough for amphibians to find and lay eggs. These structures are potential ecological sinks or traps if the water dries up prior to amphibian dispersal. More monitoring will be done to expand the sample size. This information indicates that there is potential to improve the design and construction of PCSM structures to ensure they do not negatively affect amphibians.

Aquatic Organisms

Infiltration Berm PCSM Structure.

Stream habitat is abundant across state forest lands. Aquatic organism passage through connected stream corridors, including intermittent streams, is vital to the health of aquatic communities. Effective habitat management considers all species in the aquatic community, including but not limited to: invertebrates, reptiles, amphibians, and fish. Connectivity is important for dispersal and access to suitable habitat such as spawning areas and colder water refugia.

If installation is not done correctly, culverts have the potential to negatively affect the stream habitat. Improperly placed culverts can lead to excessive erosion, act as barriers to aquatic organism passage, and can cause the stream crossing to fail. Five culverts on gas roads in proximity to the permanent pad monitoring efforts were assessed using the North Atlantic Aquatic Connectivity Collaborative (NAACC) protocol. These culverts were on the gas roads used to access the

permanent monitoring pads. This protocol was piloted in 2016 and expanded in 2017. Three of the culverts (60 percent) were rated as allowing limited aquatic organism passage. Two of the culverts (40 percent) were rated as allowing full aquatic organism passage. No assessed culverts blocked all aquatic organism passage. Common problems with culverts are blockages, undersized pipes, and improper installation.

Culvert being assessed on state forest lands.

By monitoring culverts, there is the potential to improve road/stream crossings. Due to the findings that some stream crossings restricted aquatic organism passage, culvert installation BMPs were developed to ensure aquatic organism passage. These BMPs focus on proper sizing of the crossing structure and embedding the structure to prevent perched outlets. The bureau has adopted the NAACC protocol to conduct stream crossing assessments across all state forest land.

Forest Health

The bureau's forest health program is implemented for the protection of all forest land in the state from "fungi, insects, and other enemies." The program is designed to reduce pest-caused economic losses by utilizing integrated forest pest management strategies, providing assistance, and conducting projects aimed at preventing, detecting, evaluating, and suppressing forest pest outbreaks.

Non-native invasive forest pests are a significant threat to forests and considerable effort and resources are expended to detect, monitor, assess, and control non-native invasive forest pests. Some of the major invasive forest insect and disease pests established in Pennsylvania are the gypsy moth, hemlock woolly adelgid, emerald ash borer, thousand cankers disease, walnut twig beetle, Sirex woodwasp, butternut canker, elongate hemlock scale, chestnut blight, Dutch elm disease, and beech bark disease. Other non-native invasive forest pests not yet detected in Pennsylvania, but which would cause considerable tree mortality are the sudden oak death pathogen, Asian longhorned beetle, exotic bark beetles, and winter moth.

Maintaining forest health and the management of destructive insects and disease is a statewide concern. However, there is a focus on the core gas forest districts where shale gas development is the most prevalent. Over time this will allow the bureau to evaluate if any forest health trends are related to shale gas activity.

Annual aerial surveys are conducted across Pennsylvania to detect forest damage and tree mortality. The well pads utilized for the permanent monitoring efforts are monitored for forest health concerns as part of the aerial surveys. Ground-truthing is conducted to confirm unknown causes of the damage. Ground surveys using forest insect and disease reporting procedures are used to determine the presence or absence of forest pests and to document damage when present.

Specialized surveys are also conducted for Asian longhorned beetle, emerald ash borer, hemlock woolly adelgid, elongate hemlock scale, Sirex noctilio woodwasp, exotic bark beetles, sudden oak death, sugar maple decline, butternut canker, ash yellows, beech bark disease, gypsy moth, forest tent caterpillar, winter moth, and thousand cankers disease and the walnut twig beetle vector.

Since most forest insect and disease pests are driven by host condition and climate, there is a great amount of variation in forest pest distribution and abundance any given year.

Due to the stochastic nature of forest pest related damage, the correlation between gas development and forest health is inconclusive. This will only be revealed by continued long-term monitoring.

The principal biotic damage-causing agents from 2013-2016 in this region of Pennsylvania were the forest tent caterpillar and the gypsy moth. The last gypsy moth outbreak in Pennsylvania occurred in 2013, mainly in the northeastern portions of Pennsylvania. During the 2013-2016 period in core gas forest districts, considerable forest damages by gypsy moth were reported.

The spread of oak wilt is a concern for oak forests in Pennsylvania. Due to this risk, it is important that equipment is cleaned when clearing trees for development prior to moving to the next site. Over the last few years, sizeable maple and oak declines were also documented in the same areas. However, the damage-causing agents remain undetermined.

Approximately 3.1 percent of the trees in Pennsylvania's forests are ash, but much of it is concentrated in the northern counties. The emerald ash borer seeks ash trees along forest edges and attacks ash trees that are under stress or are in decline.

Monitoring impacts to forest health is a long-term endeavor. Increased susceptibility to pest attack, especially by non-native invasive species, may occur wherever there is forest disturbance, especially for trees along newly created edges. The bureau will continue to monitor forest edges created by well pads and pipelines for tree dieback, decline, and mortality. Evaluation monitoring projects may be initiated if forest health changes are detected through the bureau's detection monitoring activities.

Website Links

[1] www.srbc.net/programs/projreviewnaturalgas.htm

[2] http://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/Pages/CIMReports.aspx

[3] http://mdw.srbc.net/remotewaterquality/data_viewer.aspx

[4] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20033428.pdf

[5] https://www.pacode.com/secure/data/025/chapter93/chap93toc.html

[6] http://www.dep.pa.gov/business/energy/oilandgasprograms/oilandgasmgmt/Pages/default.aspx

[7] http://www.dep.pa.gov/Business/Air/BAQ

[8] http://www.depgis.state.pa.us/oilgasannualreport/index.html

[9] http://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/Advisory%20Committees/Air%20Quality%20Technical%20Advisory%20Committee/2016/12-8-16/2016_Unconv_Well_and_Compressor_Station_NG_Emission_Inventory_For_2014.pdf

[10] http://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/Advisory%20Committees/Air%20Quality%20Technical%20Advisory%20Committee/2017/6-15-17/4_AQTAC_AQ_Summary_170615.pdf

[11] http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-116594/DRAFT_2017-18%20Annual%20Network%20Plan.pdf

[12] http://www.dep.pa.gov/Business/Air/BAQ/Permits/Pages/default.aspx

[13] http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-13330

Literature Cited

Allen, A.W. 1987. Habitat Suitability Index Models: barred owl. U.S. Fish and Wildlife Service Biol. Rep. 82(10.143). 17 pp.

Barlow, K.M., Mortensen, D.A., Drohan, P.J., Averill, K.M. (2017). Unconventional gas development facilitates plant invasions. Journal of Environmental Management, 202: 208-2016.

Entrekin SA, Maloney KO, Kapo KE, Walters AW, Evans-White MA, Klemow KM. 2015. Stream Vulnerability to Widespread and Emergent Stressors: A Focus on Unconventional Oil and Gas. PLoS ONE 10(9): e0137416. doi:10.1371/journal. pone.0137416.

Idaho Transportation Department. 2012. Best Management Practices Manual: PC-33 Topsoil Management.

PA DEP. 2013a. Instream Comprehensive Evaluations (ICE). http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Methodology/2015%20Methodology/ICE.pdf

PA DEP. 2013b. Water Quality Antidegradation Implementation Guidance. http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-47704/391-0300-002.pdf

PA DEP. 2015. An Index of Biotic Integrity for Benthic Macroinvertebrate Communities in Pennsylvania's

Wadable, Freestone, Riffle-Run Streams. http://files.dep.state.pa.us/Water/Drinking%20Water%20and%20Facility%20Regulation/WaterQualityPortalFiles/Methodology/2015%20Methodology/freestoneIBI.pdf

Penn State Extension. 2011. Marcellus Shale Wastewater Issues in Pennsylvania. http://extension.psu.edu/natural-resources/water/marcellus-shale/waste-water/current-and-emerging-treatment-and-disposal-technologies

PA Code. CHAPTER 93. WATER QUALITY STANDARDS. http://www.pacode.com/secure/data/025/chapter93/chap93toc.html

R. Vidic et al., Science 340, 1235009 (2013). DOI: 10.1126/science.1235009.

Goff, F.G., Dawson, G.A. & Rochow, J.J. 1982. Site examination for threatened or endangered plant species. Environmental Management, Vol. 6, No. 4, pp. 307-316

Keefer, J.S., Marshall, M.R. & Mitchell, B.R. 2010. Early detection of invasive species: Surveillance, monitoring, and rapid response: Eastern Rivers and Mountains Network and Northeast Temperate Network. Natural Resources Report NPS/ERMN/NRR-2010/196. National Park Service, Fort Collins, Colorado.

Mason, A., C. Driessen, J. Norton, and C. Strom. 2011. First Year Soil Impacts of Well-Pad Development and Reclamation on Wyoming. Natural Resources and Environmental Issues, Vo. 17.

Natural Resources Conservation Service. 2004. Soil Biology and Land Management. Soil Quality – Soil Biology Technical Note No. 4.

Pennsylvania Bureau of Forestry. 1999. Inventory Manual of Procedure for the Fourth State Forest Management Plan.

Pennsylvania Bureau of Forestry. 2007. Analysis of first 5-year continuous forest inventory cycle. Division of Resource Planning and Information: Forest Inventory and Analysis Unit. Available at: http://intraforestry/planning/Documents/Overview_Analysis_First_5_yr_CFI_Cycle.pdf.

Pennsylvania Bureau of Forestry, 2016. Guidelines for Administering Oil and Gas Activities on State Forest Lands, 4th Edition. Available at: http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20032134.pdf

Pennsylvania Bureau of Forestry. 2007. Manual for Inventory of Wild Areas, Division of Resource Planning and Information Forest Inventory & Analysis Unit.

Pennsylvania Bureau of Forestry, 2011. Protocols for Conducting Surveys for Plant Species of Special Concern. Ecological Services Section. Available at: http://www.gis.dcnr.state.pa.us/hgis-er/PNDI_DCNR.aspx.

Rantz, S.E. 1982. Measurement and computation of streamflow: Volume 1, measurement of stage and discharge. USGS: Geological Survey Water-Supply Paper 2175. United States Government Printing Office, Washington DC. Available at: https://pubs.usgs.gov/wsp/wsp2175/pdf/WSP2175_vol1a.pdf.

Schroeder, R.L. 1982. Habitat Suitability Index Models: Downy woodpecker. U.S. Dept. Int., Fish and Wild. Serv. FWS/OBS-82/10.38. 10 pp.

Strohmayer, Patti. 1999. Soil Stockpiling for Reclamation and Restoration activities after Mining and Construction. Student On-Line Journal, Vol. 4, No. 7, Spring 1999 University of Minnesota, St. Paul, MN.

White, J.A., J. Tallaksen, I. Charvat. 2008. The effects of arbuscular mycorrhizal fungal inoculation at a roadside prairie restoration site. Mycologia. 100(1) 6-11.

Wick, A.F., P.D. Stahl, L.J Ingram, and L. Vicklund. 2008. Soil Aggregate and Aggregate Associated Carbon Recovery in Short-term Stockpiles. 2008 National Meeting of the American Society of Mining and Reclamation, Richmond, VA.

Zimmerman, E., Davis, T., Podniesinski, G., Furedi M., McPherson, J., Seymour, S., Eichelberger, B., Dewar, N., Wagner, J., & Fike, J. (editors). 2012. Terrestrial and Palustrine Plant Communities of Pennsylvania, 2nd Edition. Pennsylvania Natural Heritage Program, Pennsylvania Department of Conservation and Natural Resources, Harrisburg, Pennsylvania.

Chapter VI. Forest Use: Wild Character, Recreation, and Community Engagement

Key Points

- The Recreation Opportunity Spectrum (ROS) analysis indicates gas development activity shifted 22,423 unique acres to a more developed ROS category since 2008. From 2008-2012, 14,858 unique acres moved to more developed ROS categories and 8,049 acres shifted for the period 2013-2016. However, only 19 acres moved from the primitive (the most undeveloped) ROS category.
- 20.3 miles of non-motorized trails have been directly affected by the placement of shale gas infrastructure (pads, pipelines, and roads) and 52.6 miles have infrastructure within 400 feet.
- Between 2013-2016 there have been 140.5 miles of snowmobile trails closed due to plowing for vehicular gas traffic.
- Compressor station sound monitoring indicates sound levels 300 feet from noise producing feature on the pad are lower than they were in 2015, but most compressors are still above the 55 db(A) Ldn guideline.
- Ambient noise level diversity is greater than at operational compressor stations.
- Well pad sound levels are similar to ambient.
- The Visitor Use Monitoring survey conducted by Penn State indicates that 15.5 percent of respondents reported that shale gas activities have affected their *Use* of state forest land and 18.7 percent reported it affected their *Experience*.
- Forest user feedback regarding gas development through comment cards indicate that traffic, dust, litter, and a general increase in activity in previously isolated/uncrowded places is a concern.

Introduction

Because state forest land has many uses, the bureau strives to balance and manage differing activities, values, and experiences. The bureau recognizes wild character as an important value state forest lands provide to visitors and strives to retain it while managing the forest. Wild character can be defined by both physical factors, such as remoteness and primitiveness, and subjective experiences, such as peace and tranquility. Wild character commonly relates to the quality of experience for state forest visitors regarding scenic beauty, feeling of solitude, sense of remoteness, and the undeveloped and aesthetic nature of the state forest system. Recognizing that shale gas development has the potential to affect wild character, the bureau's shale gas monitoring program uses several metrics to quantify features that can serve as indicators.

Quantitative Metrics: Infrastructure and Activities

Recreation Opportunity Spectrum

Because the perception of wild character can be subjective, direct measurements are difficult. One surrogate measure that is used to approximate the relative wild character of the landscape is the Recreation Opportunity Spectrum (ROS). This is an inventory system developed by the U.S. Forest Service to characterize land by types of recreation experiences. The bureau utilizes ROS to make and communicate management decisions that are transparent, credible, and compatible with other state forest management goals. However, this formulaic approach should be tempered with an awareness of the conditions that can lead to changes in this type of analysis.

ROS builds on the premise that people expect certain types of recreational experiences on public land and that land managers should be able to direct people to appropriate places for these experiences. ROS allows land managers to provide recreational opportunities across a spectrum, or continuum, of five land-use classes so that the user may find satisfying recreational experiences in a variety of recreational activities. The ROS land-use classes follow a continuum from "primitive" to "developed" based on distance from motorized roads/trails (Figure 6.1). The bureau uses acreages associated with each class as a measure of wild character to guide long-term management planning to provide a balance of experiences.

State forests are generally managed to maintain the conditions that define each ROS land-use class or increase the primitive area, but typically not to increase the amount of developed area. Some temporary activities may affect the condition of the forest, but do not change the ROS land-use class, such as temporary roads used in timber harvesting. Permanent impacts can change ROS classes, such as new public use roads or buildings. Closing a road or restoring a developed area can change ROS classes back to a more primitive classification. While remoteness is a consideration of wild character, the primitive classification itself does not define wild character, but does tend to provide experiences that are more of a backcountry nature. However, an area that is not primitive or remote can still offer wild character, depending on the user's perception. For example, some areas that fall into the more developed categories of the ROS analysis may still offer aspects of wild character. Conversely, some areas may be converted to a more developed category when conditions in that area remain unchanged. Two areas with the same ROS zone may also provide

Figure 6.1. ROS classes and characteristics of those classes based on user experience, distance from road, and acreage.

different experiences. For example, a traditional state forest road is not considered primitive or remote, but the narrow shoulders and closed forest canopy offer more wild character than a wide road with no tree canopy, although the ROS category would be the same for both road corridors.

The analysis to calculate and map the distribution of ROS categories on state forest land after the onset of shale gas development was performed in 2012 and findings were shared in the 2014 Shale-Gas Monitoring Report. The analysis was re-run to assess the changes to ROS on state forest land from 2013 through 2016. Since ROS zoning is based on distance to motorized roads, changes in ROS classification can be due to construction of roads or alteration of existing roads. Typically, on state forest land, roads that are gated are considered trails behind the gate because their use is limited to infrequent administrative activity. However, in the case of certain shale gas roads, the road is still considered motorized behind the gate because it still has frequent traffic. In this case, the gate is primarily for public safety and the road is still heavily used by the gas company and its affiliates. Although many activities on state forest land can result in changes to ROS designations, for this report, changes have been filtered to ROS zone acreages to represent those due specifically to shale gas roads since 2012.

Figure 6.2 shows the spatial distribution of changes to categories of ROS due to shale gas activity (roads) in the core gas forest districts between 2008-2016. In general, the changes in ROS designation occurred on scattered parcels of land across these state forests (Figures 6.3 and 6.4; Table 6.1), but with some locally severe alterations at specific locations across the landscape. Overall, gas development activity resulted in 22,423 unique acres shifting to more developed categories since 2008. From 2008-2012, 14,858 unique acres moved to a more developed ROS category and 8,049 acres shifted for the period 2013-2016 (note these are not additive to the total unique acreage shifted, due to some acreage shifting in both time periods). However, of these acres, only 19 acres moved from the primitive (the most undeveloped category).

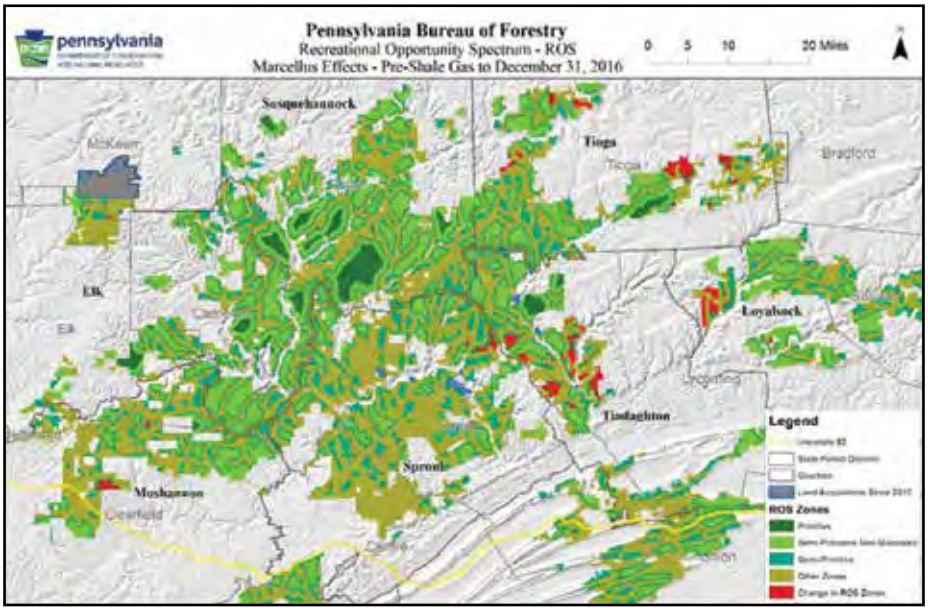


Figure 6.2. Map of the changes in ROS classifications due to shale gas development from 2008-2016 for the core gas forest districts.

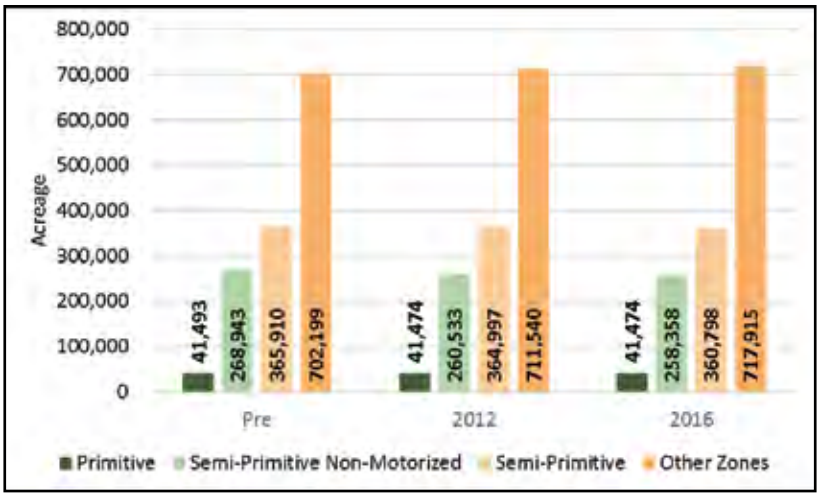


Figure 6.3. Overall acreage in each ROS category within the core gas forest districts for pre-shale gas, in 2012, and in 2016.

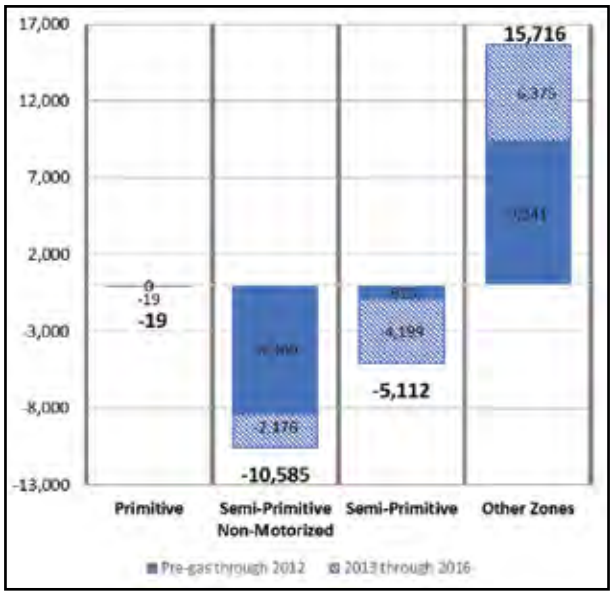


Figure 6.4. Net change in acreage in each ROS category within the core gas forest districts for changes due to gas roads only (pre-shale to 2016). Total net for the entire period in bold.

	ROS Zones			
	Primitive	Semi-Primitive Non-Motorized	Semi-Primitive	Other Zones
Pre-gas to 2012	-19	-8,409	-913	9,341
2013-2016	0	-2,176	-4,199	6,375
Total Net Change Pre-gas through 2016	**-19**	**-10,585**	**-5,112**	**15,716**

Table 6.1. Net ROS acreage for each ROS category within the core gas forest districts for changes due to gas roads only (pre-shale to 2016).

Changes in overall acreage of ROS were affected by gas road construction and land acquisitions in the core gas forest districts (Figure 6.2). A total of 2.894 acres of state forest land were acquired in the core gas forest districts since 2008. Acquisitions that have occurred since 2012 are shown in the map in gray and outlined in in blue (Figure 6.2).

In general, the overall effects to ROS since the analysis done in 2012 are relatively small. Some areas that were not adequately buffered led to conversion of acreage to a more developed category. In the future, it may be advantageous to create a buffer around certain primitive areas to prevent effects to the ROS zoning, rather than allowing development up to the edge of the primitive zone. Overall, the changes into more developed categories were minimal and these losses were generally offset by the acquisition of new lands on which there was minimal development.

Trails

Much of state forest use occurs on the broad network of designated trails, and so effects to the state forest trail system translates to user effects. Changes near trails due to nearby shale gas infrastructure are easily seen (Figures 6.5, 6.6, and 6.7). However, these changes are difficult to measure. Since trail "impacts" can be subjective and problematic to quantify, several quantitative spatial measures as a proxy for the influence of shale gas infrastructure on a trail and its users were used. Direct effects are defined as those locations where infrastructure crosses or is co-located with trails. Indirect effects were estimated by determining areas where trails were within 400 feet of shale gas infrastructure.

In the 2014 Shale-Gas Monitoring Report, trail effects were reported for designated state forest hiking trails and designated national trails, if there was infrastructure placed within the trails buffer limit. In response to stakeholder feedback and availability of more complete data, all trail categories are included in the summaries below. Trail designations include district specific-use trails (e.g., hiking only trails, snowmobile only trails, etc.), district shared-use trails (open to hiking, biking, horseback riding, and cross-country skiing), and designated state forest hiking trails (hiking only).

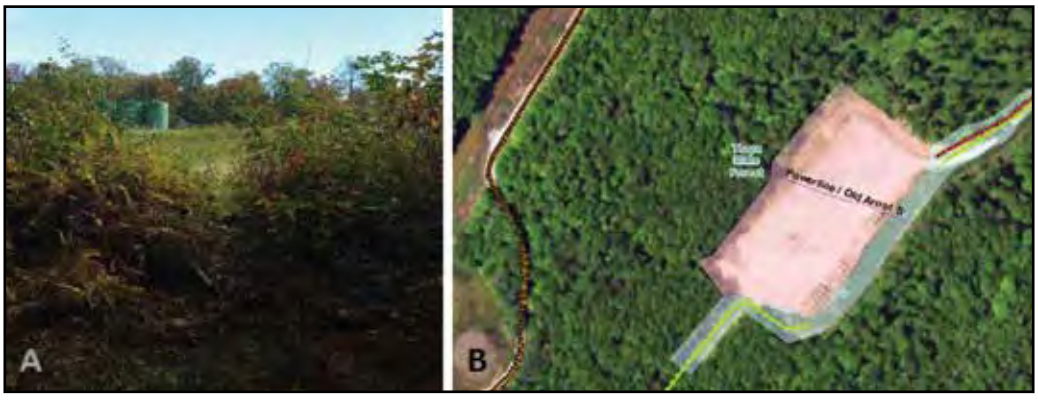


Figure 6.5. Old Arnot Trail (a shared-use trail) traversing a well pad. A) looking east from the intersection of the pad and trail on the west side of the well pad; B) aerial image of Old Arnot Trail (purple) crossing the well pad.

Figure 6.6. Example of an old woods road (gated road serving as a trail); A) before; and B) after improvement and pipeline installation.

Figure 6.7. Shared-use trails crossing access roads and adjacent pipelines. Trail indicated in red.

National scenic and national recreation trails, which are designated by the National Park Service, are also found on some portions of state forest, but are not found on state forest land within the core gas forest districts.

Non-motorized trails

A spatial analysis was conducted to determine where non-motorized trails were near, crossed, or were coincident with shale gas infrastructure in the core gas forest districts. First, an intersect analysis was conducted to quantify direct effects to trails (Figure 6.8) by determining the number of times and distance that gas infrastructure directly crossed or coincided with a trail. This information is summarized in Tables 6.2 and 6.3 in the "On Trail" column, which includes existing road crossings that were improved for shale gas traffic access.

In addition, a proximity analysis was completed to identify trails that were within 400 feet of shale gas infrastructure (Figure 6.9; Tables 6.2 and 6.3) to capture indirect effects, such as changes to the aesthetics and wild character. Any trail that starts from a road improved for gas is counted as affected. Snowmobile and ATV trails are reported separately.

Roads are the most abundant form of direct effect, with 13.6 miles of trail coinciding with roads that were created or improved for shale gas development (Table 6.3). At these locations, trail users may be affected by the wider canopy opening and periodic traffic. During the construction phase, traffic is highest, and users will likely hear or see traffic. In some cases, there may be an obstacle, such as an above ground waterline, silt sock, or various debris, during the construction phase (Figure 6.10). After construction is completed, materials are removed, and traffic is usually more limited. However, canopy openings may remain and alter the character of the trail.

Figure 6.8. Example of a direct effect. A) retired timber haul road used as a shared-use trail, showing condition without improvements for shale gas development; B) same trail, altered by construction access road along the trail.

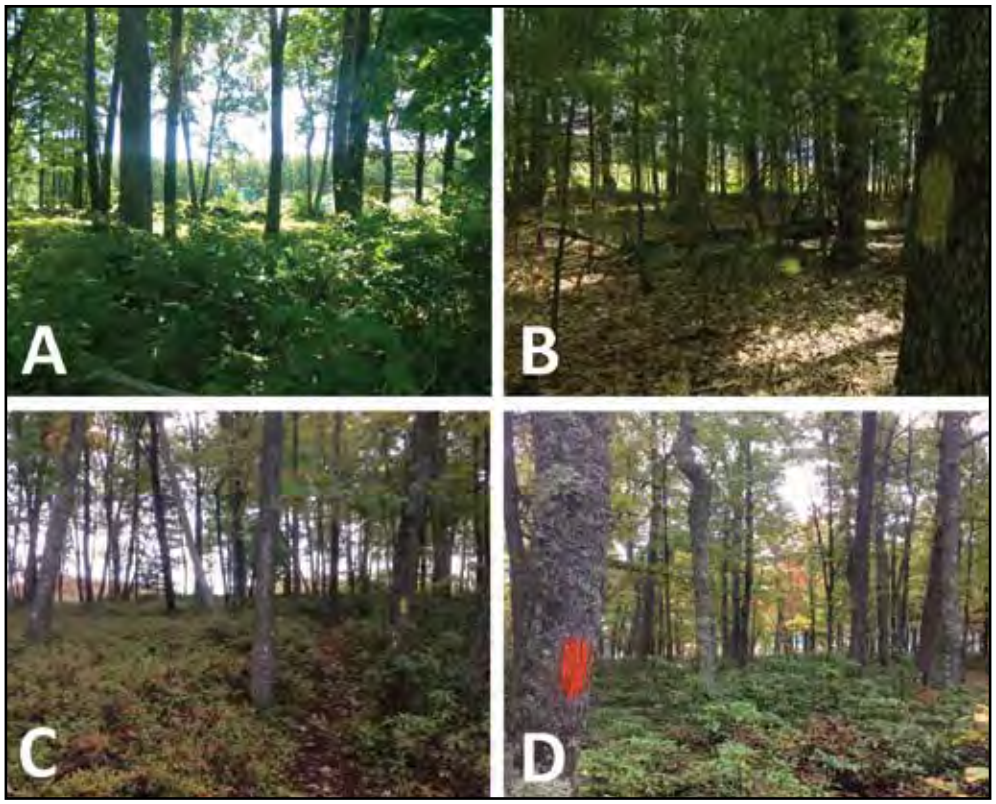


Figure 6.9. Photos from the trail at various distances from infrastructure; A) district shared-use trail within 100 feet of a well pad edge; B) district specific-use trail within 200 feet of a well pad edge with mid-story screen of white pine; C) district specific-use trail within 300 feet of an impoundment, compressor station, and topsoil stockpile; note abundant light levels; compressor was easily heard. D) state forest hiking trail within 400 feet of a well pad; open mid-story allowed pad to be visible and workers audible.

Non-motorized Trails with Adjacent or Coincident Infrastructure										
	Infrastructure Distance from Trail (in feet)									
	On Trail		100		200		300		400	
Trail Class	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail
District Specific-Use	6	2.6	19	3.5	20	4.0	22	5.0	26	5.7
District Shared-Use	34	17.6	121	24.5	132	30.9	141	36.3	163	42.1
State Forest Hiking	1	0.1	13	1.1	13	2.1	14	3.3	16	4.8
Total	41	20.3	153	29.2	165	37.0	177	44.5	205	52.6

Table 6.2 – Number and mileage of non-motorized trails with shale gas infrastructure within 0-400 feet, by proximity category and trail class. For trails in the core gas forest districts. Note: trails are counted within all columns of lesser distances (i.e., the rows are not additive and each column includes the numbers and mileages c contained in columns to their left).

Non-motorized Trails with Adjacent or Coincident Infrastructure										
	Infrastructure Distance from Trail (in feet)									
	On Trail		100		200		300		400	
Infrastructure type	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail
Pads (all types)	10	0.5	11	0.3	16	1.1	21	1.9	28	3.6
Pipelines	20	2.0	85	21.6	89	26.4	90	30.0	91	33.1
Roads	33	17.8	61	7.7	64	10.1	70	13.3	90	16.6

Table 6.3 – Number and mileage of non-motorized trails with shale gas infrastructure within 0-400 feet, by proximity category and infrastructure type. For trails in the core gas forest districts. NOTE: Neither columns nor rows are additive in this table; COLUMNS: the design of this table results in trails counted multiple times in different rows, since a trail may be proximal to a pad, pipeline, and road; ROWS: trails are counted within all columns of lesser distances (i.e., the rows are not additive and each column includes the numbers and mileages contained in columns to their left). Refer to Table 6.2 for totals.

Figure 6.10. Various obstacles near trail intersections during construction activities associated with shale gas development; trail indicated by red line; a) temporary above ground waterline crosses the entrance to a district shared-use trail; b) pile of wood debris from a pipeline project placed across the entrance to a district shared-use trail.

Snowmobile Trails

Snowmobile trails are frequently affected since the infrastructure used for snowmobile trails (joint-use roads, administrative roads, and pipelines) are also used during shale gas development. This may mean interruption of trails for gas construction activity or plowing of roads used as snowmobile trails to provide vehicle access for gas activity. In some cases, the roads are plowed for vehicle access, but are shared by snowmobilers along the edge of the road or on an unplowed strip of snow left along the road per an agreement with the gas companies. When a section of trail must be closed, it will often be relocated onto newly created adjacent trails (Figure 6.11) or pipelines (Figure 6.12) or closed temporarily until construction is concluded. Some trails cannot be re-routed due to topographical constraints, environmental reasons, or connectivity/looping issues.

Closed trails are trails that have been removed from the system. These may be closed without replacement or be re-routed. For re-routes, the closed section is counted in the "closed" column and the re-route accounted for in the "new" mileage. Temporarily closed trails are trails that were closed for a riding season due to short term conflicts. If a trail is temporarily closed for three seasons, it is automatically calculated as a "closed trail" or loss. A "plowed" trail is a trail that was either partially or fully plowed, but the trail has stayed open for riding due to limited vehicle use. "New" trails include re-routed trails, newly created, or newly designated trails. A summary of closed, temporarily closed, plowed, and new trails since the 2012/13 riding season can be found in Table 6.4. New replacement trails are still being planned and focus on establishing trail connectivity and improving trail quality.

Figure 6.11. Snowmobile trail (left red line) shifted from a plowed access road (right red line) onto a new adjacent trail with a forested buffer between the trail and the road.

Figure 6.12. Snowmobile trail shifted from main access road to a parallel pipeline, with vehicular traffic for shale gas development on road surface adjacent to riders.

ATV Trails

As of 2016, no state forest ATV trails have been affected (i.e., shale gas infrastructure within 400 feet or closure or re-routing due to gas activity). Though not managed by the bureau, there is one township road that crosses the Sproul State Forest that received a short duration closure. Kato-Orviston Road is a township road traversing through a section of state forest. The township has the road posted open to ATV use and it serves as a connector to the Bloody Skillet ATV trail. The road was closed from May 2015 to September 2015 and briefly during weekday work hours for the installation of the pipeline in the shoulder of the road (Figure 6.13). No formal complaints were received, although ATV riders were observed to re-route when approaching the construction site.

Viewshed Analysis

Viewsheds are the portion of the landscape that can be viewed from a given location and are key features for all public recreational use. They include the viewable landscape along transportation corridors and areas of visual importance near high-use areas in state forests where visitors congregate and spend time (e.g., a hill in close view of a high-use picnic area or along popular scenic drives). Impact to public use is considered carefully when managing the landscape within heavily visited viewsheds. One factor that can reduce wild character is the presence of visible manmade features or disturbances. Pads, pipelines, and similar infrastructure are manmade disturbances that do not mimic natural forest processes and are undesirable to many visitors in the forest setting.

Snowmobile Season (years)	Newly CLOSED		Newly CREATED		Temporarily closed (by season)		Plowed still open (by season)	
	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail	No. of Trails	Miles of Trail
2013-2014	41	133.5	14	25.1	5	8.4	25	116.2
2014-2015	2	0.8	2	4.4	6	15.4	25	104.7
2015-2016	1	4	19	25.6	25	42.8	56	98.3
2016-2017	2	2.2	1	3.6	25	40.7	28	112.2
Total	46	140.5	36	58.7	n/a	n/a	n/a	n/a

Table 6.4. Number and miles of snowmobile trails in the core gas forest districts that were newly closed, temporarily closed, plowed or newly created by winter riding season. Note that "Temporarily closed" and "Plowed" are recurring year to year and the same trails may be counted year to year.

Figure 6.13. Kato-Orviston township road. A) recreational UTV riding road amid pipeline construction project; B) pipeline welding crew working on pipeline installation.

In 2008, in areas leased for gas development, the bureau identified scenic viewshed "Areas of Special Consideration" along state forest trails, rivers, and major roads to minimize disruption of scenic viewsheds. When considering the effects that shale gas development has had on wild character, an assessment of prominent viewsheds is informative for estimating these effects. Changes in scenic views were examined and roughly quantified based on the infrastructure that was visible in major viewsheds, such as along high use roads and popular vistas.

Road Corridors and Aesthetic Buffers

The narrow roads, minimal traffic, overarching canopies, feeling of solitude, and long relaxing traverses through the forest embody the wild character that so many people seek on state forest land. Scenic driving has been one of the most popular uses of state forest lands for over 50 years. Most recreational users participate in this activity coming to and from the state forest, but for many this is the sole purpose of their visit. Changes to this primitive atmosphere are difficult to quantify, but they are easily seen. Wider built-up roads, increased traffic, pipelines, compressor stations, pads, and other miscellaneous infrastructure detract from the experience of what many visitors come to see in a forest setting (Figure 6.14). In some cases, when areas known for scenic driving could be affected, gas traffic and infrastructure have been relocated or visual mitigation practices have been employed, such as burying pipelines in road shoulders or incorporating buffers. However, perception is highly variable; for example, one person may view an adjacent pipeline as favorable for wildlife viewing (Figure 6.14b) and another may see it as detracting from the forest setting. It is also important to consider that effects will change over time. Many of the linear corridors have not been around long enough for adjacent trees to respond to increased light and fill some of the opened canopy space. Where most closed canopy state forest roads have been in existence for decades. Oak hickory types are more conducive to occupying the void than northern hardwoods, which could be useful in planning future corridors to produce the desired long-term condition of reduced canopy disruption.

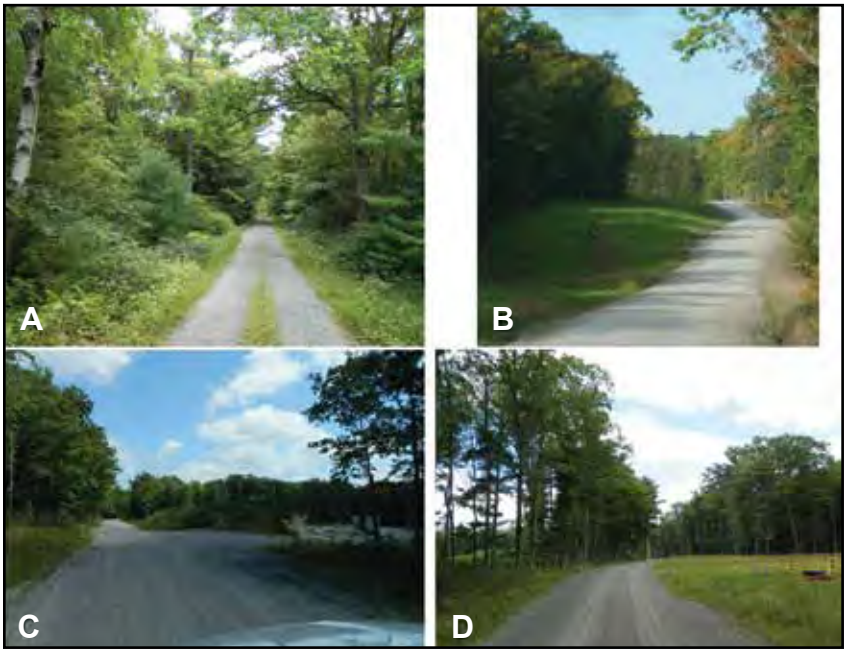


Figure 6.14.

A) Traditional (no gas traffic) low-use state forest road;

B) Post-gas low-use state forest road with adjacent pipeline, note turkeys;

C) Post-gas medium-use state forest road with adjacent well pad and topsoil stockpile with no buffer between the road and infrastructure;

D) Post-gas medium-use state forest road with adjacent well pad with forested buffer (left side of photo) and pipeline co-located within the road corridor (right side of photo).

To quantify effects to road corridors, independent of subjective perception, the number of miles of drivable public use road and drivable trails that have adjacent infrastructure were summarized. Shale gas infrastructure may be visible from 100, 200, 300, 400 feet, or even more depending on the vegetative conditions, so these distance categories were used (Table 6.5).

Because state forests are managed for many uses and values, the bureau maintains various guidelines and recommendations to minimize the effects of one use on another. One example is the incorporation of forested buffers surrounding high-use features during certain disturbance activities, such as gas development or timber harvesting. Some buffers are "no management zones" where the forest is to remain completely undisturbed, and others require that at least a partial canopy be maintained. Buffers not only shield infrastructure from view, but also help to maintain tree canopy connectivity, reduce dust, and maintain the feel of wild character. Roads and trails require a setback that serves as a buffer. Depending on the type of road or trail feature, different restrictions apply, from no cutting or disturbance to minimum overstory basal area retention requirements. These buffers preserve forest aesthetics and wild character in actively managed forests.

However, in balancing the diverse uses and values of state forests, there are times when a project may require a waiver to this requirement so that infrastructure may be placed within the buffer limits. This requires a review of the project and approval to waive the guidelines in favor of other priorities, such as minimizing fragmentation or promoting forest regeneration (Table 6.6). Waivers for this are often the result of discussions and negotiations to consider all the implications of various approaches.

Table 6.5a Public Use Roads (Z1) With Adjacent Infrastructure

	Distance from Road (in feet)							
	100		200		300		400	
Infrastructure Type	Miles of Road	Number of Roads	Miles of Road	Number of Roads	Miles of Road	Number of Roads	Miles of Road	Number of Roads
Compressor	0.4	6	1.0	8	1.5	8	2.1	12
Freshwater Impoundment	0.6	9	1.6	12	2.5	14	3.3	15
Gas Well	1.7	15	4.0	23	6.4	29	9.2	33
Meter	0.6	9	1.1	11	1.7	11	2.3	11
Other	0.0	1	0.1	2	0.3	3	0.4	3
Shale Gas Pipeline Corridor	37.9	65	59.4	68	72.5	72	82.0	76

Table 6.5b Drivable Trails (Z2) With Adjacent Infrastructure

	Distance from Road (in feet)							
	100		200		300		400	
Infrastructure Type	Miles of Trail	Number of Trails	Miles of Trail	Number of Trails	Miles of Trail	Number of Trails	Miles of Trail	Number of Trails
Compressor	0.1	1	0.2	1	0.2	1	0.2	1
Freshwater Impoundment	0.2	2	0.2	3	0.3	4	0.4	4
Gas Well	0.6	6	1.0	7	1.3	8	1.6	10
Meter	0.1	1	0.1	1	0.1	1	0.2	1
Shale Gas Pipeline Corridor	3.5	24	5.6	28	7.8	29	9.6	29

Table 6.5a-b - Infrastructure within 0-400 feet of roads Note: some roads are counted more than once if a road has an adjacent pipeline, compressor, pads, impoundments and other infrastructure, therefore columns are not additive for total impacts. Additionally, infrastructure is counted within all columns of lesser distances (i.e., the rows are not additive, and each column includes the road mileages contained in columns to their left).

Infrastructure Type	Number within Buffer	Acres Within Buffer
Pipeline	6	72.6
Road Right of Way	6	19.5
Compressor	3	17.5
Freshwater Impoundment	3	12.4
Gas Well	1	6.9
Meter or Valve Tap	3	2.4
Grand Total	22	131.4

Table 6.6. Projects since 2013 for which a waiver to place infrastructure within the set aesthetic buffer was approved.

Early efforts in shale gas development focused on reducing the number of fragmenting features in the forest by placing shale gas infrastructure in the same corridor as roads or other existing features, such as when pipelines are co-located with roads (Figures 6.14b and 6.14d). Although fragmentation is reduced overall, co-location creates a wider corridor to accommodate both features. The bureau also utilizes the placement of pipelines in road shoulders when appropriate (Figure 6.15), instead of a cleared ROW along the road or a cleared area in the forest behind the forested buffer. The intent for road shoulder pipelines is to reduce both fragmentation and effects to aesthetics, since the corridor can be maintained relatively narrow. Another option that has been useful in certain cases is the creation of a forested buffer between the road and a pipeline corridor to maintain aesthetics, wild character, and a continuous canopy (Figures 6.16 and 6.17). In addition, some linear features that intersect with roads, such as pipeline corridors, have a turn within a short distance from the road (Figure 6.18). In these cases, although the rights-of-way may overlap the buffer area, the wild character perception is still maintained because the bend in the cleared area limits the amount of un-forested area that is visible from a road or trail (Figure 6.18).

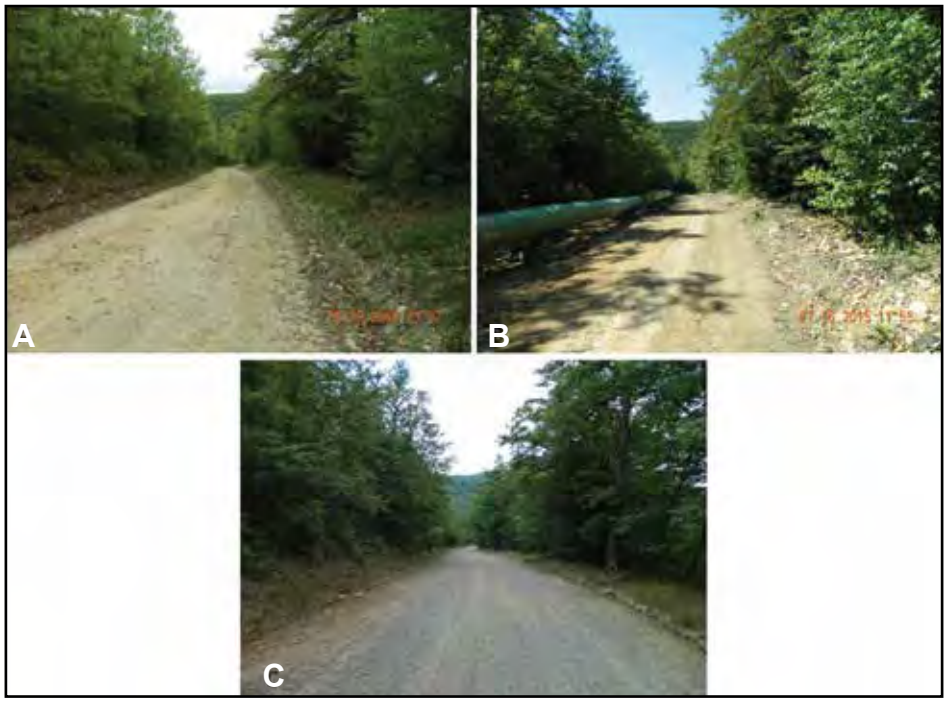


Figure 6.15. Public use road a) before; b) during; c) after gas pipeline installation in road shoulder.

Figure 6.16. Public use road and adjacent pipeline with a 50-foot buffer forested buffer and thick midstory of mountain laurel between the pipeline and road.

A) View of buffer from road corridor, looking toward pipeline ROW;

B) View of forested buffer from the pipeline ROW.

Figure 6.17. Public use roads with adjacent pipelines and a variable forested buffer. Each photo (A & B) shows segments of the road with no buffer (foreground) and the beginning of a forested buffer (background). Note the large canopy gap in the foreground and the increasing connectivity of the canopy across both the pipeline and the road in the area with the forested buffer in the background.

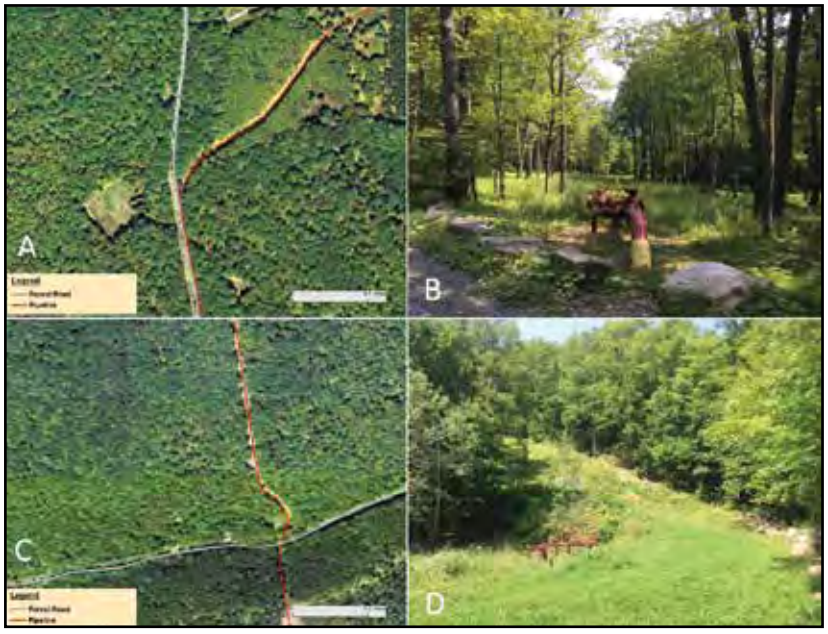


Figure 6.18. Two examples of pipeline rights-of-way with strategic bends to reduce line-of-sight from forest roads. Note how a relatively slight bend (seen in aerial imagery) creates a reduced line-of-sight of non-forested area (seen in photos)

A) looking northeast from the intersection of pipeline #1 right-of-way and the forest road;

B) aerial imagery of pipeline #1 at the same intersection;

C) looking northeast from intersection of pipeline #2 right-of-way and the road;

D) aerial imagery showing pipeline #2 right-of-way at this intersection.

Vistas

Vistas are recreational focal points, with visitors driving or hiking to a specific vista to take in the surrounding landscape (Figure 6.19). Many visitors plan a scenic drive to visit several vistas along a deliberate route. Vistas are established to provide views into or through the forest to unusual or attractive features of the landscape. The size of the vista, parking area, and need for signage and naming are also carefully considered. Because of long sight distances, vistas may be altered by gas infrastructure that traverses through or is placed within the viewshed. In the previous report, vistas were summarized for only those that were affected (disturbance on site). This analysis has been expanded to include visual impacts within the viewsheds of vistas. A viewshed analysis was conducted for all vistas in the core gas forest districts that includes the area in view from the vista to 5 miles (Figure 6.20). The analysis is based on a digital elevation model and predicts what areas can be seen based on topography. However, the analysis does not consider vegetation, such as tree cover. Therefore, the analysis represents a "bare earth" scenario to serve as an approximation for actual line-of-sight from the vista. This may not represent what can actually be seen.

Between 2008 and the end of 2016 in the core gas forest districts, gas infrastructure has been placed within the 5-mile radius viewshed of 46 vistas (of 190 vistas total). This infrastructure consists of 3.9 miles of pipeline corridors across 12 pipelines, 20.9 miles of road from 124 roads, and 193 pads totaling almost 296 acres.

Changes to vista visitation are not as quantifiable as a simple viewshed analysis. Nearby infrastructure can have a negative effect on the visit to the vista. Even if a view is preserved, the approach to the vista may be altered due to gas infrastructure. The Ramsey Point vista is an example of an affected vista because of the infrastructure that was placed nearby (Figures 6.21 and 6.22). However, it is also important to consider the negative scenic changes that were avoided in the placement of the well pad. For example, this vista approach was affected because the choice was made to avoid major changes to the viewshed of the Pine Creek Rail Trail and to the major roads through the Pine Creek Valley. To achieve this, the only feasible alternative was to site the infrastructure on the ridgetops based on the topography and desire to minimize the disturbance. This example illustrates the complexity of the decision-making for differing forest uses and tradeoffs that are made at a local level to prioritize and minimize effects in a holistic way.

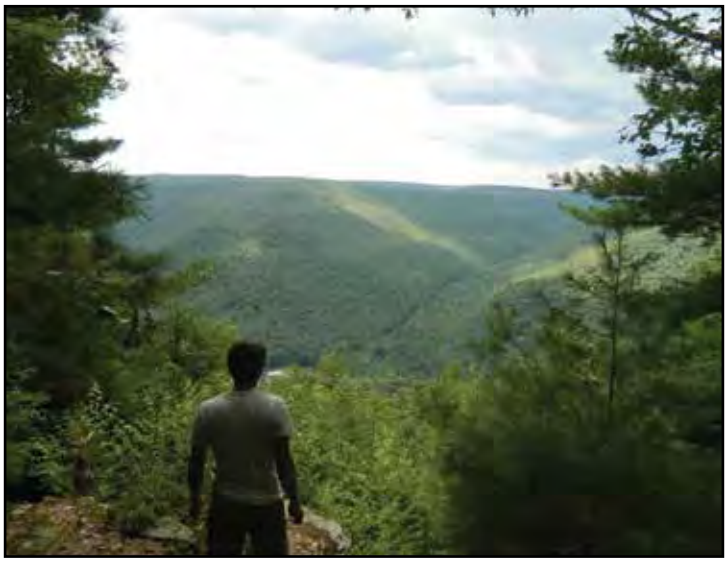


Figure 6.19. Typical state forest vista.

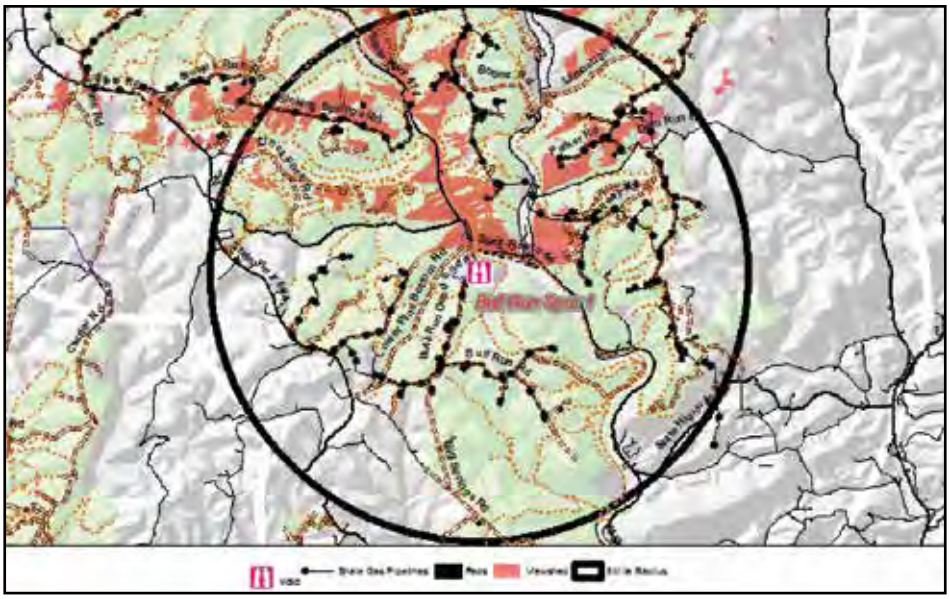


Figure 6.20. Example of a 5-mile radius viewshed. Magenta denotes area seen from the vista in the absence of vegetation.

Figure 6.21. Ramsey Point Vista a) view from vista; b) approach to vista.

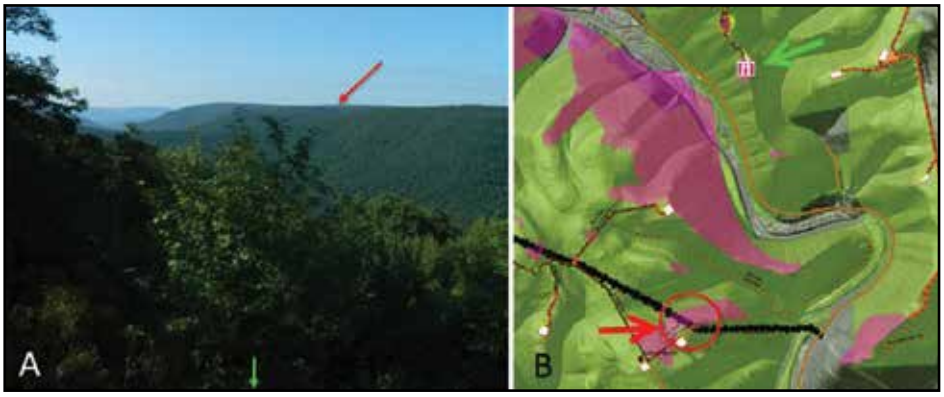


Figure 6.22. A) View from Ramsey Point Vista looking south;

B) viewshed analysis (magenta overlay). Green arrow denotes vista location, red arrow denotes pipeline cutting through the viewshed boundary. Note: this pipeline was created prior to shale gas development and would not be counted as new infrastructure in the viewshed analysis. The approach to the vista; however, was impacted by the creation of the shale gas well pad seen in Figure 6.21.

Sound Monitoring

Soundscape is another component of wild character and shale gas development introduces novel sounds to the forest landscape. This is in the form of heavy equipment traffic, drilling, compressor stations, equipment on well pads, and others. To quantify the potential effects to visitors (and wildlife), sound levels at gas infrastructure pads are monitored as part of the monitoring efforts on state forest land.

The sound level is reported in db(A) Ldn which is the unit of measure for the bureau's sound guideline. The guideline reads: ***When no suitable alternatives exist, and a compressor station must be sited on state forest lands, the operating noise level of the compressor station should not exceed an Ldn of 55 db(A) at any distance greater than 300 feet from the compressor building.*** The Ldn metric is the average sound level over a 24-hour period, with a penalty added for noise during the nighttime hours of 10:00 p.m. and 7:00 a.m. This is a standard metric for use in reporting noise magnitude.

Compressor Stations

Since 2013, the shale gas monitoring program has measured operating sound levels at 14 compressor station sites, each of which has a unique configuration and specifications (Figure 6.23). The monitoring program collects ambient sound data at approved compressor sites before compressors are built (Figure 6.24). The bureau also collects operating sound data twice a year at each operating station, once with leaves on the trees, and once with leaves off (Figure 6.25). The guidelines include a threshold for sound levels at compressor stations, which is an average of 55 db(A) Ldn at 300 feet from anything on the compressor pad capable of producing noise. Ambient sound has been measured at six approved compressor locations. Three compressor stations, which had such ambient sound level data, have been built and become operational since the ambient data were collected. Two others have not yet been built. The final station was operational at the onset of monitoring, but has since gone offline. Each site is uniquely configured and situated among the native vegetation (Figures 6.23 and 6.25). Such site-specific details can make generalization about conditions surrounding compressor stations difficult.

Figure 6.23. Examples of different configurations and types of compressor stations.

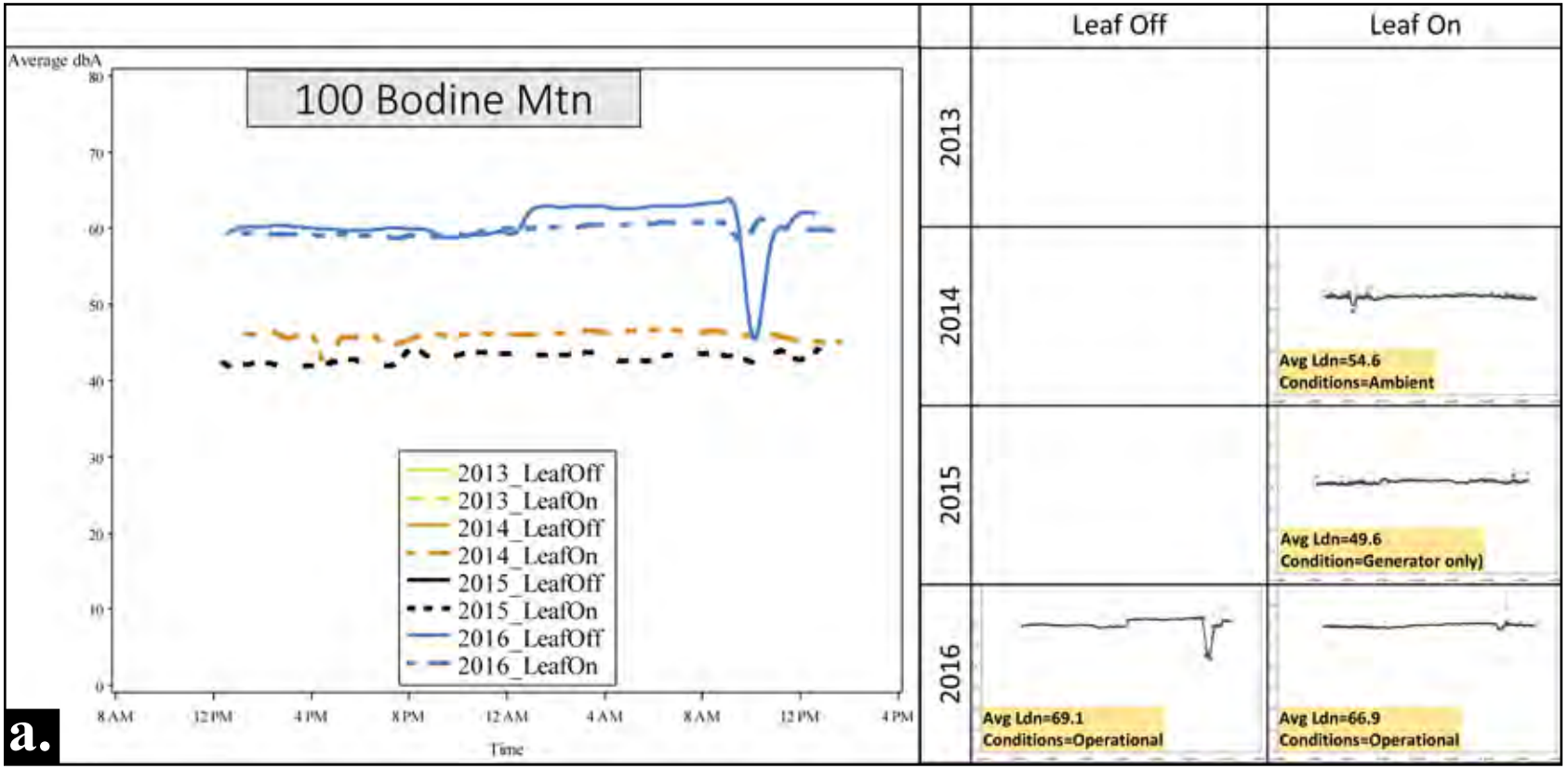
Figure 6.24. Top photos show conditions when ambient reading was taken at a proposed compressor site in 2013. Lower photos show conditions at compressor site in 2015 after station was constructed.

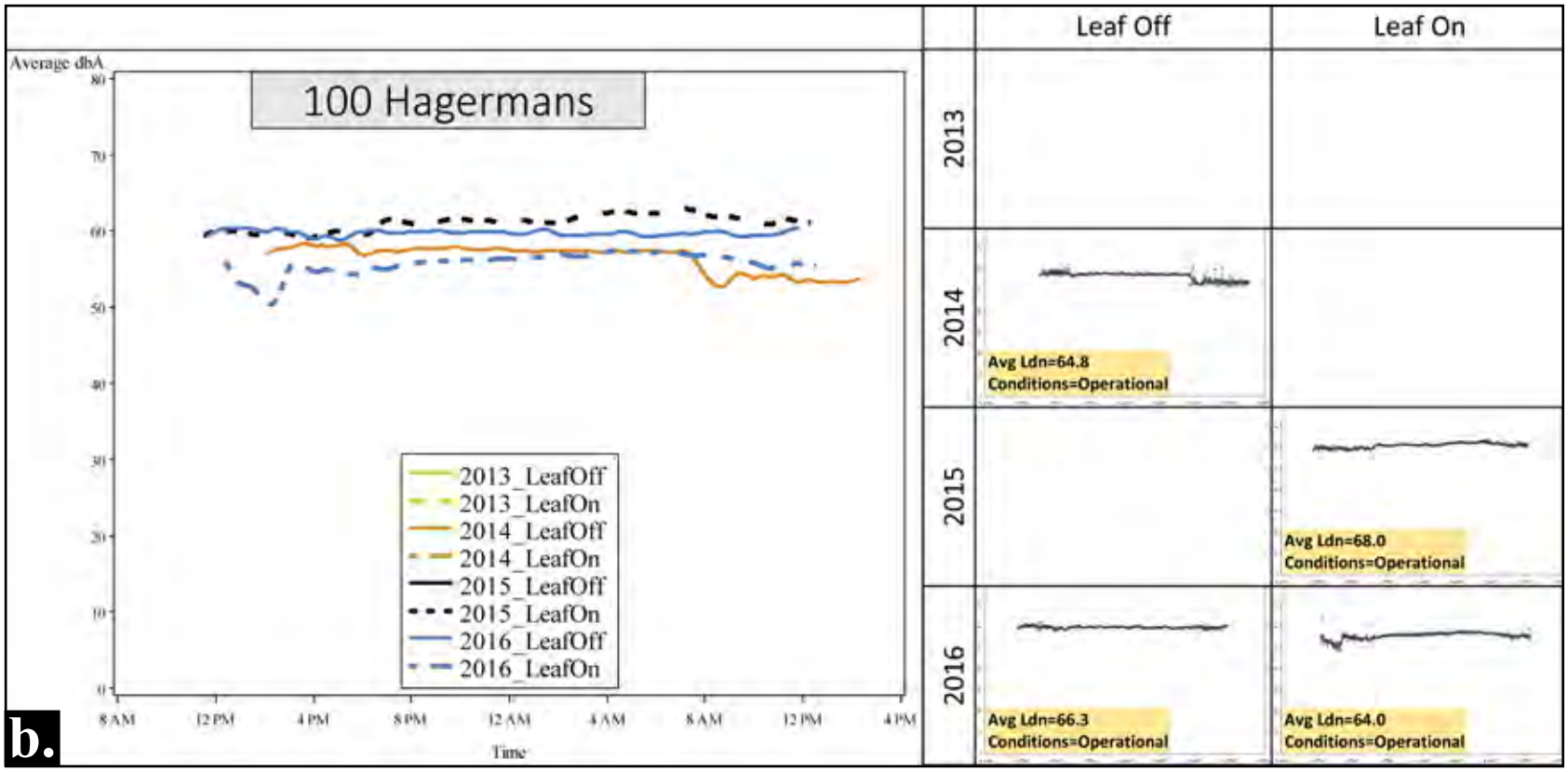
Figure 6.25. Top row shows the varying conditions of "leaf off" measurements and the bottom row shows '"leaf on" conditions across various compressor sites.

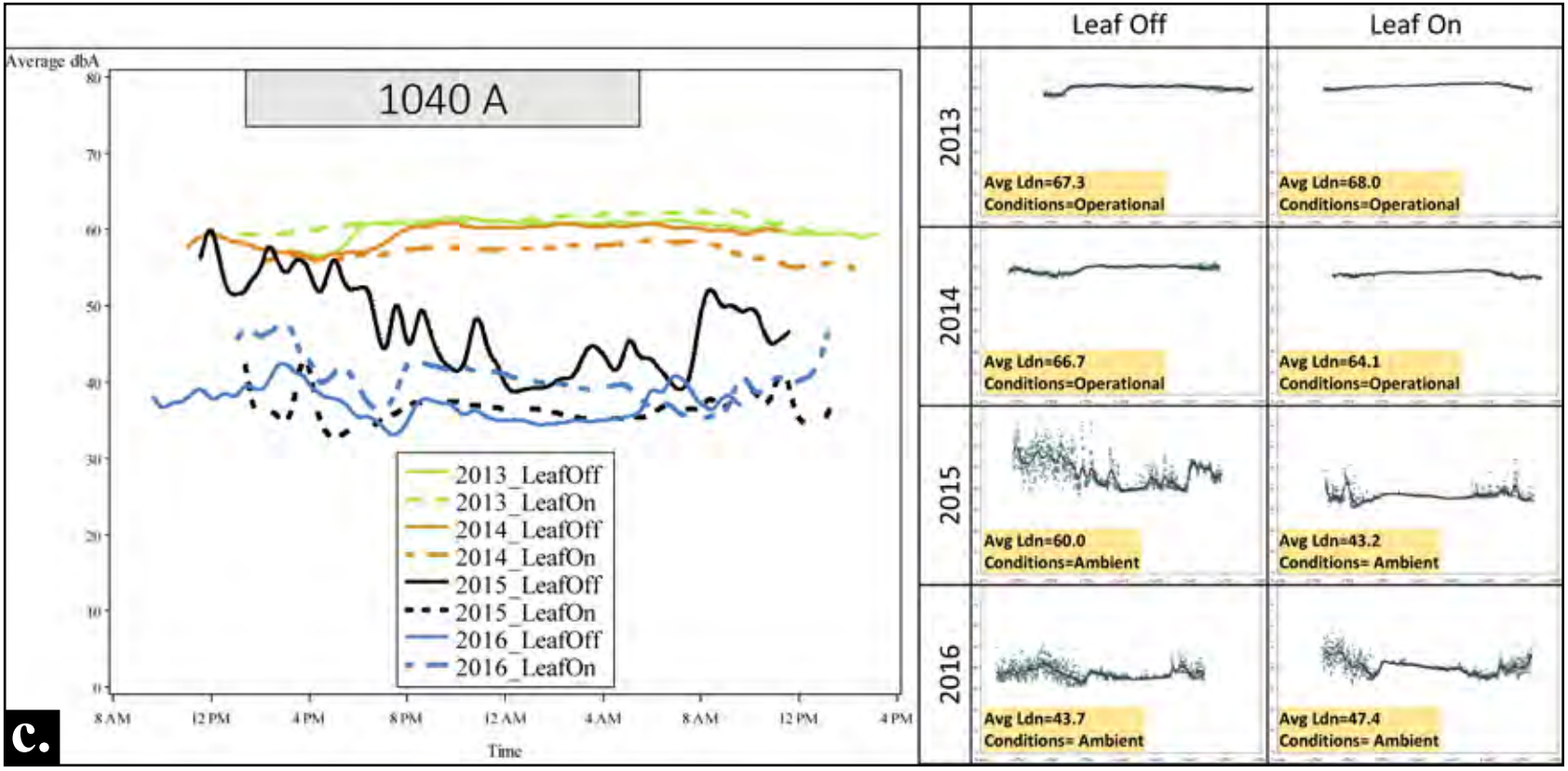
In general, each compressor station has a unique signature and it is difficult to generalize across these infrastructure units. There were no differences between leaf off and leaf on conditions at 300 feet from the compressor station (Table 6.7 and Figure 6.26). There were no discernable differences in sound levels at night versus daytime, although a few measurements of ambient conditions reveal a variation throughout the 24-hour period which could be explained by a suite of natural conditions, from dawn chorus to thunderstorms, as well as traffic or forest visitors. Despite the wide variation in sound signatures at each station, Figure 6.26 reveals a few key points. First, readings at ambient conditions have much more diversity of levels, although the ambient average is typically lower than when the compressor station is operational (Figures 6.26c, 6.26g and 6.26m). For example, Compressor 729 has ambient sound levels around 10-20 db(A) lower than the average operating sound levels (Figure 6.26m). The electric compressor station generally had a lower average operational sound level, ranging from 45.1-50.4 average db(A) Ldn under operational conditions in visits to this compressor (Figure 6.26i).

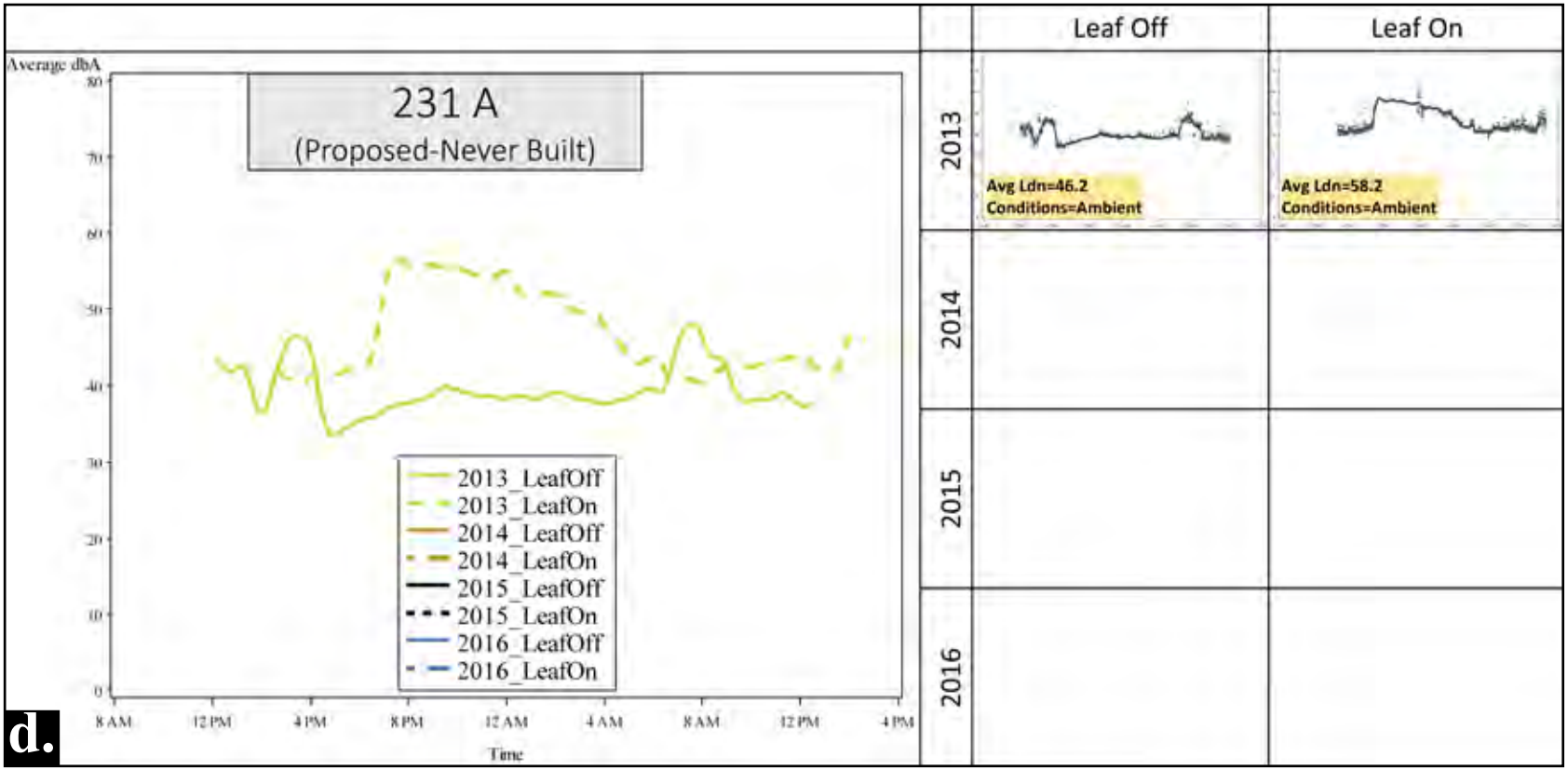
Compressor	Year	2013		2014		2015		2016	
		Leaf Off	Leaf On	Leaf Off	Leaf On	Leaf Off	Leaf On	Leaf Off	Leaf On
100- Bodine Mtn	Avg Ldn	--	--	--	54.6	--	49.6	69.1	66.9
	Condition	--	--	--	Amb	--	Ope**	Ope	Ope
100-Hagermans	Avg Ldn	--	--	64.8	--	--	68	66.3	64
	Condition	--	--	Ope	--	--	Ope	Ope	Ope
1040A	Avg Ldn	67.3	68.0	66.7	64.1	60.0	43.2	43.7	47.4
	Condition	Ope	Ope	Ope	Ope	Amb	Amb	Amb	Amb
231A	Avg Ldn	46.2	58.2	--	--	--	--	--	--
	Condition	Amb	Amb	--	--	--	--	--	--
285A	Avg Ldn	76.9	69.0	70.5	71.2	58.2	54.0	52.0	57.2
	Condition	Ope	Ope	Ope	Ope	Ope	Ope	Ope	Ope
289A	Avg Ldn	61.7	62.9	64.4	64.7	58.7	59.6	56.8	55.9
	Condition	Ope	Ope	Ope	Ope	Ope	Ope	Ope	Ope
293A	Avg Ldn	--	--	--	--	--	48.7	63.9	67.0
	Condition	--	--	--	--	--	Amb	Ope	Ope
322A	Avg Ldn	--	65.0	--	--	--	52.6	--	--
	Condition	--	Amb	--	--	--	Amb	--	--
324-Electric	Avg Ldn	--	--	48.0	--	--	50.4	45.1	45.5
	Condition	--	--	Ope	--	--	Ope	Ope	Ope
587A	Avg Ldn	68.3	74.3	64.6	62.8	62.5	65.6	61.8	62.5
	Condition	Ope	Ope	Ope	Ope	Ope	Ope	Ope	Ope
595A	Avg Ldn	66.0	72.7	69.9	66.6	67.0	58.5	64.8	67.4
	Condition	Ope	Ope	Ope	Ope	Ope	Ope	Ope	Ope
685A	Avg Ldn	66.5	59.1	71.9	62.3	55.1	50.5	54.4	56.2
	Condition	Ope	Ope	Ope	Ope	Ope	Ope	Ope	Ope
729A	Avg Ldn	53.5	50.0	--	--	70.6	65.0	65.8	68.3
	Condition	Amb	Amb	--	--	Ope	Ope	Ope	Ope
997A	Avg Ldn	--	67.3	--	67.1	67.1	63.2	66.3	64.7
	Condition	--	Ope	--	Ope	Ope	Ope	Ope	Ope

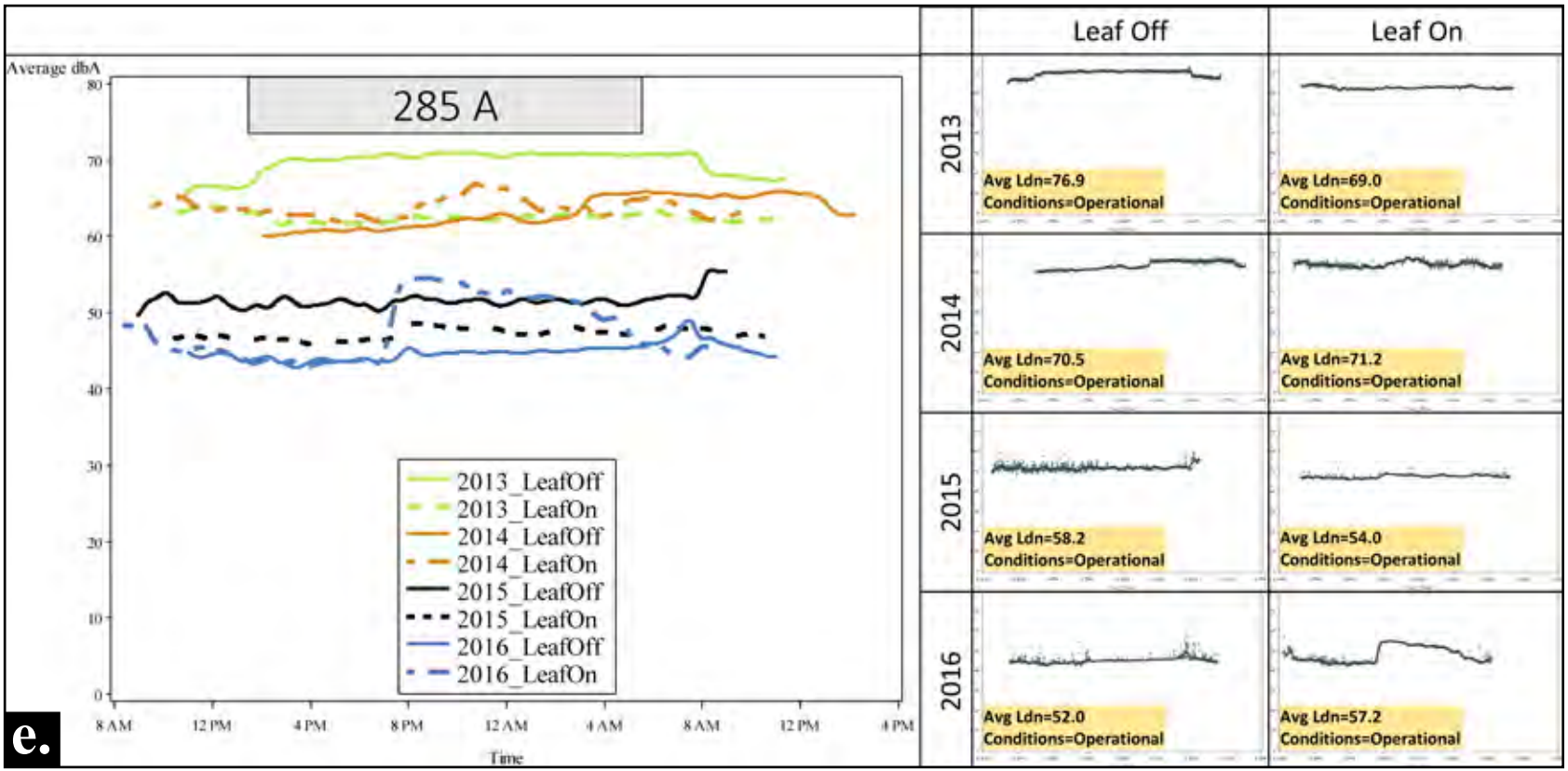
Table 6.7. Average db(A) Ldn and operational condition (ope=operational; amb=ambient) for every compressor station measurement taken since 2012. Measurements below 55db(A) are marked in green. **The compressor station at 100-Bodine Mtn was operational for the Leaf On-2015 measurement, but only a generator was running (no compressors).

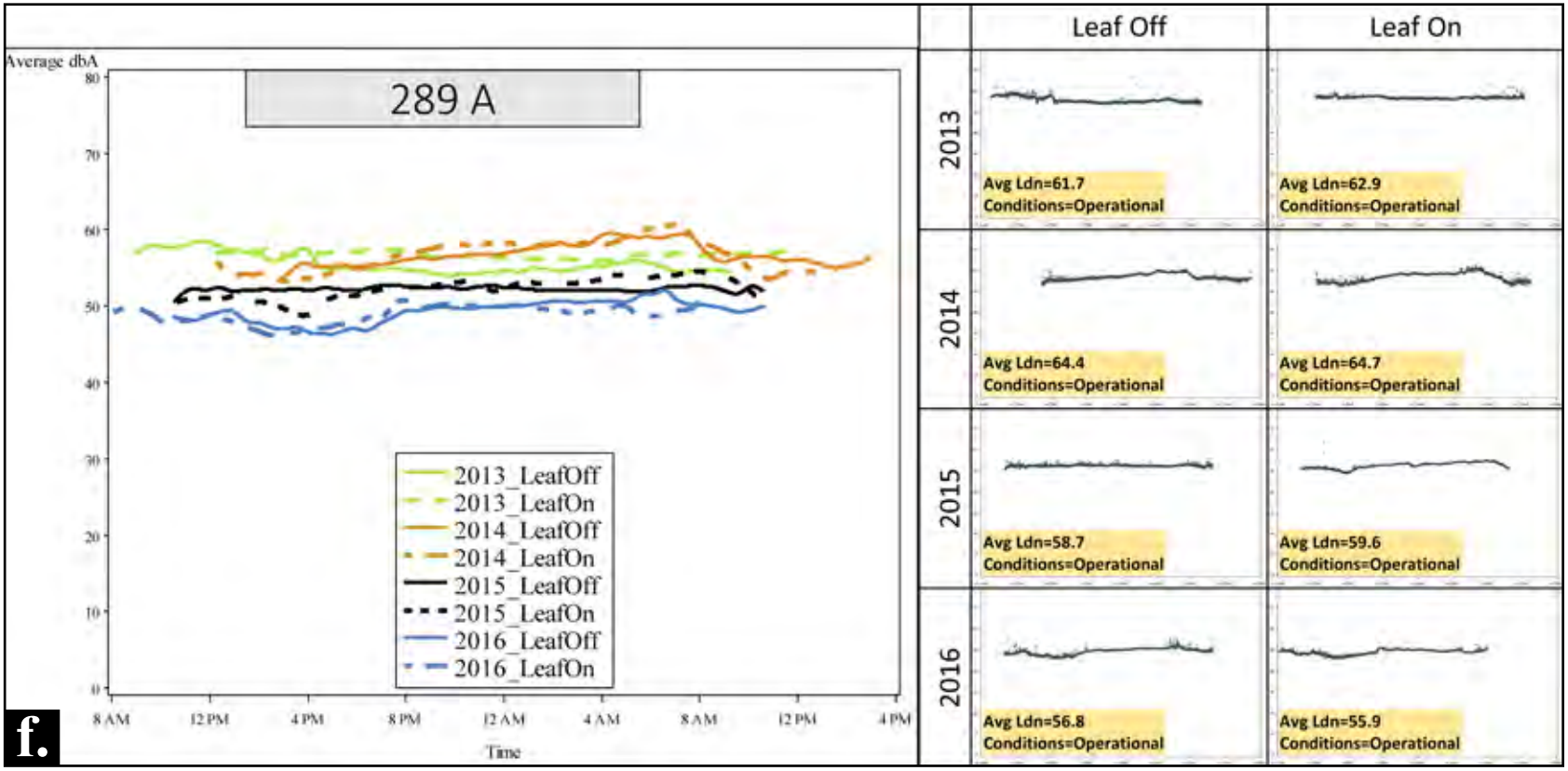

100 Bodine Mtn
Average dbA
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
a.
Leaf Off
Leaf On
2013
2014
2015
2016
Avg Ldn=54.6
Conditions=Ambient
Avg Ldn=49.6
Condition=Generator only)
Avg Ldn=69.1
Conditions=Operational
Avg Ldn=66.9
Conditions=Operational

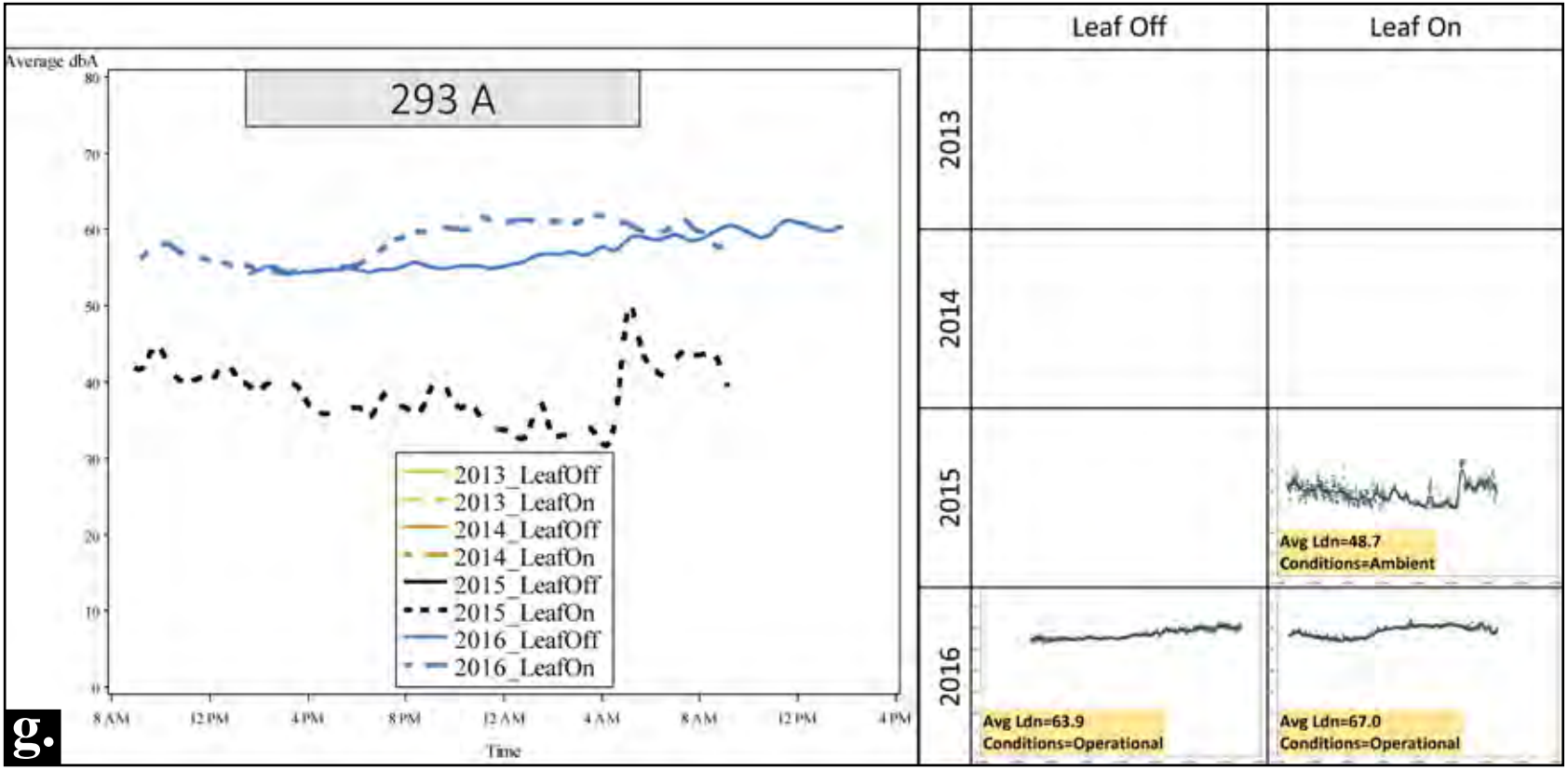

b.
100 Hagermans
Average dbA
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
Leaf Off
Leaf On
2013
2014
2015
2016
Avg Ldn=64.8
Conditions=Operational
Avg Ldn=68.0
Conditions=Operational
Avg Ldn=66.3
Conditions=Operational
Avg Ldn=64.0
Conditions=Operational

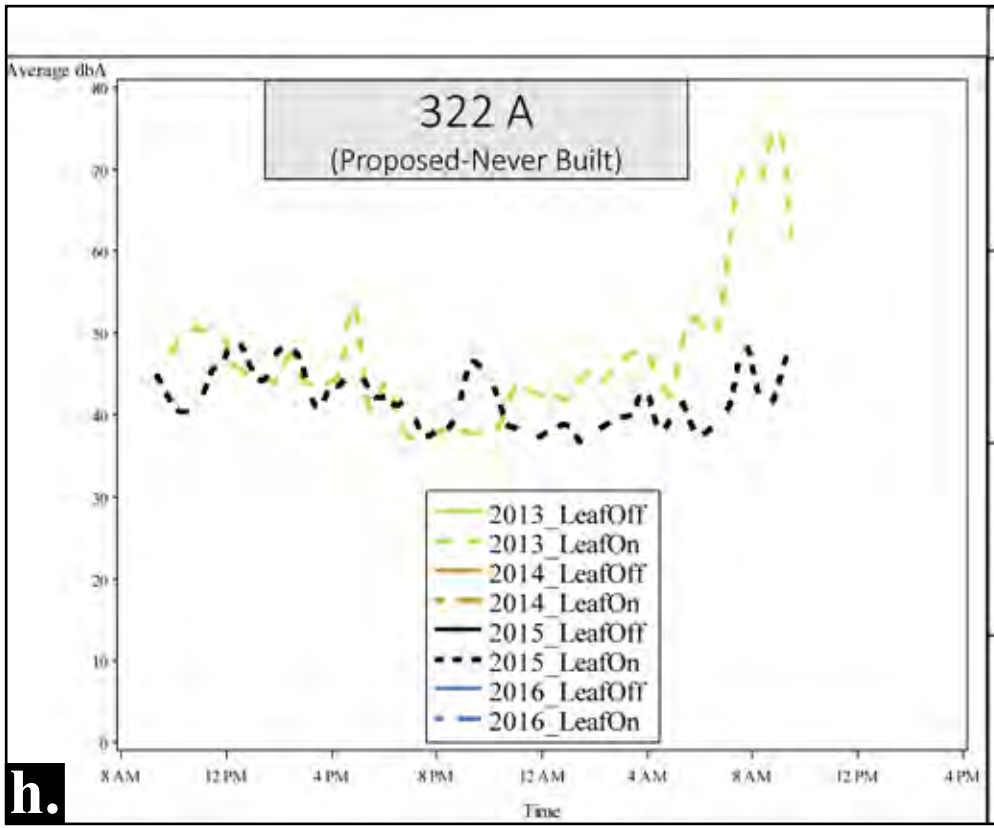

Average dbA
1040 A
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
c.
Leaf Off
Leaf On
2013
2014
2015
2016
Avg Ldn=67.3
Conditions=Operational
Avg Ldn=68.0
Conditions=Operational
Avg Ldn=66.7
Conditions=Operational
Avg Ldn=64.1
Conditions=Operational
Avg Ldn=60.0
Conditions=Ambient
Avg Ldn=43.2
Conditions= Ambient
Avg Ldn=43.7
Conditions= Ambient
Avg Ldn=47.4
Conditions= Ambient


231 A
(Proposed-Never Built)
Average dbA
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
d.
Leaf Off
Leaf On
2013
2014
2015
2016
Avg Ldn=46.2
Conditions=Ambient
Avg Ldn=58.2
Conditions=Ambient


285 A
Average dbA
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
e.
Leaf Off
Leaf On
2013
Avg Ldn=76.9
Conditions=Operational
Avg Ldn=69.0
Conditions=Operational
2014
Avg Ldn=70.5
Conditions=Operational
Avg Ldn=71.2
Conditions=Operational
2015
Avg Ldn=58.2
Conditions=Operational
Avg Ldn=54.0
Conditions=Operational
2016
Avg Ldn=52.0
Conditions=Operational
Avg Ldn=57.2
Conditions=Operational

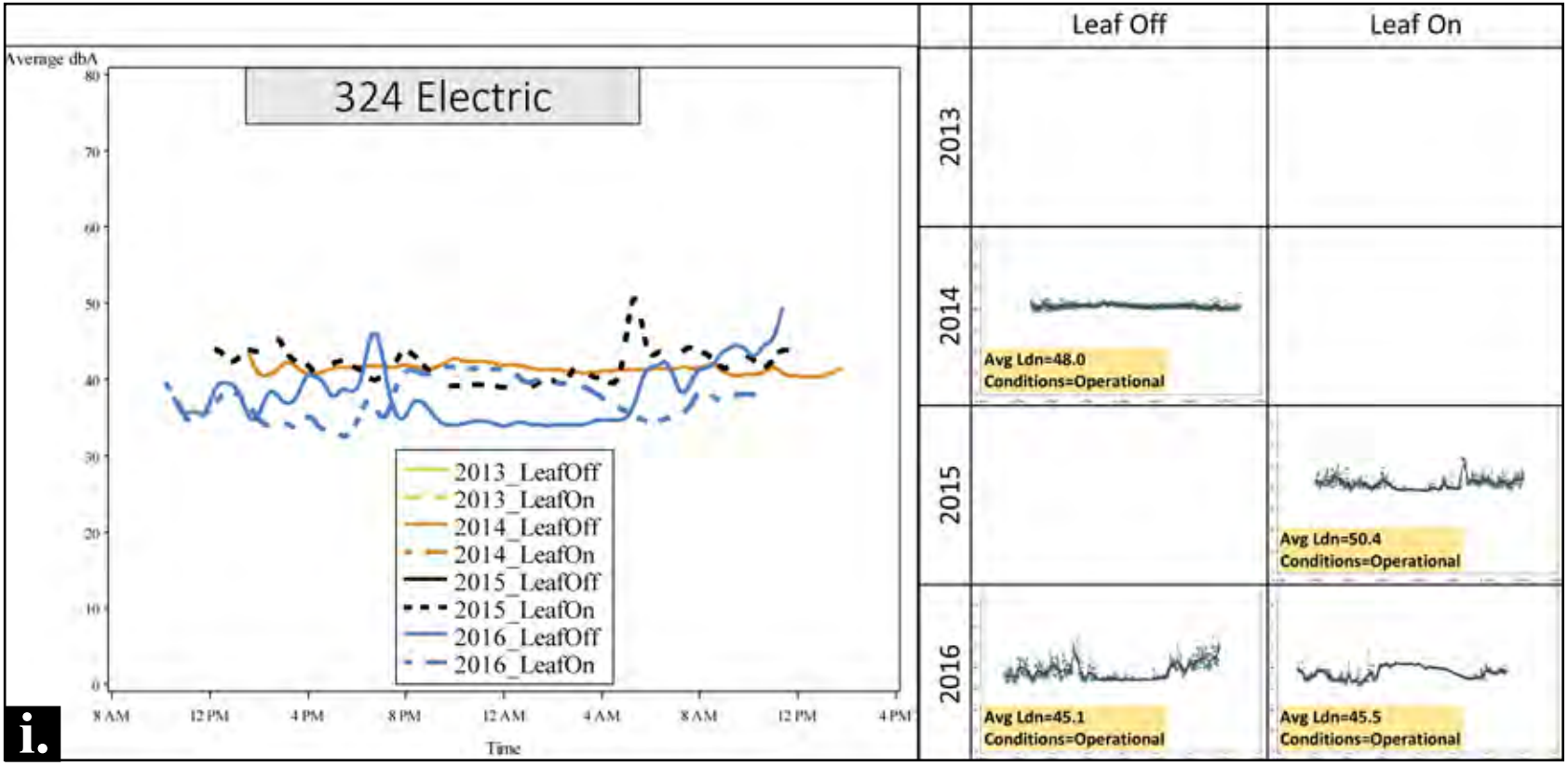

289 A
Average dbA
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
f.
Leaf Off
Leaf On
2013
Avg Ldn=61.7
Conditions=Operational
Avg Ldn=62.9
Conditions=Operational
2014
Avg Ldn=64.4
Conditions=Operational
Avg Ldn=64.7
Conditions=Operational
2015
Avg Ldn=58.7
Conditions=Operational
Avg Ldn=59.6
Conditions=Operational
2016
Avg Ldn=56.8
Conditions=Operational
Avg Ldn=55.9
Conditions=Operational

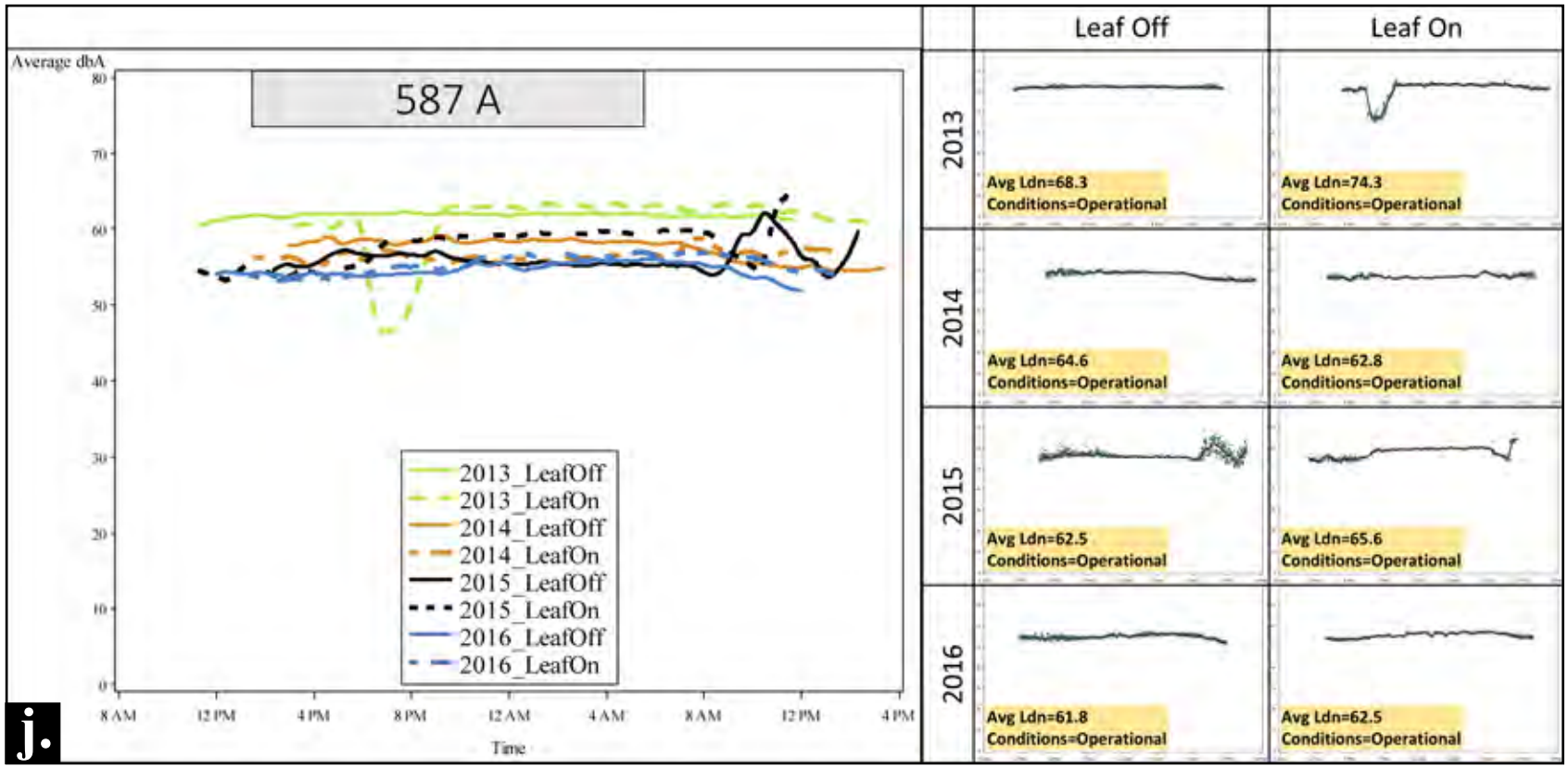

293 A
Average dbA
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
g.
Leaf Off
Leaf On
2013
2014
2015
2016
Avg Ldn=48.7
Conditions=Ambient
Avg Ldn=63.9
Conditions=Operational
Avg Ldn=67.0
Conditions=Operational

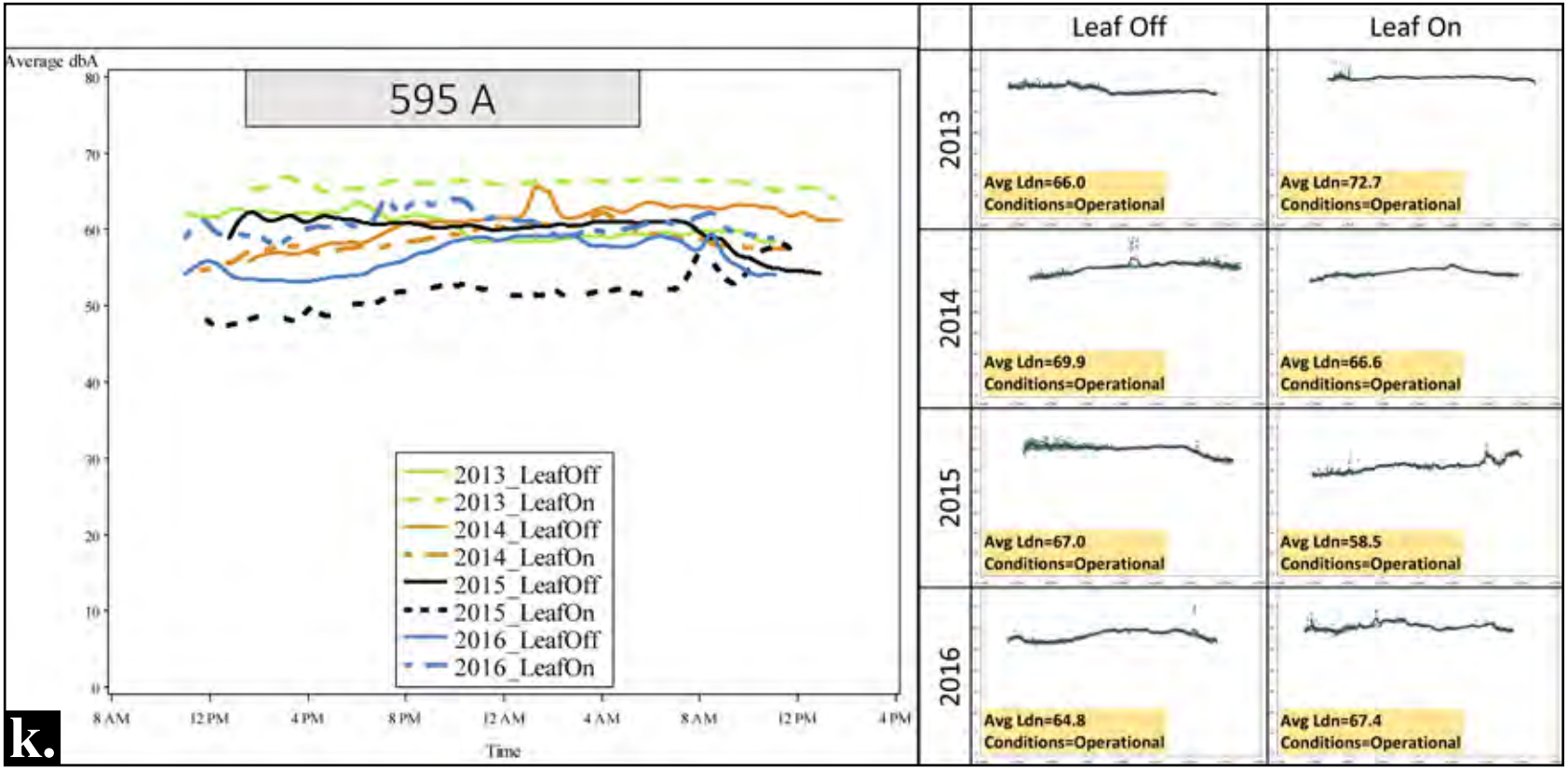


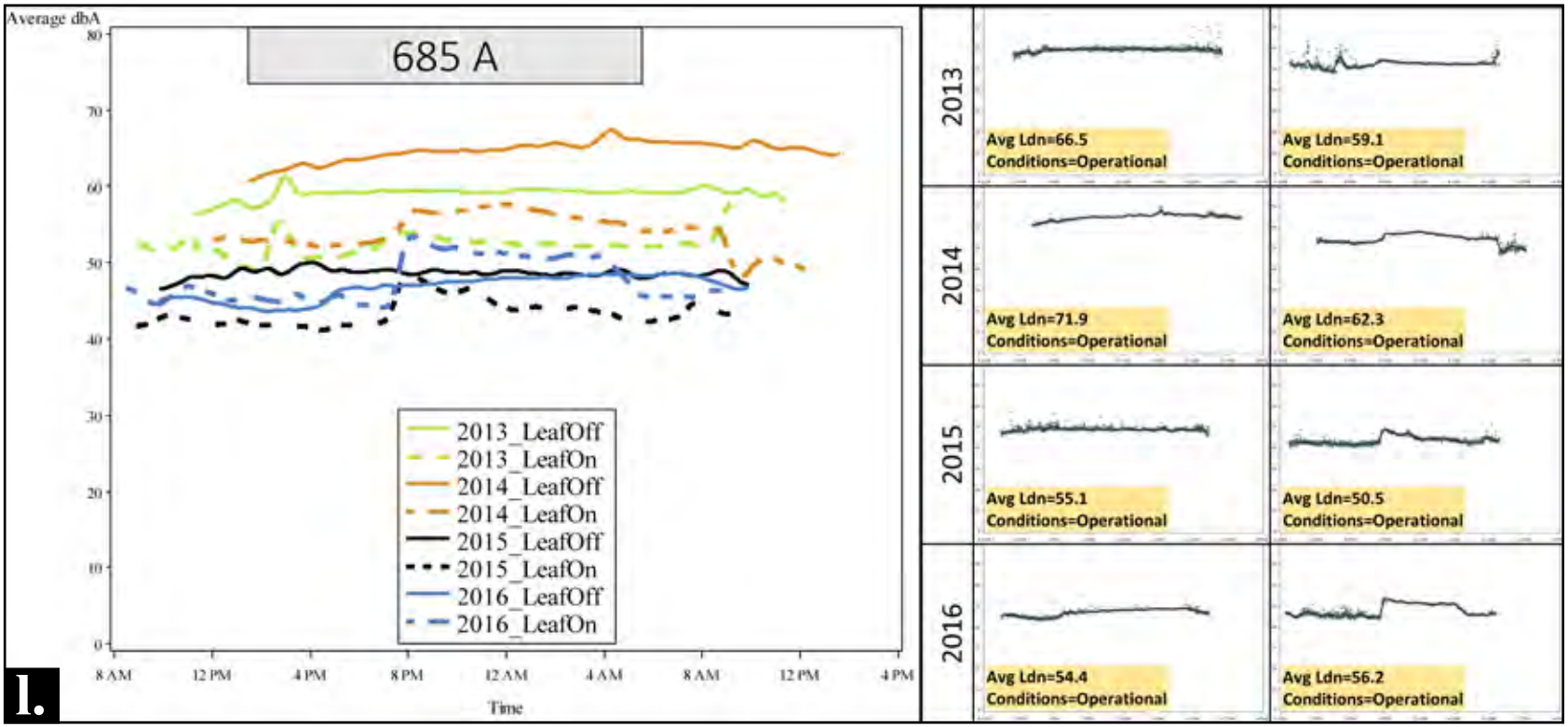
h.

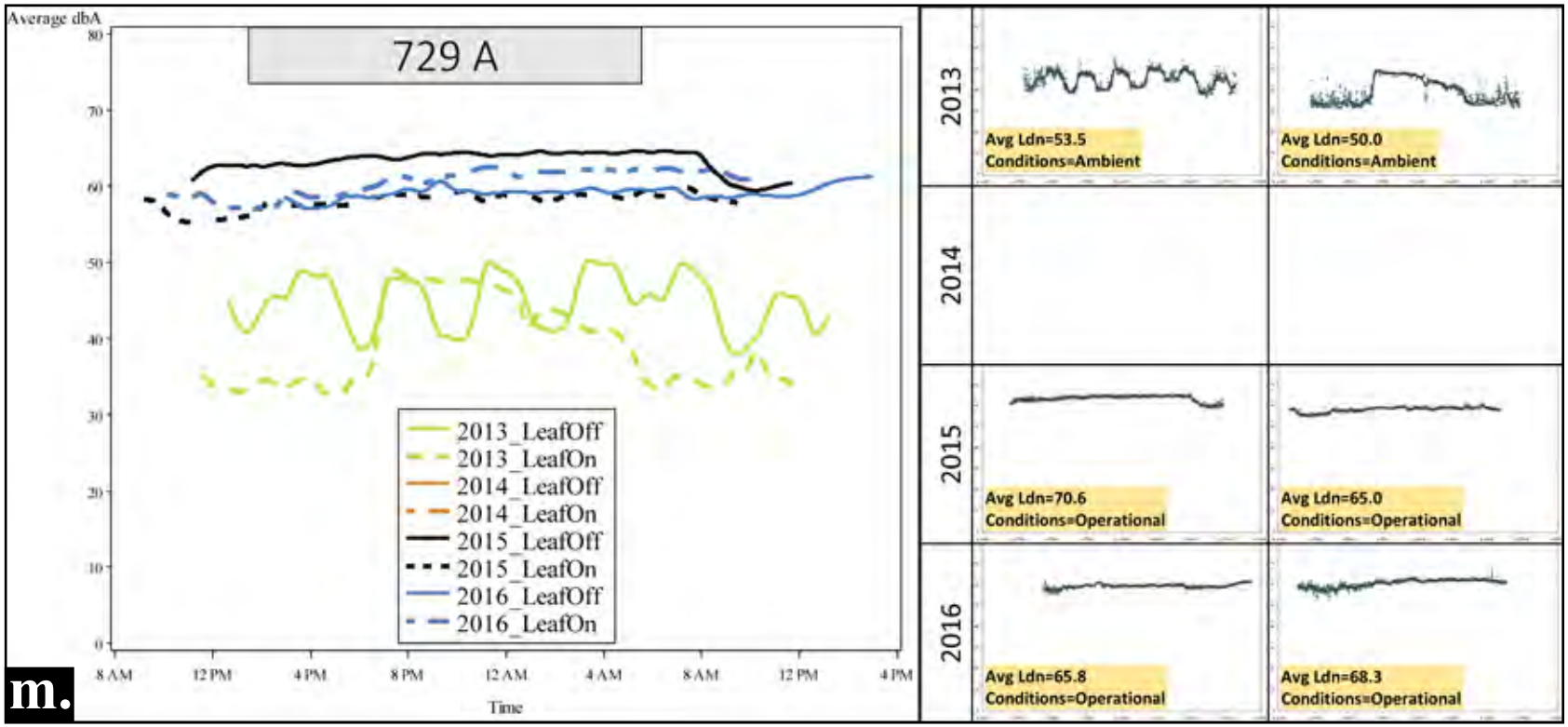
	Leaf Off	Leaf On
2013		Avg Ldn=65.0 Conditions=Ambient
2014		
2015		Avg Ldn=52.6 Conditions=Ambient
2016		


Average dbA
324 Electric
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
i.
Leaf Off
Leaf On
2013
2014
2015
2016
Avg Ldn=48.0
Conditions=Operational
Avg Ldn=50.4
Conditions=Operational
Avg Ldn=45.1
Conditions=Operational
Avg Ldn=45.5
Conditions=Operational


Average dbA
587 A
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
j.
Leaf Off
Leaf On
2013
Avg Ldn=68.3
Conditions=Operational
Avg Ldn=74.3
Conditions=Operational
2014
Avg Ldn=64.6
Conditions=Operational
Avg Ldn=62.8
Conditions=Operational
2015
Avg Ldn=62.5
Conditions=Operational
Avg Ldn=65.6
Conditions=Operational
2016
Avg Ldn=61.8
Conditions=Operational
Avg Ldn=62.5
Conditions=Operational


595 A
Average dbA
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
k.
Leaf Off
Leaf On
2013
Avg Ldn=66.0
Conditions=Operational
Avg Ldn=72.7
Conditions=Operational
2014
Avg Ldn=69.9
Conditions=Operational
Avg Ldn=66.6
Conditions=Operational
2015
Avg Ldn=67.0
Conditions=Operational
Avg Ldn=58.5
Conditions=Operational
2016
Avg Ldn=64.8
Conditions=Operational
Avg Ldn=67.4
Conditions=Operational


Average dbA
685 A
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
l.
2013
Avg Ldn=66.5
Conditions=Operational
Avg Ldn=59.1
Conditions=Operational
2014
Avg Ldn=71.9
Conditions=Operational
Avg Ldn=62.3
Conditions=Operational
2015
Avg Ldn=55.1
Conditions=Operational
Avg Ldn=50.5
Conditions=Operational
2016
Avg Ldn=54.4
Conditions=Operational
Avg Ldn=56.2
Conditions=Operational


729 A
Average dbA
80
70
60
50
40
30
20
10
0
8 AM
12 PM
4 PM
8 PM
12 AM
4 AM
8 AM
12 PM
4 PM
Time
2013_LeafOff
2013_LeafOn
2014_LeafOff
2014_LeafOn
2015_LeafOff
2015_LeafOn
2016_LeafOff
2016_LeafOn
m.
2013
2014
2015
2016
Avg Ldn=53.5
Conditions=Ambient
Avg Ldn=50.0
Conditions=Ambient
Avg Ldn=70.6
Conditions=Operational
Avg Ldn=65.0
Conditions=Operational
Avg Ldn=65.8
Conditions=Operational
Avg Ldn=68.3
Conditions=Operational

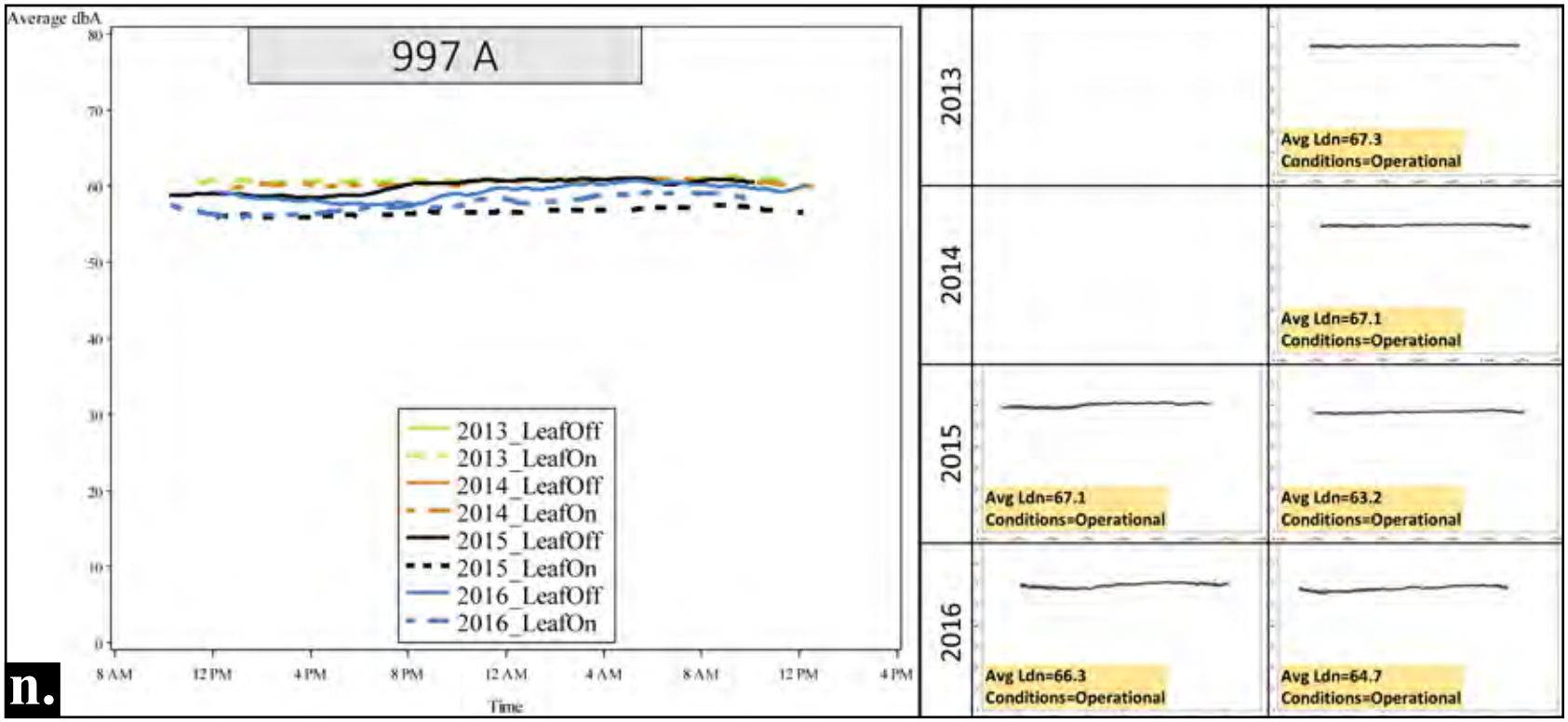


Figure 6.26 A-N. Compressor monitoring graphs for each of the 14 compressor sites.

Several compressors that have been online since 2013 show lower operational 24-hour averages starting in 2015 (Figures 6.26e, 6.26f and 6.26l). The compressor station sound levels may have decreased due to noise attenuation modifications, decreased production, or compressor station shut down. Operators communicate with the bureau regarding noise attenuation efforts and subsequent measurements have shown decreases in sound levels. Attenuation methods include things such as tree plantings or enclosing noisy equipment in insulated structures. Decreased natural gas production may also lead to changes in compression needs, which may affect sound levels. In some cases, when compressor engines and fans have been observed to be off, sound levels dropped substantially.

Well pads

Well pads with permanent vegetation monitoring sites are also measured for sound at 300 feet from the nearest sound source while collecting vegetation data. Five sound measurements were recorded at well pads in 2014, four in 2015, and five pads in 2016. Because these data are not collected over a 24-hour period, the sound levels are reported in average db(A), which does not include the nighttime adjustment associated with Ldn.

Table 6.8 shows the average value for sound meter data collected every five seconds over a short period (several hours). Measurements show that well pads have sound levels similar to ambient conditions (Table 6.8 and Figure 6.27).

While the bureau has only measured sound levels at 14 well pads, the sound levels measured and observed have been relatively quiet. The sound guideline was not written specifically for well pads, but well pads often have various equipment needed for gas production, which has the potential to generate sound. Because well pad sound levels can be efficiently measured while collecting other monitoring data, the bureau will continue to monitor these to examine trends and expand

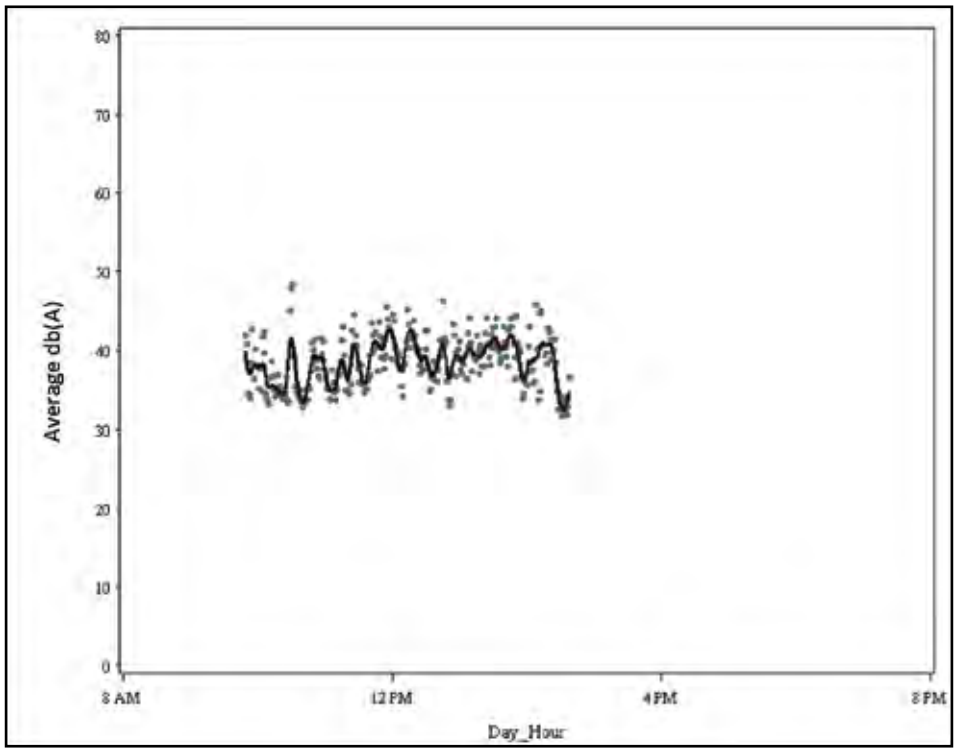


Figure 6.27. Well pad sound monitoring graph for one of the 14 well pad sites. Other well pad graphs show similar trends.

Well Pad ID	Min	Max	Average
1006-Turkey Pad	35	53	39
100-Pad M	36	53	42
154-Pad A	35	63	38
285-Pad F	32	56	38
289-Pad B	32	51	34
324-Pad A	34	48	36
356-Pad J	34	69	37
587-Pad 3	35	54	37
595-Pad E	32	58	34
678-Pad B	32	55	36
706-Pad 10	32	64	36
720-Pad A	33	56	38
724-Pad A	30	64	35
729-Pad E	32	55	34

Table 6.8. Minimum, maximum, and average db(A) readings for well pads recorded for several hours during the day for each site.

the baseline dataset of 'typical' sound levels at well pads across state forest land.

Sound Summary and Future Direction

Sound levels have been measured at 12 operating compressor stations, two approved compressor station sites (yet to be built), and 14 well pads. Several compressor stations show a general trend since 2013 of decreasing average sound level. Four of 12 compressor stations monitored in 2016 had at least one of the two readings of the 24-hour average below the bureau's guideline for sound level. This is due to several factors, including mitigation practices, decreased volumes being processed at the compressors, and some compressors fully or partially going offline during decreased demand and production. The bureau is working cooperatively with operators to address compressor sound and to meet recommended guideline thresholds. Well pads have average sound levels like ambient conditions, both in the level (db(A)) and the variability over time (diversity of sound magnitude).

The bureau's monitoring protocols examine the magnitude of sound near infrastructure, but level is only one component of noise. These measures provide a gauge to detect trends and a relatively simple metric to establish thresholds and guidelines. However, the true effects are more complex than solely the magnitude of the sound. To understand the biological effect and the disruption caused by a sound, it is necessary to look at the character of the sound and delve into the complexities of perception. More information is needed to determine what soundscapes are acceptable or disruptive beyond just the magnitude. Frequency, persistence, and context of the sounds are essential to get at the true effects to the soundscape and wild character. To address this complex question, a research project is underway in conjunction with researchers at Penn State University. The following description from the research proposal submitted to the bureau in 2016 describes the goals of the study:

> *The sounds emanating from these natural gas compressor stations are constant, and may interfere with the experiences visitors seek while recreating within these forests. Furthermore, sound levels vary, not only with topography and vegetation density, but also by individual compressor stations. Anthropogenic sounds in protected area settings not only impact ecological systems and processes, but they also impact visitor experiences, and have been found to negatively influence aesthetic evaluations of protected area settings (Weinzimmer et al., 2014) and mood state (Benfield et al., 2014). To date, it is unknown how current or future natural gas compressor station sounds influence visitor experiences, and research is needed to inform visitor management in these Pennsylvania State Forest areas.*
>
> *The proposed project serves to examine Pennsylvania State Forest visitor thresholds for experiencing natural gas compressor station sounds. Specifically, this study will serve to gain an understanding of the sounds/noise (both natural and anthropogenic) that PA State Forest visitors are experiencing, and how they influence the visitor experience. Moreover, this study will examine the sound/noise levels (masking of natural sounds) in which natural gas*

compressor station sounds become: a) annoying and b) unacceptable; thus informing thresholds.

Recreation Activity

Trends and effects to forest use can be quantified by examining changes in recreational use of the forest. Without formal user inventories across every location on state forest, the 'actual' recreational use cannot be determined. Therefore, documentation that exists for recreation, such as agreements and permits, is examined to discern trends.

Recreational Agreements

Each year the bureau has vendors, groups, and individuals who request permission to hold events or conduct services on state forest land. Permission for these activities are carried out through either a Special Activities Agreement (SAA) or Commercial Activities Agreement (CAA). These agreements allow the bureau to define the constraints and conditions under which the activity must take place to minimize conflicts and ensure appropriate use of state forest land. A special questionnaire attachment is included with the agreement to capture changes in use or displacement due to shale gas activities on these recreation events (Figure 6.28).

Since 2013, the bureau has instituted 193 new agreements across all forest districts. Of those agreements, 17 respondents (8.8 percent overall) indicated that shale gas activity has affected their use or experience of the state forest (Figure 6.29 a, c). For core gas forest districts only, the number of agreements indicating that they were affected is nine (12.5 percent) (Figure 29 b, d). No events reported being relocated due to gas, but six respondents indicated that they did have to re-route the course of their event due to gas activities. For those affected, the explanation was attributed to unfavorable experiences, snowmobile trail inaccessibility (due to closed or plowed roads or gas traffic on groomed trails), or natural conditions that were less peaceful (loss of wild character).

Camping Permits

Permits are only required for motorized camping or for designated sites. Backcountry/hike-in campers do not need a permit unless camping at a site for more than one consecutive night. The bureau has recently begun to track campsite reservations issued statewide, but some forest districts have maintained records of their permitting at a local level. Starting in 2014, the bureau began compiling the number of permits issued yearly based on the district records. Although this dataset is somewhat inconsistent across the state, it is apparent that the number of permits issued fluctuates through time and it does not appear that core gas forest districts have a clear pattern or a trend that is unlike all other districts (Figure 6.30). It is important to note that major camping facilities are typically not located near major gas infrastructure. Well pads and compressor stations tend to occur on ridgetops while campgrounds are often found along streams.

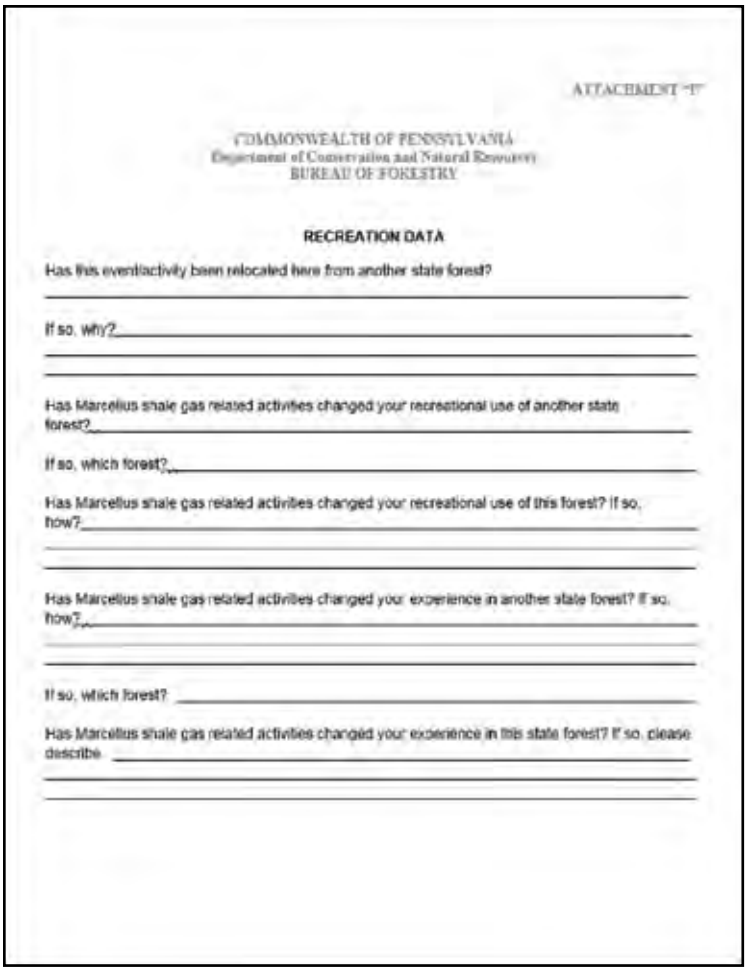
Qualitative Metrics: Social Perception and Coummunity Engagement

Community engagement in various forums is a way to solicit feedback and quantify effects on forest use.

Visitor Use Monitoring

In 2011, the bureau began a partnership with the Pennsylvania State University to adapt the National Visitor Use Monitoring (VUM) program to measure ten state forest districts and 30 state parks over a five-year period. The objectives of the study are:

1. To conduct surveys of visitors to selected Pennsylvania state forest and state park areas and develop a visitor profile, including information on the origin of visitors (e.g., local, non-local resident, out of state), trip context and purpose (e.g., day versus overnight visitor, primary purpose versus casual visitor), length of stay



ATTACHMENT "F"

COMMONWEALTH OF PENNSYLVANIA
Department of Conservation and Natural Resources
BUREAU OF FORESTRY

RECREATION DATA

Has this event/activity been relocated here from another state forest?

If so, why?

Has Marcellus shale gas related activities changed your recreational use of another state forest?

If so, which forest?

Has Marcellus shale gas related activities changed your recreational use of this forest? If so, how?

Has Marcellus shale gas related activities changed your experience in another state forest? If so, how?

If so, which forest?

Has Marcellus shale gas related activities changed your experience in this state forest? If so, please describe

Figure 6.28. Attachment that is included in group activity agreements (commercial activities agreements and special activities agreements).

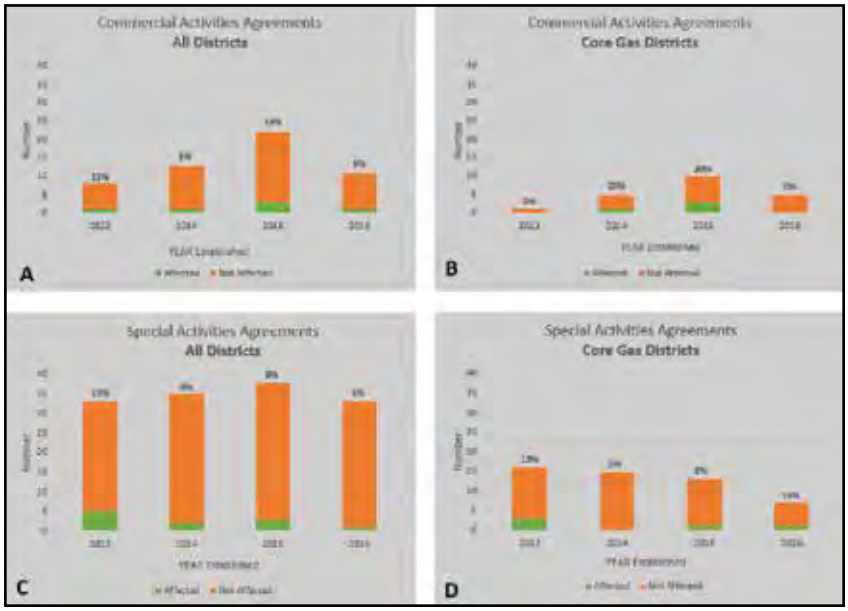


Figure 6.29. Number of commercial and special activities agreements reporting impacts from gas development by year for:

A) Commercial Activities Agreements across all forest districts;

B) Commercial Activities Agreements within core gas forest districts only;

C) Special Activities Agreements across all forest districts;

D) Special Activities Agreements within core gas forest districts only.

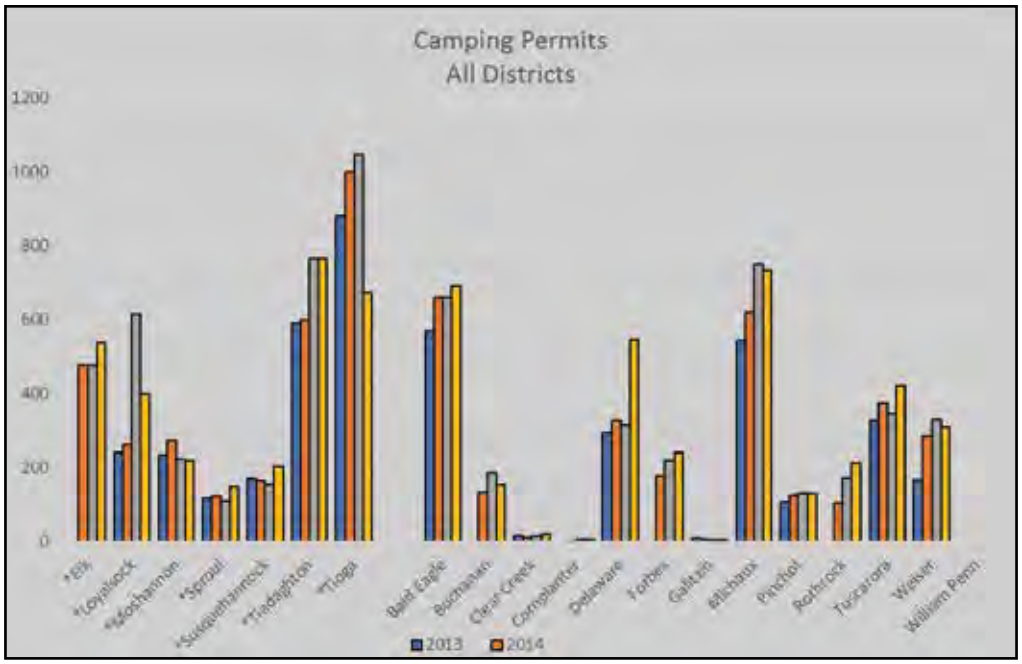


Figure 6.30. Number of camping permits issued each year by forest district. Core gas forest districts are show on left.

in the area, spending patterns, size and type of visiting groups, previous visitation history, activities pursued, and different patterns of visitation across seasons.

2. To measure overall recreational use and specific visitation patterns within the selected state forests and state parks, including the number of visitors per vehicle and the distribution of use across different types of sites within the area.
3. To develop a demographic profile of visitors at the designated state forests/parks.
4. To identify visitor expectations and levels of satisfaction with various aspects of their visit.
5. To examine visitor opinions about probable future state forest and state park management and facility development decisions.
6. To examine visitor reactions to oil and gas activities and the impacts of these activities on recreational visitation patterns and experiences.
7. To measure visitor expenditures and levels of economic impact on surrounding communities.

As part of these surveys, visitors were asked questions related to their use and experience related to shale gas activities. Six of the ten forest districts surveyed are core gas forest districts (Figure 6.31). Districts surveyed are as follows; Sproul and Susquehannock (2011-12), Forbes and Delaware (2012-13), Tioga and Tiadaghton (2013-14), Elk and Moshannon (2014-15), and Michaux and Buchanan (2015-16). At the time of this report data were not yet compiled for year five (Michaux and Buchanan), so these estimates do not contain these data. For the first four years across eight surveyed districts, 15.5 percent of respondents reported that shale gas activities had affected their *Use* of the state forest and 18.7 percent reported that it had affected their *Experience* (Figure 6.31). Districts with most affected responses came from the Sproul, Susquehannock, Tiadaghton, and Tioga State Forests (Figure 6.31). All these state forests have high numbers of recreational users and active gas construction at the time of the survey. Road and traffic issues, displacement/closed areas, and general environmental concerns were the most common reasons cited as impacts (Figure

6.32). However, most users did not report that shale gas activity had changed their use or their experience of state forest land. Completed reports with additional detailed information can be found in the reports on the bureau's **website**[1].

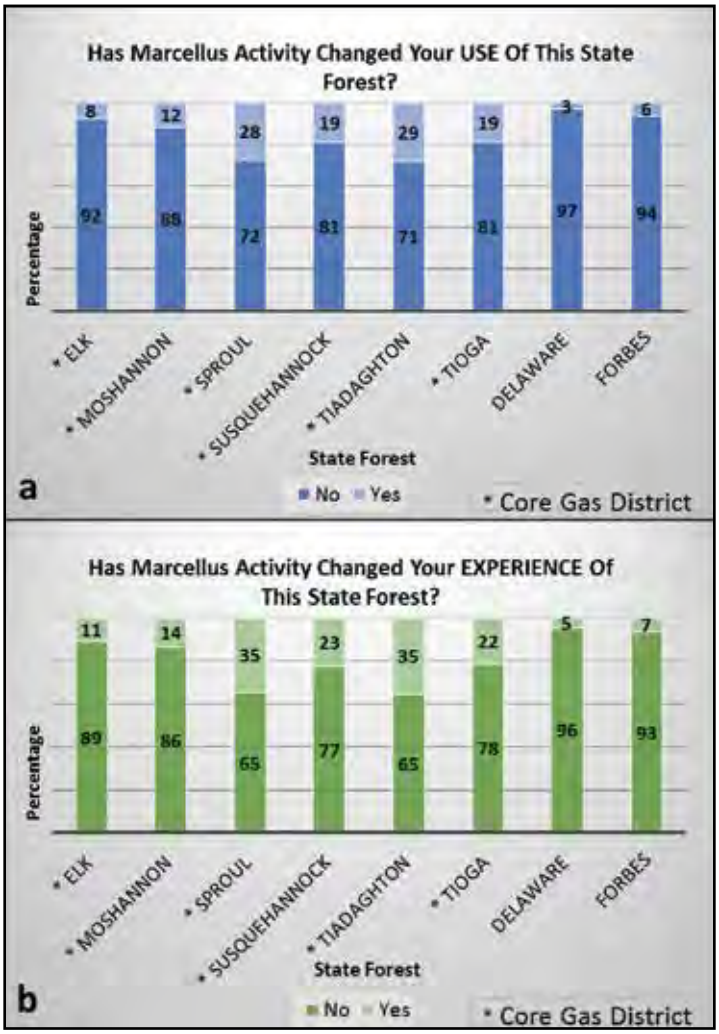
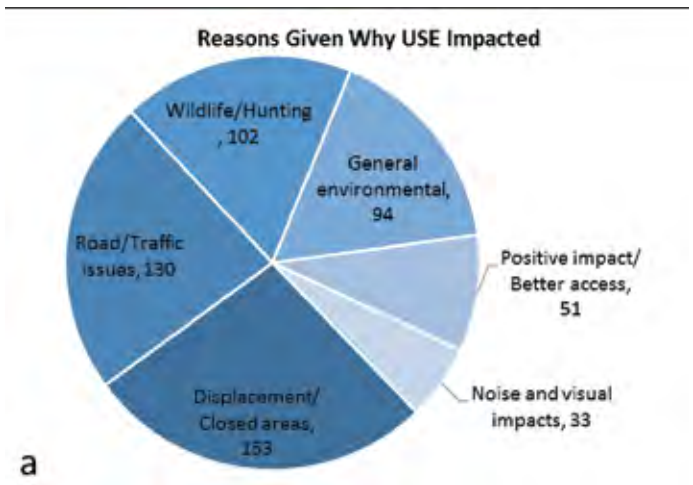
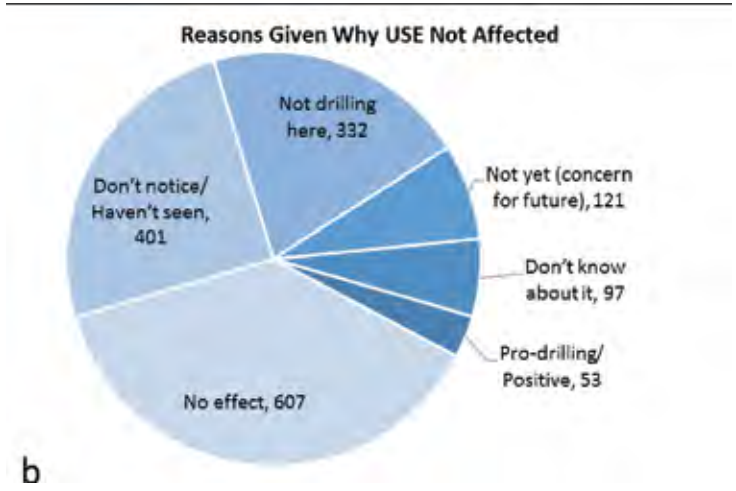


Figure 6.31. Visitor Use Monitoring (VUM) survey results.

a) percentage of surveyed visitors whose USE of specific state forests was affected;

b) percentage of surveyed visitors whose EXPERIENCE of specific state forests was affected.





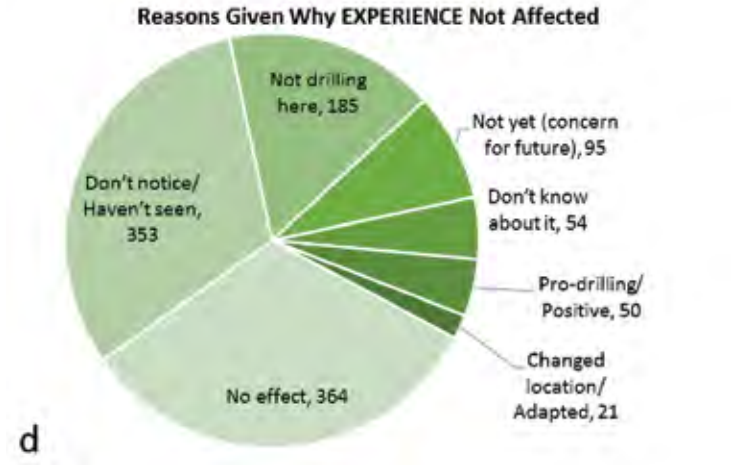


Figure 6.32. Reasons given for why a) state forest USE was impacted; b) state forest USE was NOT affected; c) state forest EXPERIENCE was impacted; D) state forest EXPERIENCE was NOT affected by shale gas development activity.

Comment Cards

In addition to the formal study of visitor use with Penn State University, the bureau has also incorporated a comment card system that continually monitors visitor needs, use, and experience. Postage paid comment cards (Figure 6.33) are placed at high recreation areas such as trail heads, parking lots, boat launches, and forest district offices. The comment card responses primarily come from state forest visitors that obtain the comment cards at these various locations across state forests. In addition, comment cards have been used to garner feedback from special events or targeted groups. For example, the cards were handed out to participants at a forest district open house event that featured an educational drive-through; 107 responses from 2015 are from this event (Table 6.9 for numbers of responses by year). In 2016, cards were mailed to all leased camps across state forest land and 529 cards came from this effort. Although not designed to be statistically analyzed, summaries of the comment card responses are useful in providing periodic evaluation of user issues and evaluating broad trends in visitor concerns, attitudes, and emerging issues.

Comment cards are reviewed when they are received, and any immediate concerns are relayed to the forest districts. A summary of the cards received is compiled quarterly and sent to the forest districts and program managers. Typical requests for action are related to trail maintenance issues, signage, littering or vandalism, need for ranger patrol, water sources, restrooms, or unsuitable activities. Typical comments regarding shale gas activity remark on dissatisfaction with increased traffic or express the visitor's overall opinion of shale gas development on state forest land.

In 2016, a new question regarding shale gas activity was added to help capture displacement of visitors. The question asks, "Has shale gas activity at another location prompted you to use this location (if so, where)?" This will help to discern where users have abandoned an area to take up their recreation at another location to avoid the shale gas activity. Of the 602 users that responded to this question, 26 respondents (4 percent) reported that they did change location due to shale gas activity at another location. (In addition, prior to the addition of this question, many users indicated through written

8170-CD-FR0175 Rev. 9/2014

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
BUREAU OF FORESTRY

DC: _____

COMMENT CARD

Please give us a minute of your time to help us serve you better on this state forest. How would you rate our facilities and services in

State Forest Name: _____ at Location: _____ Date of Visit: _____ Your Home Zip: _____

What is the primary reason or activity that brings you to this state forest (please circle): scenic driving, camping, backpacking, hiking, biking, hunting, fishing, boating, horseback riding, ATV riding, snowmobiling, wildlife viewing, relaxation, picnicking, other (please specify)? _____

Please circle one for each item:	Poor	Fair	Avg.	Good	Very Good
Scenery	1	2	3	4	5
Condition of the natural environment	1	2	3	4	5
Condition of Forest roads	1	2	3	4	5
Condition of Forest trails	1	2	3	4	5
Parking lot\Trailhead condition\Appearance	1	2	3	4	5
Condition of developed recreation facilities (latrines, picnic tables, fire rings, campsites, pavilions, etc.)	1	2	3	4	5
Feeling of safety and security	1	2	3	4	5
Adequacy of signage	1	2	3	4	5
Availability of recreation information: (maps, website, etc.)	1	2	3	4	5

Has Marcellus activity at another location prompted you to use this location? (if so, where) _____

Has Marcellus activity changed your recreational use of this state forest? (if so, how) _____

Has Marcellus activity changed your experience on this state forest? (if so, how) _____

What do you like or what are we doing right? _____

What improvements would you like to see? _____

Figure 6.33. Bureau of Forestry comment card that is placed at high use locations to collect feedback from forest users.

comments that they had adjusted the location of their recreation on state forest land; see section below on written comments and Figure 6.36).

Of the 2,101 cards that have been received since the system was implemented in 2012, 430 users (20 percent) indicated that shale gas development has affected their recreational use, experience, or location of state forest visitation (Table 6.9). A response was characterized as "affected" if the user answers yes to any of the questions regarding gas development: 1) Has shale gas activity at another location prompted you to use this location?; or 2) Has shale gas activity changed your recreational use of this state forest?; or 3) Has shale gas activity changed your experience on this state forest?

The proportion of visitors that indicated affected use and experience has dropped steadily since the beginning of the card's use in 2012 (Figures 6.34 and 6.35). In 2012, 24 percent of respondents indicated their *Use* was affected by gas activities; this decreased to only 12 percent in 2016 (Figure 6.34). A similar decrease can be seen from 2012-2016 (35 to 14 percent) when these data are filtered by visitors to core gas forest districts only (Figure 6.34, hatched area). The same trend of decreasing reported effects shows for visitor *Experience* (Figure 6.35). However, the decrease in percentage was not as marked (2012=26 percent; 2016=19 percent) as with recreation *Use* effects, suggesting that perhaps visitor *Experience* continues to be somewhat disrupted while *Use* effects have tapered off with decreasing activity and development (Figure 6.35). Again, a similar decrease is seen when these data are filtered by visitors to core gas forest districts only (Figure 6.35, hatched area; 37 to 23 percent).

Additionally, many respondents indicated they had not been affected by shale gas development, but still provided comment on gas activity. Responses for all written comments regarding shale gas development are summarized in Figure 6.36.

The most common recreational activity in which comment card respondents took part was hiking (Figure 6.37). The number of users that indicated they were affected (Use, Experience, or Location) by shale gas development varied across categories. For most categories, the percentages of users in each group that indicated an effect (right axis, line graph Figure 6.36) fell between 20 and 35%, with only ATV and horseback riders showing a lower percentage of users affected. These are not exhaustive surveys, but responses received via voluntary acquisition and submission of the cards.

Examining the proportion of respondents who indicated they were affected by gas activity shows a pattern of declining effect over time for both core gas forest districts and other forest districts (Figure 6.38). However, the percentage of users that indicated an effect is consistently much lower in the non-core gas forest districts, as is expected.

The average rating for each evaluation criterion from 2012-2016 was calculated separately according to whether the visitor was or was not affected by shale gas activity (Figure 6.39). In all nine categories, the average rating was lower in the respondents who were affected by gas development. When the data are filtered

Comment Cards: Recreation affected by shale gas development?	Year 2012	2013	2014	2015	2016	Grand Total
No	151	416	245	280	581	1673
Yes	61	130	45	25	167	428
Grand Total of Responses	212	546	290	305	748	2101
Percentage Affected	29%	24%	16%	8%	22%	20%

Table 6.9. Number of comment cards received each year and the number of responses that indicated gas development had affected their use, experience, or location of recreation on state forest land.

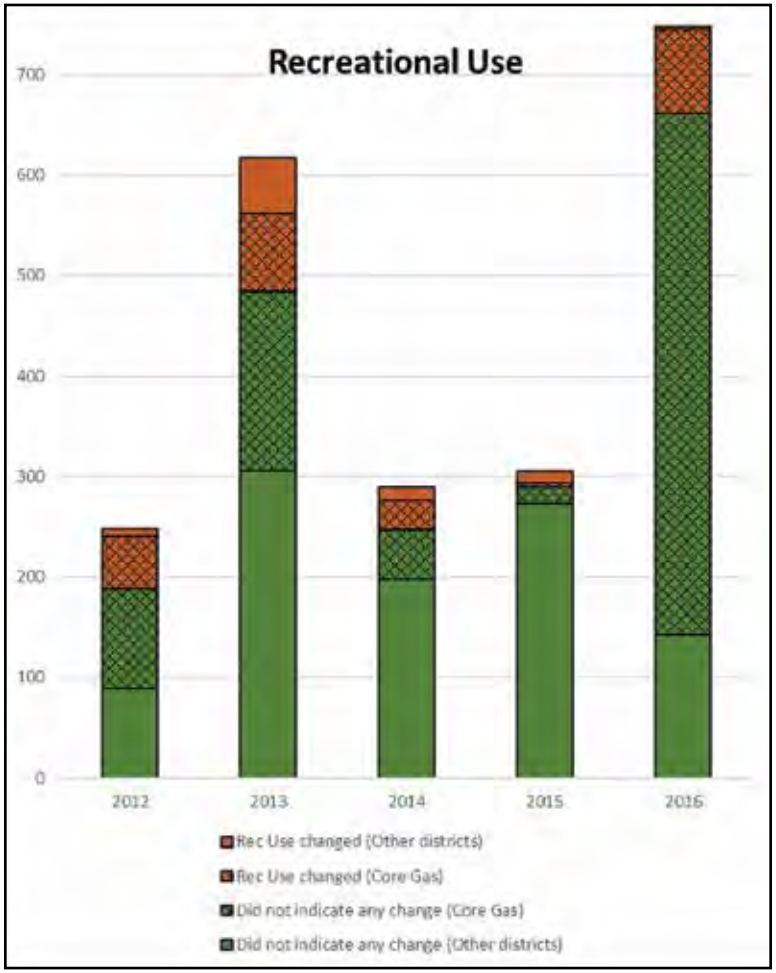


Figure 6.34. Number of comment card respondents that indicated their USE of state forest land was affected by shale gas activities by year for ALL FOREST DISTRICTS (solid bar) and for CORE GAS FOREST DISTRICTS (hatched bar).

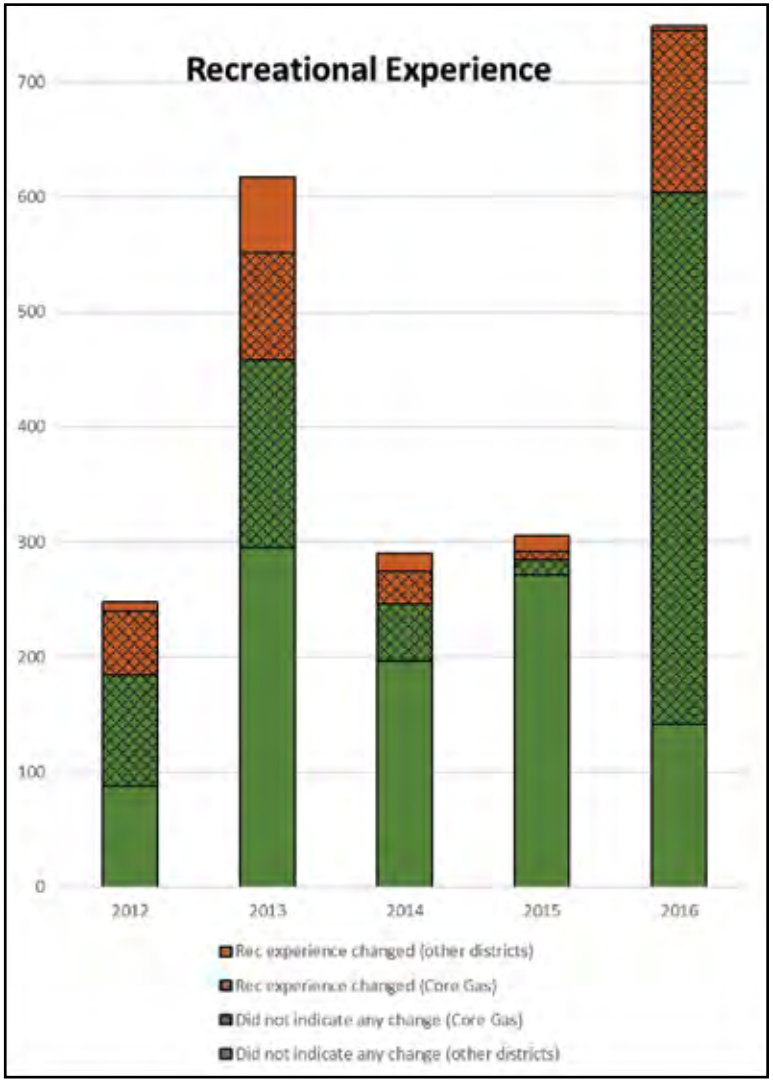


Figure 6.35. Number of comment card respondents that indicated their EXPERIENCE of state forest land was affected by gas activities by year for ALL FOREST DISTRICTS (solid bar) and for CORE GAS FOREST DISTRICTS (hatched bar).

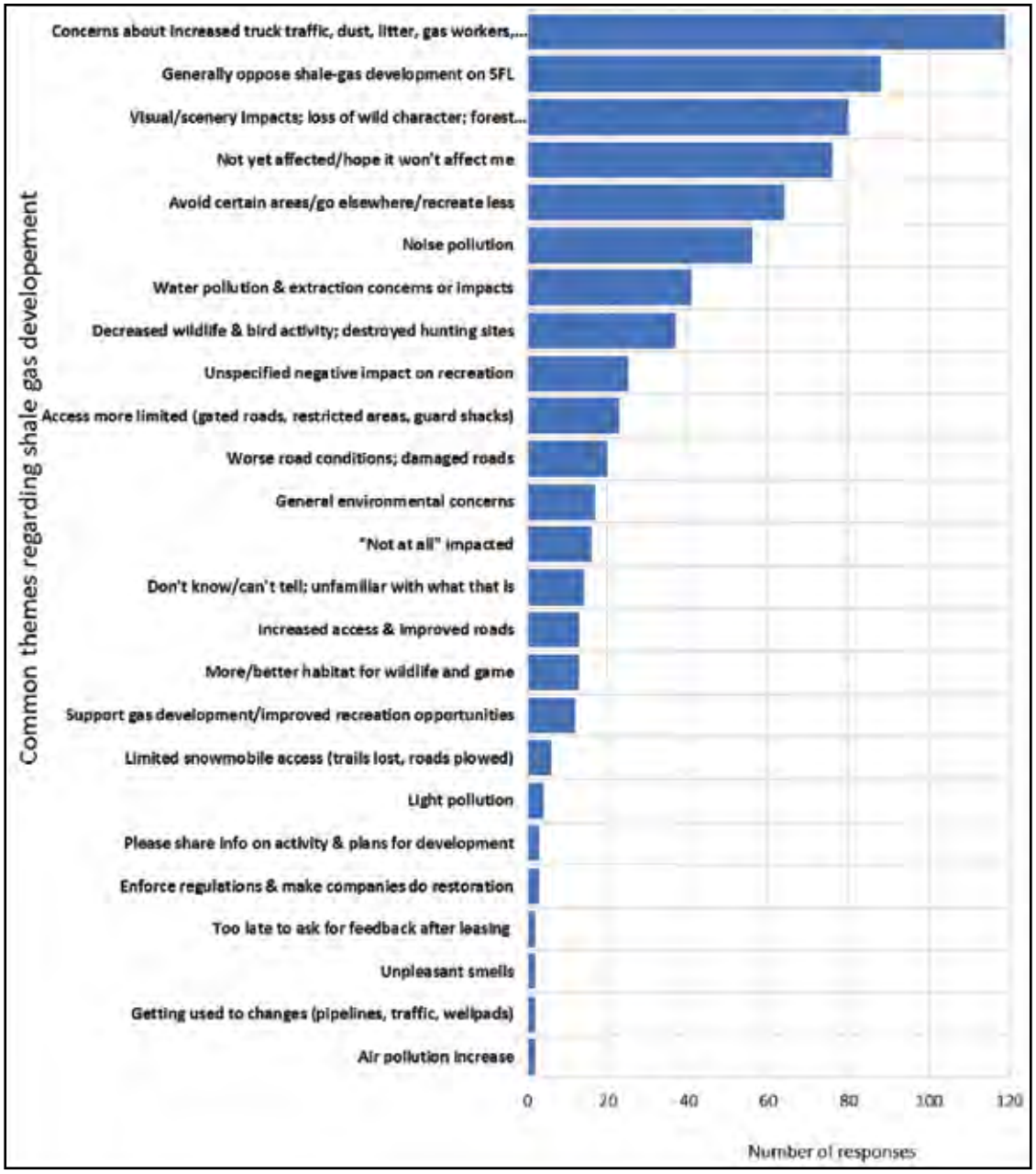


Figure 6.36. Summary of common and recurring themes of written remarks on comment cards regarding gas activities. Note: some cards may be counted in more than one category if the individual addressed several of themes on one card.

by core gas forest districts only, the discrepancy between those who indicated gas effects and those who did not is slightly more pronounced. On average, those affected gave ratings 6.9 percent lower than users who were not affected; in core gas forest districts, the average ratings were 9.2 percent lower than users who indicated no effect.

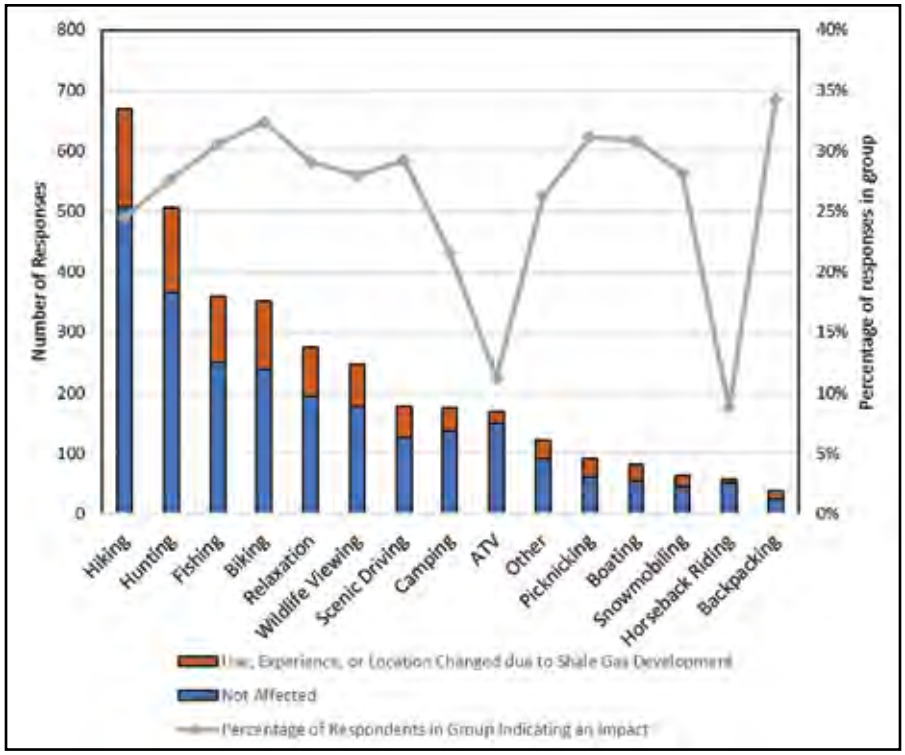


Figure 6.37. Number of comment card responses and percentage impacted by shale gas development on state forest land for each user group. Note that cards may be counted in more than on category if the user indicated more than one activity.

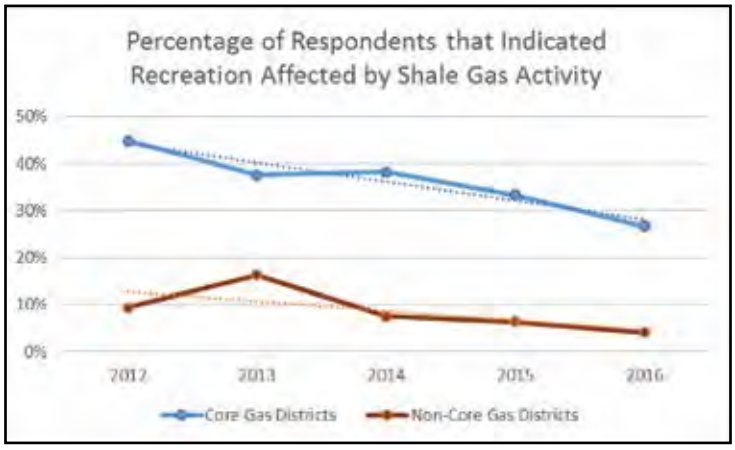


Figure 6.38. Percentage of respondents that indicated their recreation was affected by shale gas activity through time for core gas forest districts vs. other forest districts. Dotted line represents general linear trendline of percentage of respondents through time.

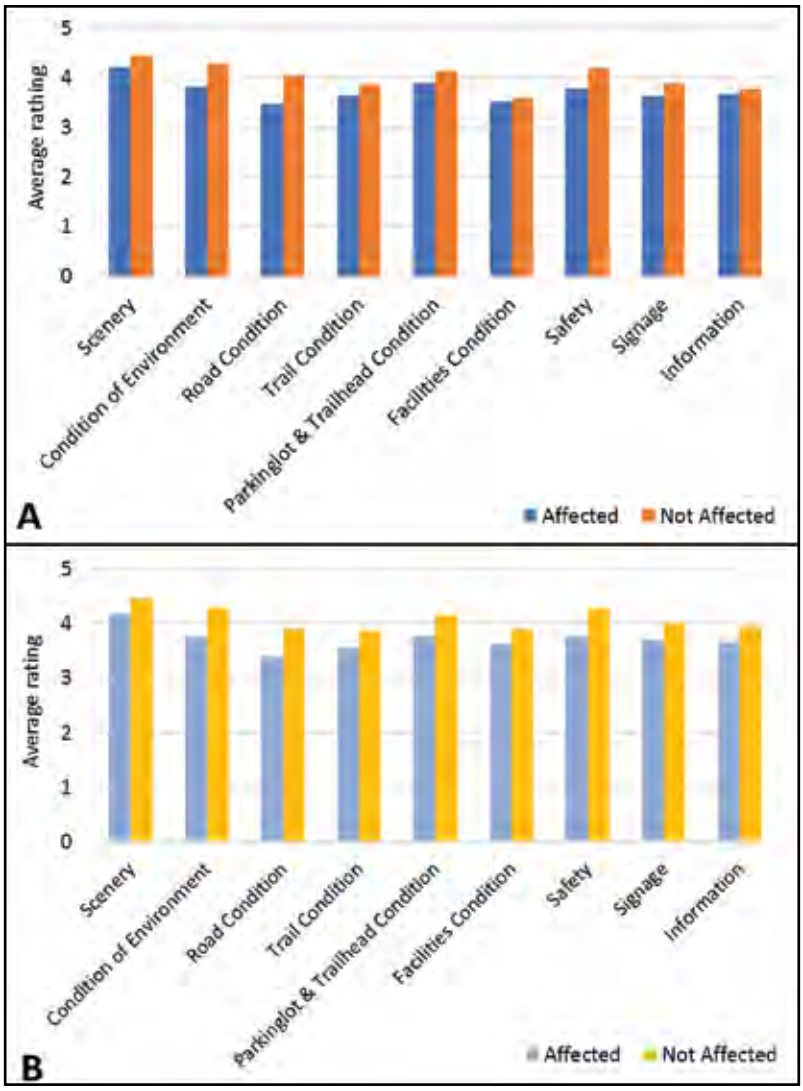


Figure 6.39. Bar graph of condition ratings by affected vs not affected

a) across all forest districts and

b) filtered by core gas forest districts only.

SFRMP Comments

As part of its 2016 revision of the State Forest Resource Management Plan (SFRMP) the bureau conducted several efforts to obtain public input and feedback. The SFRMP is the primary instrument that the bureau uses to plan, coordinate, and communicate its management of the state forest system.

2013 Online Survey

In 2013, the bureau conducted an online survey to gauge public sentiment about state forest management prior to embarking on revision of the SFRMP. The following results relate in some way to shale gas development.

The results of the question "How important to you are the following considerations in the management of state forest lands?" demonstrate that economic issues are thought to be the least important consideration in the management of state forest lands (Figure 6.40). Economic considerations might be inferred to include revenue from leasing for gas development or from timber harvesting operations.

Another question in the online survey asked users to rank the importance of different values on state forest land. From the responses in Figure 6.41, energy development was ranked as the least important value on state forest land by survey respondents.

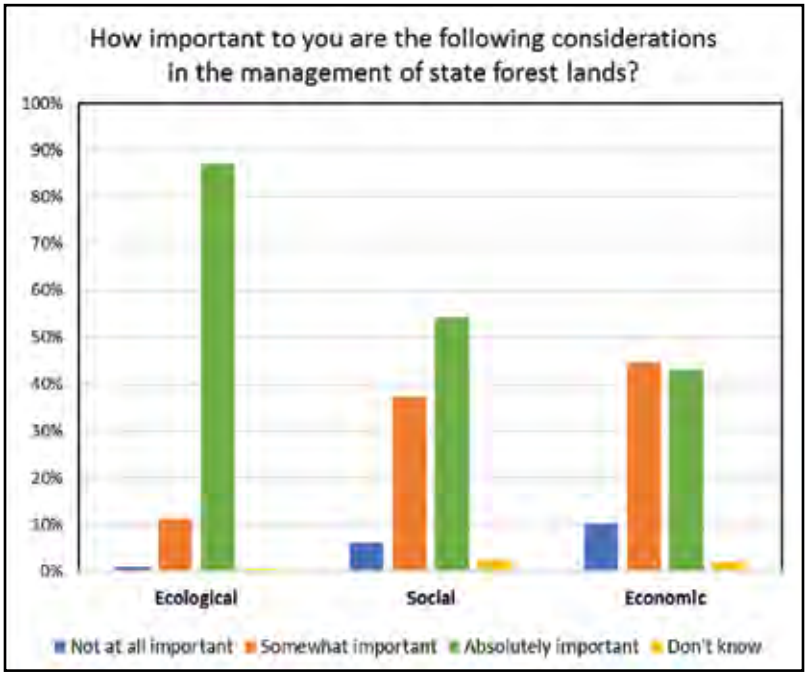


Figure 6.40. Results of survey question: "How important to you are the following considerations in management of state forest lands?". There were 3,228 responses to this question; 27 respondents skipped this question.

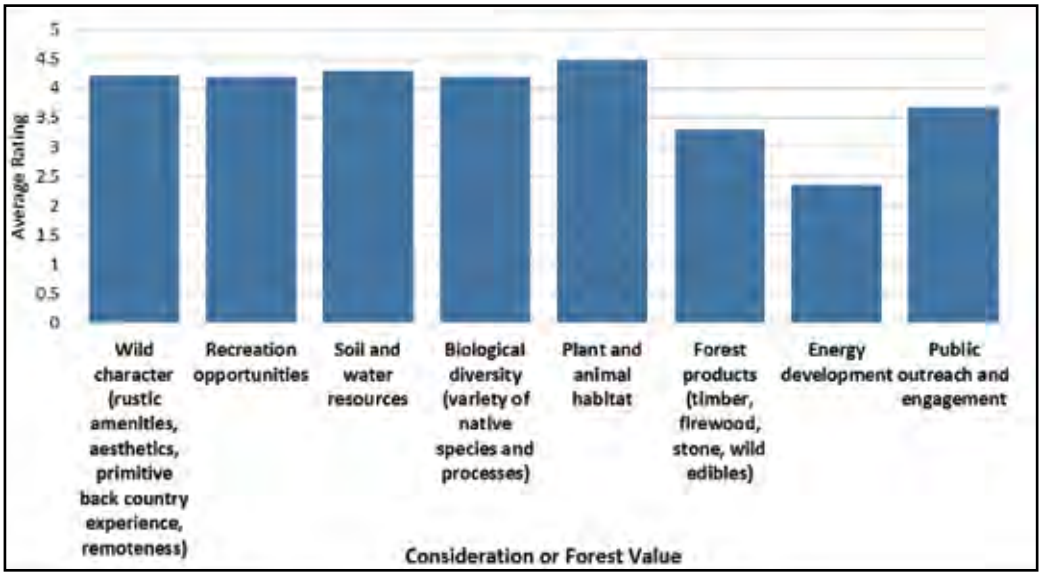


Figure 6.41. Results of survey question: "Rate the importance of each value on state forest land (1 is the least important and 5 is the most)." There were 3,241 responses to this question; 14 respondents skipped this question.

In response to the question, "How well are the following managed on state forest land?", most respondents said that energy development was managed neither poorly or well, poorly, or very poorly (Figure 6.42).

Although this survey was not designed to answer questions specifically about shale gas development, it is useful in gleaning relative importance, values, and perception held by state forest stakeholders and the general public. These responses may indicate that shale gas development may differ from traditional views of the use and purpose of state forests by the public. Follow-up questions would be needed to identify more in-depth trends, sentiments, and causal relationships.

2015-16 Public Comment Phase

In late 2015 and early 2016, the bureau held a public comment period on the draft SFRMP, in which feedback was submitted via public meetings, emails, letters, and an online survey. The bureau received many comments on shale gas development during the public comment phase. Gas development was the most frequently commented upon issue. A summary of the comments is provided below, which was posted to the bureau's website when the 2016 SFRMP was finalized. More information can be found on the bureau's **website**[2].

- Many people expressed concern over the effects of fragmentation, mainly due to gas development, but also related to other forms of development.
- The bureau had a large number of people and organizations provide comments that were generally against the development of natural gas on state forest land, citing various concerns, such as fragmentation, loss of wild character, and potential impacts on wildlife and water resources.
- The bureau also heard from a few individuals that supported gas development on state forest land.
- A number of people and organizations suggested that the Oil and Gas Lease Fund Act requires that all rents and royalties from oil and gas leases of commonwealth state forest land be placed in a special fund to be used exclusively for conservation, recreation, dams, and flood control.
- A large number of commenters called for the bureau to halt all drilling activities within state forests for companies who have violations.
- The bureau had a large number of comments expressing support for the Governor's Executive Order that placed a conditional moratorium on additional gas leasing in state forests. Many other commenters suggested that the bureau ban leasing entirely in the SFRMP.

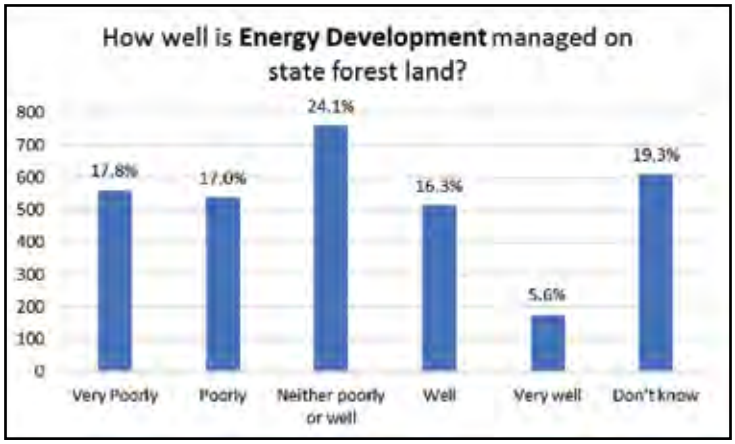


Figure 6.42. Results of survey question: "How well is energy development managed on state forest land?". There were 3,154 responses to this question; 56 respondents skipped this question.

- Several organizations and individuals requested more detail on how the bureau will evaluate decisions for new leasing or what the bureau should do before allowing new leasing.
- The bureau received a large number of comments asking us to prohibit drilling at the surface within the boundaries of state forests to minimize direct environmental impacts to these special places whenever possible.
- The bureau also received a large number of comments asking it to prohibit surface impacts where mineral rights are not owned by the commonwealth.
- A large number of commenters asked the bureau to make operators use horizontal drilling beneath severed rights land.
- The bureau received comments suggesting that there be training for DCNR staff by DEP on how to spot violations.
- The bureau heard a number of comments generally calling for it to assess the financial need of managing gas development.
- A number of commenters expressed concerns regarding the impacts of pipeline construction on state forest lands. Some of these comments came with recommendations for dealing with such impacts, such as co-location of pipelines
- Numerous commenters expressed questions or concerns about how the bureau is dealing with the existing impacts of gas development, such as what the buffers and restrictions are.
- A large number of commenters called for the bureau to require compressor stations to comply with noise limits and to shut them down if they fail to do so.
- Commenters also specified that the bureau should site compressor stations away from recreation sites.
- The bureau received a number of comments calling for the bureau to establish a contingency fund or escrow account to ensure the reclamation of lands affected by shale gas development.
- The bureau received multiple comments from individuals and organizations that were against potential development of Clarence Moore lands in Loyalsock State Forest.

Advisory Committees

The bureau and department coordinate many advisory committees to provide input and guidance on matters relevant to the agencies. Each of the advisory committees have been consulted on matters regarding shale gas development. Summaries of the committees and their activity related to shale gas development are provided below.

Natural Gas Advisory Committee

The Natural Gas Advisory Committee (NGAC) is a department-level committee comprised of members selected by the Secretary. NGAC advises DCNR on the environmentally sound extraction of gas resources. The Governor's Shale Gas Advisory Commission Report from July 22nd, 2011 recommended that "DCNR should establish a Natural Gas Advisory Committee to enhance communications among stakeholders regarding natural gas development on state forest and park land." (Recommendation 9.2.34). The report also recommends, "DEP and DCNR – along with industry – should continually review and examine the range of best management practices utilized during construction and operation of the well site, and consider incorporating these types of practices into regulatory and operator guidance…" (Recommendation 9.2.23). NGAC provides valuable insight and expertise concerning the complex nature of natural gas management. The stated purpose of NGAC is:

> The purpose of NGAC will be to advise and provide recommendations for implementing natural gas management in a manner which is consistent with the mission of DCNR and its bureaus. There are several program areas involved with implementing new strategies dealing with natural gas management in DCNR, notably the Bureaus of Forestry, State Parks, and Topographic and Geologic Survey.

The primary work of NGAC will focus on state forest lands and the work of the bureau, whose mission includes managing state forests under sound ecosystem management, to retain wild character, and to maintain biological diversity while providing pure water, opportunities for low density recreation, habitats for forest plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources. NGAC will provide recommendations for implementing the bureau's ecosystem management and resource sustainability approach to natural gas management.

The NGAC will work with DCNR to help identify natural gas management concepts and principles, and assist in integrating them into DCNR's natural gas management efforts on state forest and park lands.

Since its inception in the fall of 2013, the bureau has engaged NGAC regarding numerous topics, such as:

- the Bureau of Forestry Guidelines for Administering Oil and Gas Activity on State Forest Lands,
- the Bureau of Forestry shale gas monitoring program, including specifically the 2014 Shale-Gas Monitoring Report,
- the Bureau of Forestry State Forest Resource Management Plan,
- the Bureau of Topographic and Geologic Resources – Exploration and Development Well Information Network (EDWIN),
- Land and Water Conservation Fund and other grant-funded protected lands,
- compressor noise,
- non-surface disturbance leasing,
- air monitoring,
- site restoration,
- wastewater / produced water management, and
- pipelines.

Conservation and Natural Resources Advisory Council

The Conservation and Natural Resources Advisory Council (CNRAC) is the department's only legislatively mandated council, comprised of 18 members (six members each) appointed by the Senate, House, and Governor. The mission of CNRAC is:

To provide the Department of Conservation and Natural Resources, Governor, General Assembly, and public, advice regarding the conservation and stewardship of the commonwealth's natural resources.

CNRAC strives to be the foremost source of quality advice to the Department on sustaining the natural environment for all Pennsylvanians to enjoy and appreciate.

Ecosystem Management Advisory Committee

The Ecosystem Management Advisory Committee (EMAC) is a bureau-level committee comprised of members selected by the State Forester. The purpose of EMAC is to advise the bureau concerning its ecological approach to resource management. EMAC will work with the bureau to help identify ecosystem management concepts and principles, integrate these concepts into the updating of the state forest resource plans, and evaluate the implementation of these concepts and principles.

EMAC was engaged in 2010, at the start of the shale gas monitoring program, on what shale gas impacts might be and what monitoring priorities should be, both short-term and long-term. They have also provided feedback on various aspects of the monitoring program from time to time in the intervening years. EMAC was consulted on the 2016 revision of the State Forest Resource Management Plan, which included shale gas related goals and objectives, and on the establishment of Core Forest Focus Areas, which will prohibit conversion of forest land, such as by natural gas development.

Recreation Advisory Committee

The Recreation Advisory Committee (RAC) is a department-level committee comprised of members selected by the Secretary of DCNR. This committee provides valuable insight and expertise concerning the complex nature of large-scale natural resource-based recreation planning and management. The committee's input will be an important component in the recreation planning process used by the Bureaus of Forestry and State Parks. Other factors that are included in this process include the linkages between the publics' wants and needs, the Department's fiscal and physical limitations, legal mandates, and the capacity of ecosystems to tolerate human impacts. RAC will also review current and proposed operating guidelines and procedures. The stated purpose of RAC is:

> The purpose of RAC will be to advise the DCNR, Bureaus of Forestry and State Parks on natural resource-based recreation planning and management. The committee will also advise the Bureaus of Forestry and State Parks in planning, and implementation of their natural resource-based recreation operations and help identify recreational needs, opportunities, and directions that could be pursued.

RAC has been consulted on the follow topics related to shale gas development:

- the Bureau of Forestry shale gas monitoring program,
- the Bureau of Forestry State Forest Resource Management Plan,
- the Pipeline Infrastructure Task Force,
- activity on the Clarence Moore lands of Loyalsock State Forest, and
- Land and Water Conservation Fund conversion issues.

Silviculture and Timber Advisory Committee

The Silviculture and Timber Advisory Committee (STAC) is a bureau-level committee comprised of members selected by the State Forester. The stated purpose of STAC is:

> The purpose of STAC will be to advise the bureau on natural resource management related to silviculture and timber harvesting. The committee will also help identify silviculture and timber needs, opportunities, and directions for the bureau to pursue.

STAC has been consulted on road bonding issues regarding shared use of roads by timber and natural gas companies.

Pipeline Infrastructure Task Force

Led by the Secretary of DEP, the Pipeline Infrastructure Task Force (PITF) was formed in 2015 and tasked with developing polices, guidelines, and tools to assist in pipeline development (including planning, permitting, and construction) as well as long-term operation and maintenance. Bureau staff played an integral role in the PITF. The top recommendations of the PITF, delivered in a final report to the Governor in February 2016 were as follows:

- Establish early coordination with local landowners and lessors;
- Educate landowners on pipeline development issues;
- Train emergency responders;
- Enhance emergency response training for responder agencies;
- Minimize impacts of stream crossings;
- Use anti-degradation best available combination of technologies to protect exceptional value and high-quality waters;
- Ensure adequate staffing for reviewing pipeline infrastructure projects;
- Implement electronic permit submissions for Chapters 102 and 105;
- Expand PA1Call for all classes of pipelines;
- Identify barriers to sharing rights-of-way
- Attract military veterans to the energy workforce; and

- Enhance science, technology, engineering, and math (STEM) education.

Several of these recommendations have direct relevance to the bureau and to pipeline projects on state forest lands.

In addition, the Conservation and Natural Resources Workgroup of the PITF developed the following recommendations:

1. Communicate Pipeline Development Conservation Practices to the Public
2. Develop Public Access to Pipeline GIS Information
3. Use a Landscape Approach for Planning and Siting Right-of-Way Corridors
4. Give Special Consideration to Protected / Designated Lands in Pipeline Siting
5. Mitigate the Loss of Public Use of Public Lands Resulting from Pipeline Development
6. Avoid Geological Hazards During Planning
7. Implement Full-Time Environmental Inspections During Pipeline Construction
8. Monitor Water Quality During Construction
9. Implement Post-Construction Monitoring for an Appropriate Period
10. Tie Permitting Standards to the Duration of Impact
11. Implement a Mitigation Bank to Improve Water Quality
12. Reduce Forest Fragmentation in Pipeline Development
13. Promote Biodiversity in Pipeline Development
14. Develop Rare Species Work Windows to Avoid Impacts
15. Minimize Impacts to Riparian Areas at Stream Crossings
16. Promote Wildlife Habitat Opportunities Along Pipeline Corridors
17. Restore and Maintain a Boarder Zone in Forested Areas
18. Minimize Aesthetic Impacts in Pipeline Development
19. Minimize Recreational Impacts in Pipeline Development
20. Provide Recreational Opportunities in Pipeline Development
21. Reseed Rights-of-Way Using Native Plants
22. Use Pennsylvania-Sources Plant and Seed Vendors and Landscape Services
23. Require Performance-Based Metrics for Long Term Maintenance of Rights-of-Way
24. Prevent Invasive Plant Species Establishment
25. Finalize Functional Protocols for Impacts and Offsets
26. DEP Should Follow the 2008 Final Mitigation Rule for all Mitigation Sites

Many of these recommendations were based on the bureau's existing approach to pipeline management and others may be incorporated into that approach moving forward.

Bureau of Forestry Website

The bureau is committed to being transparent in its monitoring and providing access to monitoring related information. It was in this spirit the bureau created a Shale Gas Monitoring section of its public webpage. The webpage provided the 2014 Shale-Gas Monitoring Report, links to the raw data that were used in generating the 2014 Shale-Gas Monitoring Report, updates to sections of the report, lease tract summaries, and the interactive shale gas infrastructure map.

The website served as a mechanism for distributing information to stakeholders. Table 6.10 shows usage statics of the pages from 2013-2016. Several of the pages in the table were not created until the release of the 2014 Shale-Gas Monitoring Report in April of 2014, so statistics for those periods reflect a time-frame shorter than 4 years. The greatest volume of views occurred immediately following the release of the 2014 report.

The bureau will continue to utilize its webpage for the dissemination of information regarding shale gas monitoring.

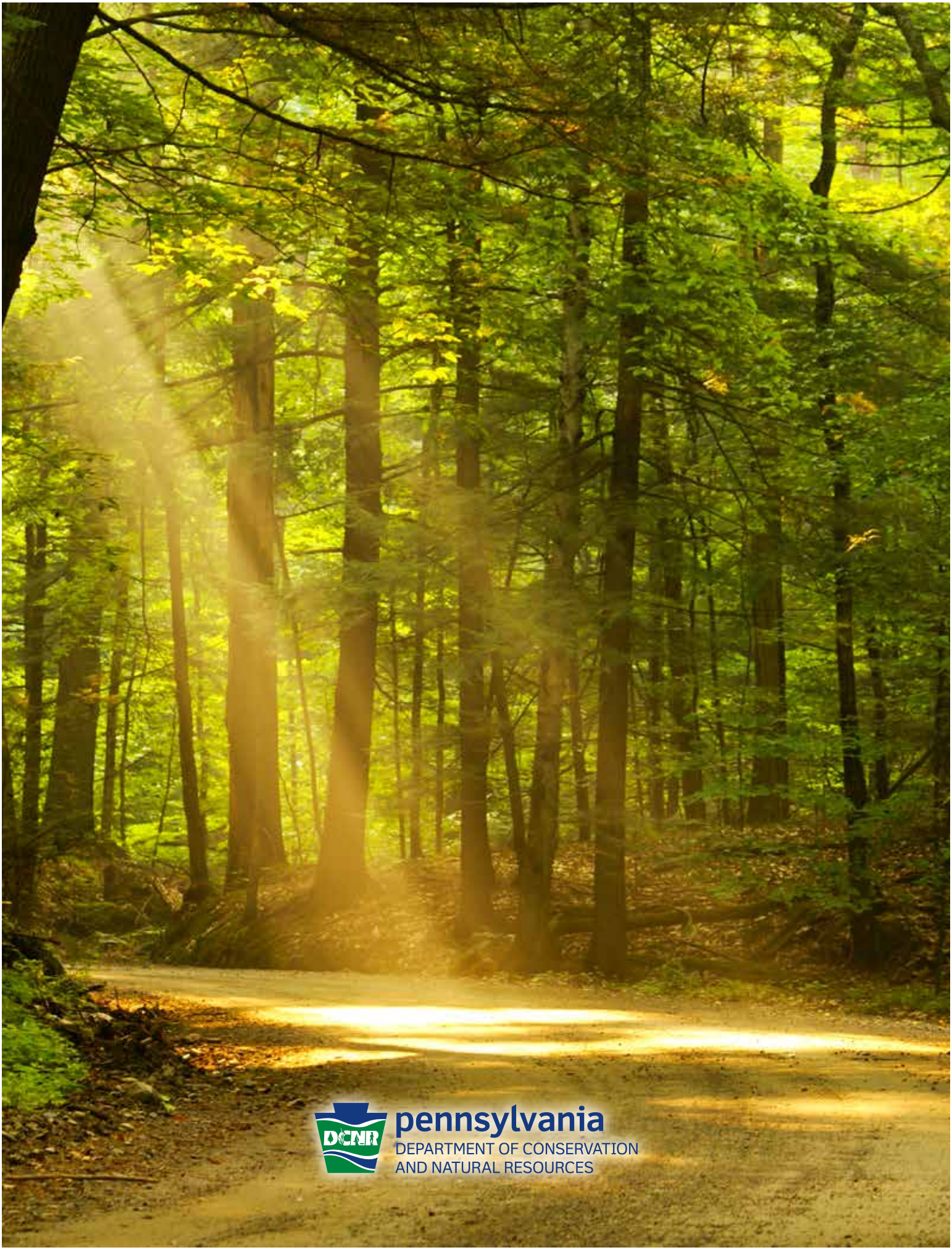
Page	Views	Unique Views	Average Time
Forestry Index	518,813	364,713	2:28
Natural Gas Index	16,145	10,058	1:33
Monitoring Report Index	4,388	2,919	2:17
Monitoring Data Files Index	1,043	507	0:46
Water	253	145	2:05
Infrastructure	155	116	1:46
Incidents	136	65	1:33
Air	123	68	1:07
Recreation	75	54	2:17
Flora	68	53	2:13
Soils	66	49	0:57
Forest Health	65	42	1:08
Forest Landscape	44	38	2:14
Timber	44	31	1:29

Table 6.10. Usage statistics for monitoring related pages on DCNR Bureau of Forestry webpage.

Website Links

[1] http://www.docs.dcnr.pa.gov/forestry/recreation/index.htm

[2] http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20032040.pdf


DCNR
pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

APPENDIX B
Location Maps and LWCF 6(f) Boundary Maps

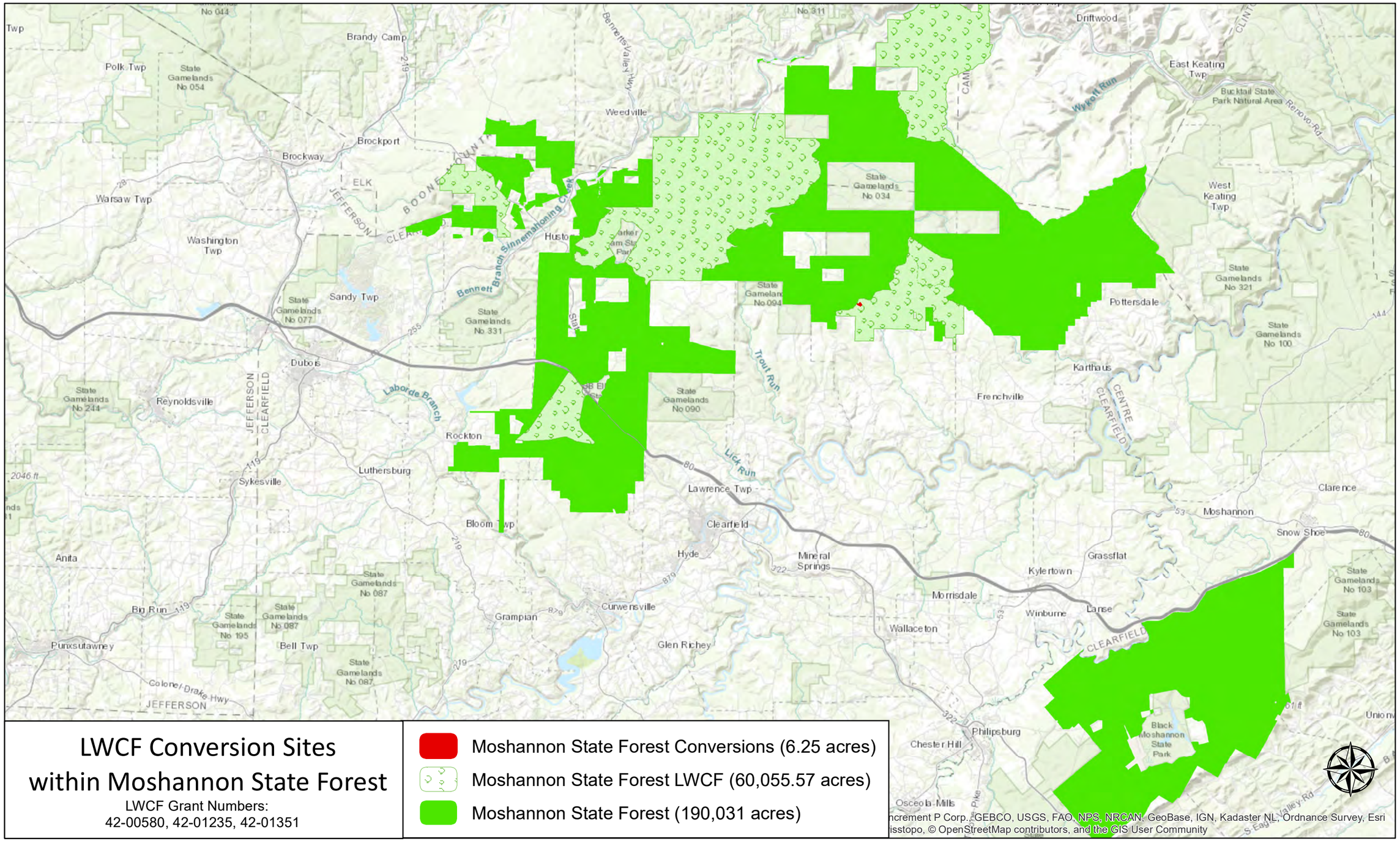
Converted Areas

State Forest LWCF Areas

State Forests

LWCF Conversion Sites on State Forest Land

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

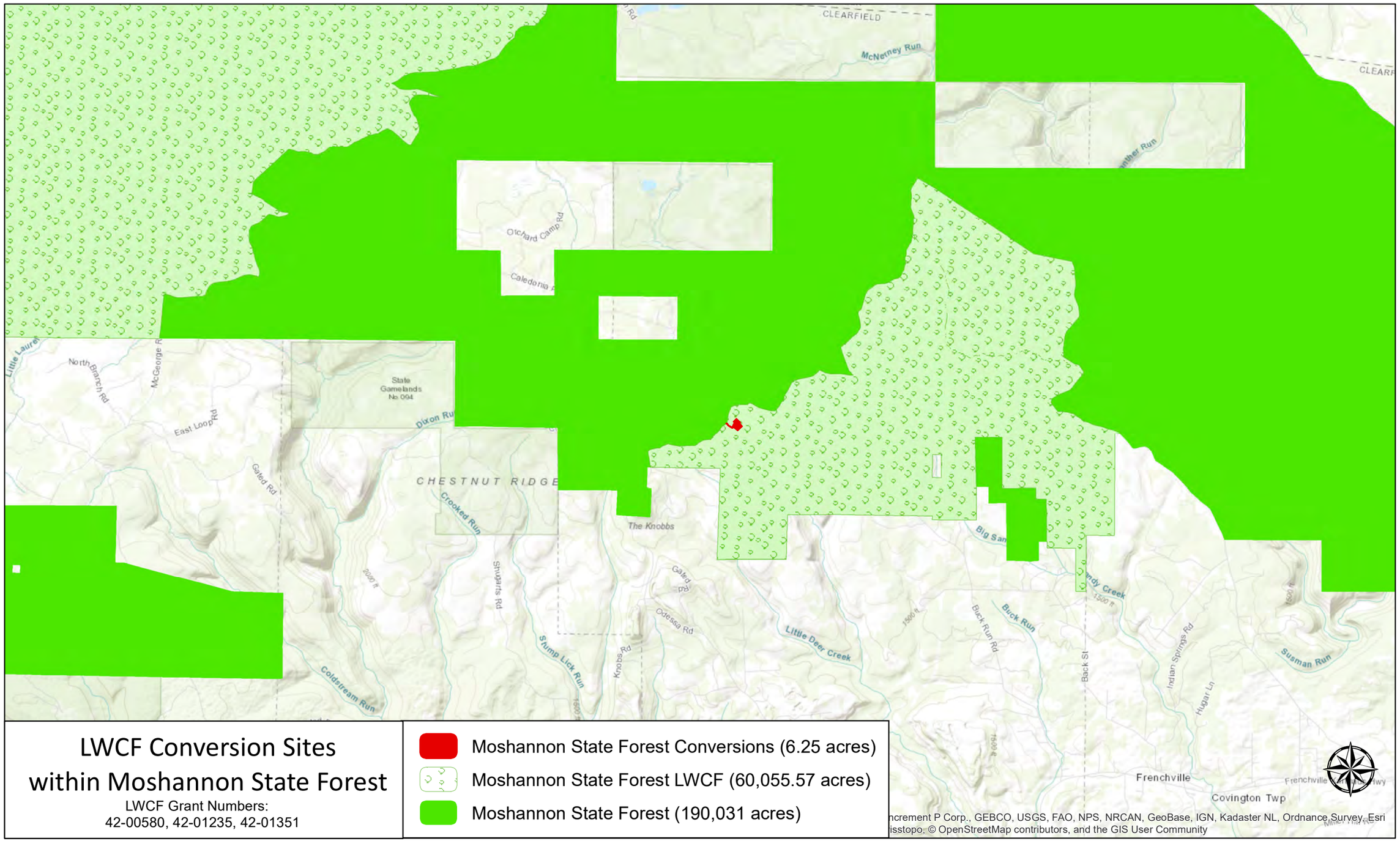


LWCF Conversion Sites within Moshannon State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Moshannon State Forest Conversions (6.25 acres)
- Moshannon State Forest LWCF (60,055.57 acres)
- Moshannon State Forest (190,031 acres)

ncrement P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri
isstopo, © OpenStreetMap contributors, and the GIS User Community

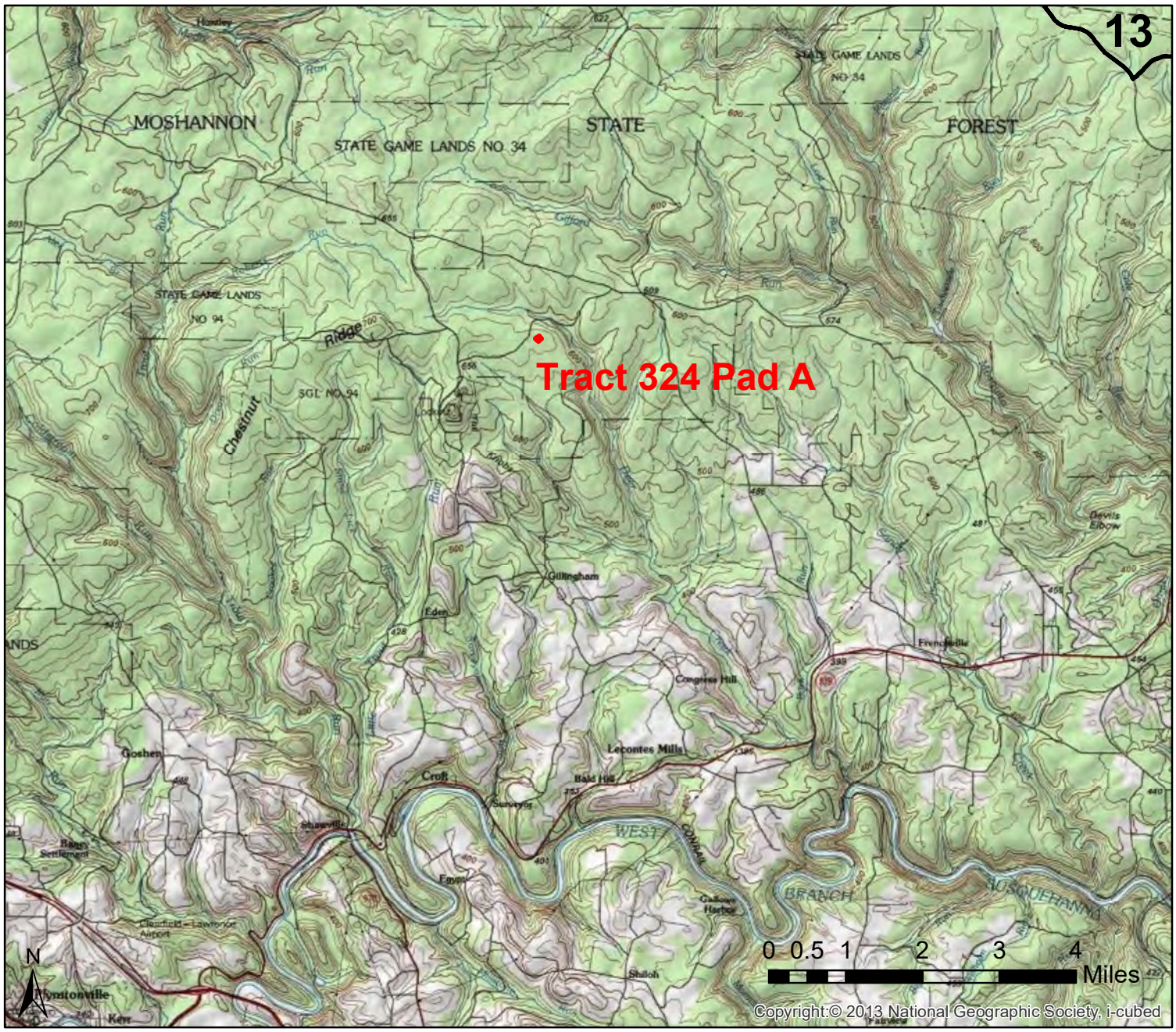


LWCF Conversion Sites within Moshannon State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Moshannon State Forest Conversions (6.25 acres)
- Moshannon State Forest LWCF (60,055.57 acres)
- Moshannon State Forest (190,031 acres)

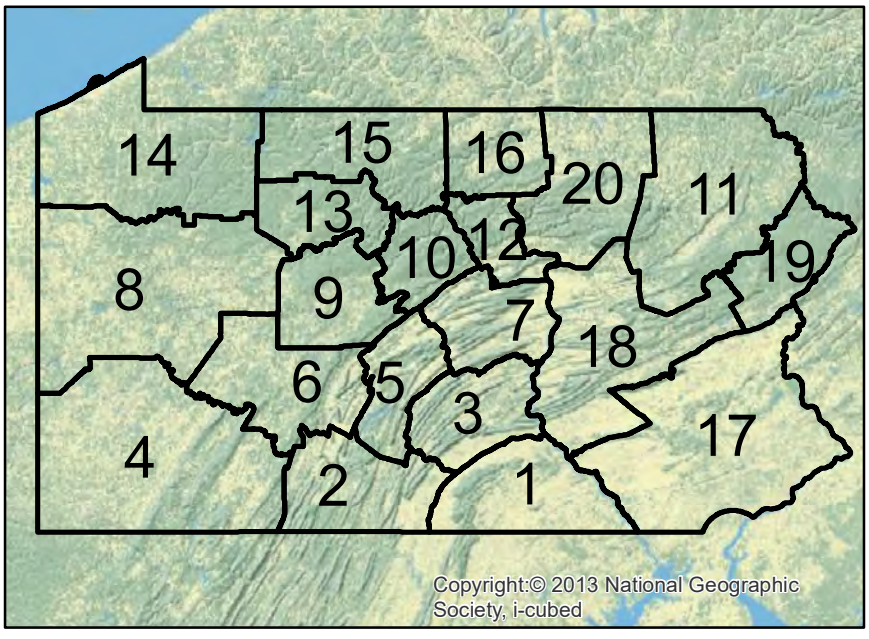
ncrement P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri
isstopo, © OpenStreetMap contributors, and the GIS User Community



Forest District 9
Moshannon State Forest
Clearfield County

Site:

Tract 324 Pad A: 41.162560, -78.314526
(Girard Twp.)



LINE	BEARING	DISTANCE
L24	N 62°32'42" E	52.39'
L25	S 89°31'57" E	34.02'
L26	S 35°30'44" E	85.73'
L27	S 40°14'28" E	76.92'
L28	S 58°11'50" E	133.59'
L29	S 57°43'53" E	73.37'
L30	N 58°01'37" E	57.55'
L31	N 22°15'27" E	186.11'
L32	N 42°39'03" E	76.49'
L33	N 41°37'14" W	93.89'
L34	N 43°07'00" E	264.98'
L35	S 46°24'29" E	346.72'
L36	S 27°48'30" W	77.37'
L37	S 41°55'39" E	224.21'
L38	S 46°53'21" W	398.18'
L39	N 50°24'48" W	295.54'
L40	S 71°57'25" W	48.31'
L41	S 77°33'49" W	55.48'
L42	N 62°41'16" W	122.60'
L43	N 58°15'34" W	162.16'
L44	N 37°25'03" W	101.66'
L45	N 48°59'52" W	66.23'
L46	N 71°51'05" W	34.89'

Tract 324 Pad A

Moshannon State Forest

Girard Township, Clearfield County

Converted Area = 6.25 Acres

N

W E

S

0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LWCF Conversion Sites within Sproul State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Sproul State Forest Conversions (16.39 acres)
- Sproul State Forest LWCF (208,973.70 acres)
- Sproul State Forest (305,450 acres)

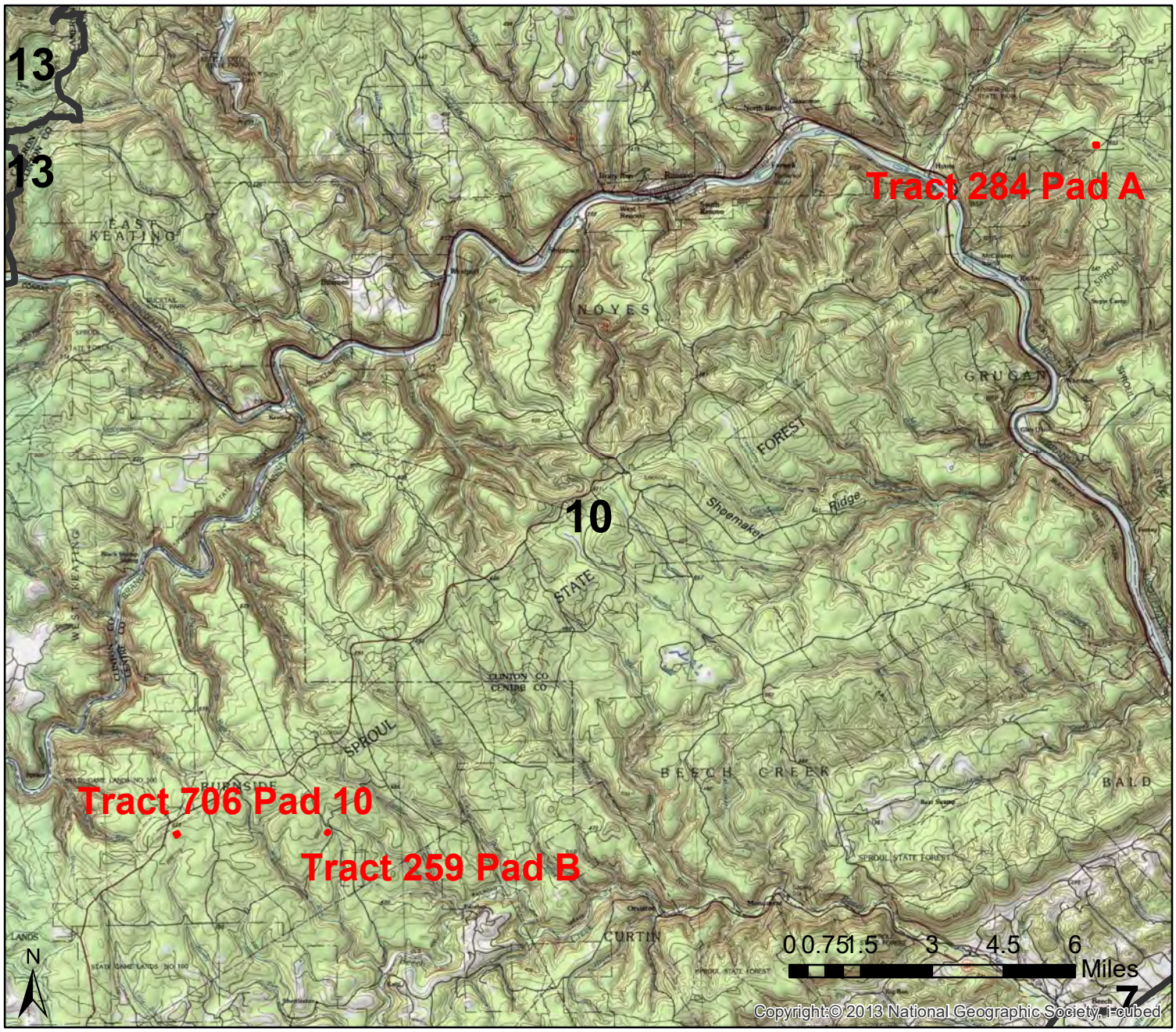
rmap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri
ng), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LWCF Conversion Sites within Sproul State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Sproul State Forest Conversions (16.39 acres)
- Sproul State Forest LWCF (208,973.70 acres)
- Sproul State Forest (305,450 acres)

rmap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri ng), swisstopo, © OpenStreetMap contributors, and the GIS User Community

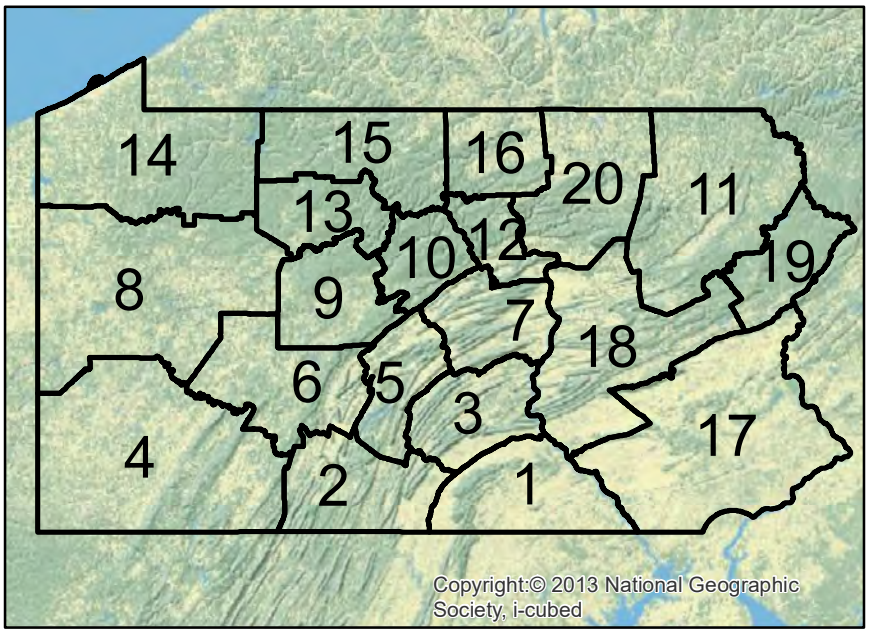


Forest District 10
Sproul State Forest
Centre and Clinton Counties

Sites:
Tract 259 Pad B: 41.131006, -77.888679
(Burnside Township, Centre County)

Tract 706 Pad 10: 41.130525, -77.949210
(Burnside Township, Centre County)

Tract 284 Pad A: 41.339985, -77.577248
(Grugan Township, Clinton County)



LINE	BEARING	DISTANCE
L75	S 39°38'23" W	44.04'
L76	S 08°37'07" W	56.23'
L77	S 06°39'37" E	105.12'
L78	S 09°22'59" E	181.30'
L79	S 18°14'13" E	145.27'
L80	S 53°35'37" E	102.66'
L81	S 34°50'44" W	75.89'
L82	S 37°34'07" W	85.42'
L83	S 35°22'30" W	72.32'
L84	S 44°18'51" W	153.61'
L85	N 52°50'14" W	324.85'
L86	N 19°30'19" W	65.28'
L87	N 39°06'20" E	358.44'
L88	S 48°07'47" E	154.04'
L89	N 44°26'11" E	47.33'
L90	N 08°25'00" W	50.40'
L91	N 09°39'26" W	143.68'
L92	N 11°03'56" W	189.20'
L93	N 13°01'23" E	63.36'
L94	S 63°46'46" E	79.77'

Tract 259 Pad B

Sproul State Forest

Burnside Township, Centre County

Converted Area = 3.88 Acres

N W E S

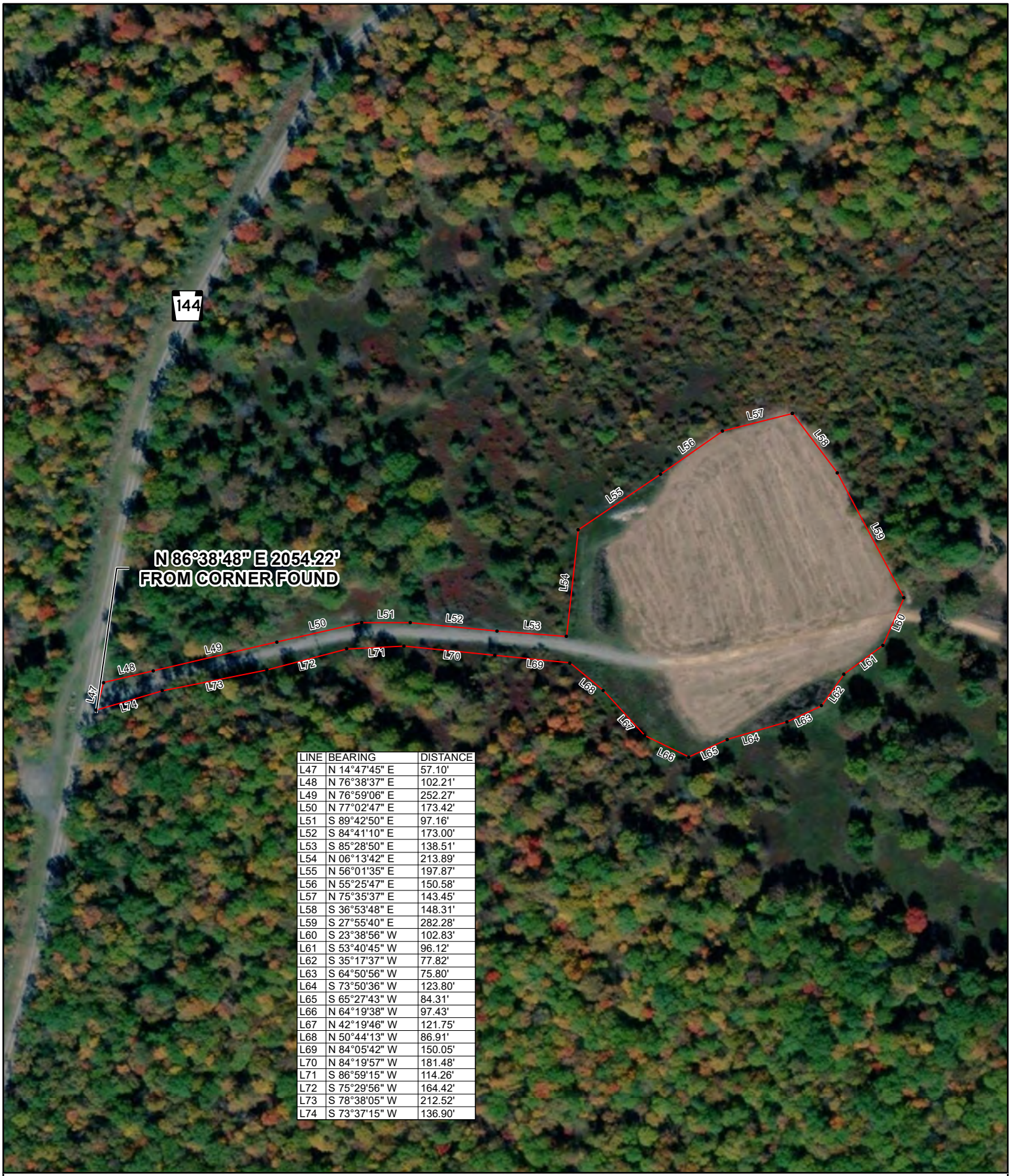
0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



LINE	BEARING	DISTANCE
L47	N 14°47'45" E	57.10'
L48	N 76°38'37" E	102.21'
L49	N 76°59'06" E	252.27'
L50	N 77°02'47" E	173.42'
L51	S 89°42'50" E	97.16'
L52	S 84°41'10" E	173.00'
L53	S 85°28'50" E	138.51'
L54	N 06°13'42" E	213.89'
L55	N 56°01'35" E	197.87'
L56	N 55°25'47" E	150.58'
L57	N 75°35'37" E	143.45'
L58	S 36°53'48" E	148.31'
L59	S 27°55'40" E	282.28'
L60	S 23°38'56" W	102.83'
L61	S 53°40'45" W	96.12'
L62	S 35°17'37" W	77.82'
L63	S 64°50'56" W	75.80'
L64	S 73°50'36" W	123.80'
L65	S 65°27'43" W	84.31'
L66	N 64°19'38" W	97.43'
L67	N 42°19'46" W	121.75'
L68	N 50°44'13" W	86.91'
L69	N 84°05'42" W	150.05'
L70	N 84°19'57" W	181.48'
L71	S 86°59'15" W	114.26'
L72	S 75°29'56" W	164.42'
L73	S 78°38'05" W	212.52'
L74	S 73°37'15" W	136.90'

Tract 706 Pad 10

Sproul State Forest

Burnside Township, Centre County

Converted Area = 8.07 Acres

N
W E
S

0 125 250

1 Inch = 250 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE
L95	S 69°12'26" E	41.24'
L96	S 62°55'54" E	33.97'
L97	S 65°19'50" E	38.40'
L98	S 79°07'30" W	42.50'
L99	S 85°12'42" W	31.50'
L100	S 50°21'12" W	38.18'
L100A	S 29°00'46" W	50.08'
L101	S 29°33'20" W	50.45'
L102	S 51°48'23" W	67.05'
L103	S 73°03'09" W	283.02'
L104	S 72°45'31" W	201.61'
L105	S 84°00'16" W	104.35'
L106	S 87°05'05" W	154.60'
L107	S 02°15'50" E	341.26'
L108	S 87°38'56" W	400.16'
L109	N 02°14'18" W	396.86'
L110	N 86°11'09" E	392.22'
L111	S 52°00'17" E	47.50'
L112	N 88°34'03" E	171.66'
L113	N 76°30'29" E	120.64'
L114	N 72°00'13" E	160.31'
L115	N 74°55'01" E	126.95'
L116	N 73°18'56" E	90.69'
L117	N 62°20'55" E	70.29'
L118	N 37°07'56" E	66.84'
L119	N 20°41'45" E	47.31'
L120	N 10°55'07" E	33.83'
L121	N 31°07'31" E	36.05'

Tract 284 Pad A

Sproul State Forest

Grugan Township, Clinton County

Converted Area = 4.44 Acres

N W E S

0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LWCF Conversion Sites within Loyalsock State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Loyalsock State Forest Conversions (101.64 acres)
- Loyalsock State Forest LWCF (54,498.49 acres)
- Loyalsock State Forest (114,551.97 acres)

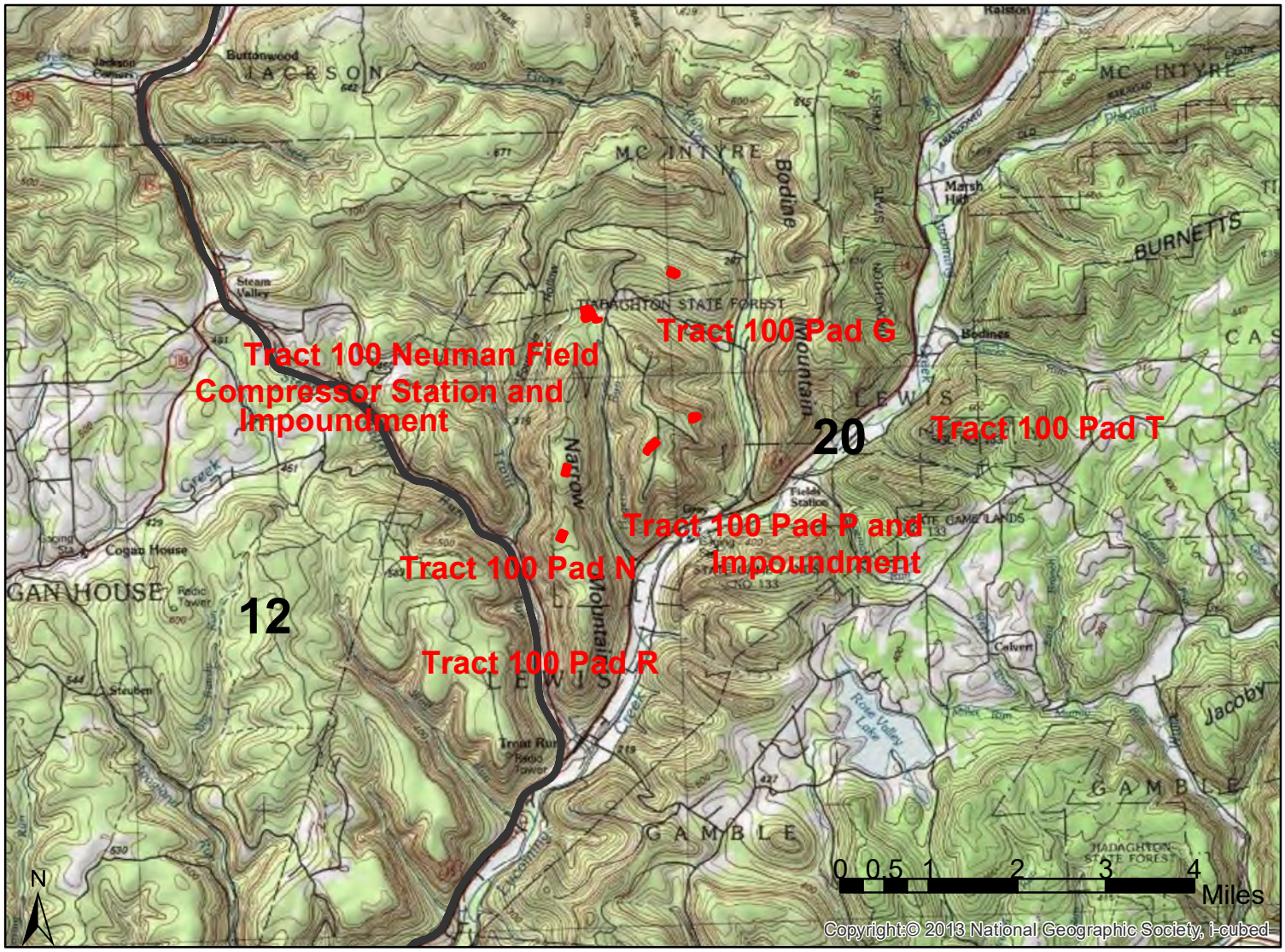
crement P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri
stopo, © OpenStreetMap contributors, and the GIS User Community

LWCF Conversion Sites within Loyalsock State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Loyalsock State Forest Conversions (101.64 acres)
- Loyalsock State Forest LWCF (54,498.49 acres)
- Loyalsock State Forest (114,551.97 acres)

crement P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri
stopo, © OpenStreetMap contributors, and the GIS User Community



Sites:
Tract 100 Pad N: 41.429924, -77.058186
(Lewis Twp.)

Tract 100 Neuman Field Compressor and Impoundment:
41.454814, -77.050990
(Lewis Twp.)

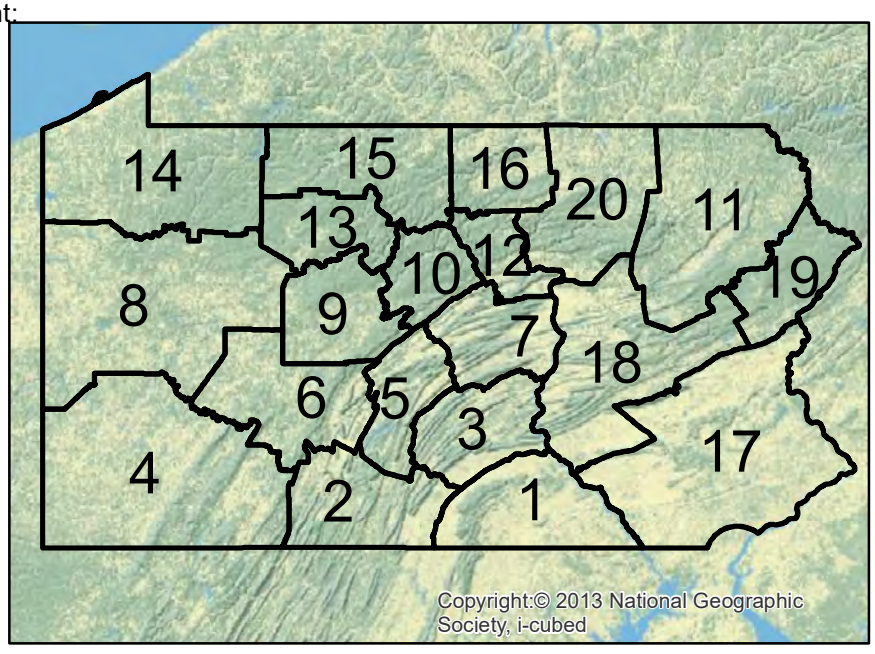
Tract 100 Pad G: 41.462363, -77.034329
(McIntyre Twp.)

Tract 100 Pad P and Impoundment:
41.434319, -77.039226
(Lewis Twp.)

Tract 100 Pad T: 41.438728, -77.030231
(Lewis Twp.)

Tract 100 Pad R: 41.419526, -77.059206
(Lewis Twp.)

Forest District 20
Loyalsock State Forest
Lycoming County



LINE	BEARING	DISTANCE
L138	S 83°51'02" E	154.88'
L139	S 79°27'30" E	194.36'
L140	S 18°36'54" E	76.74'
L141	S 09°23'39" W	326.62'
L142	S 09°38'04" W	282.28'
L143	S 25°19'03" W	99.97'
L144	S 87°07'44" W	64.21'
L145	N 84°38'34" W	171.50'
L146	N 80°19'54" W	148.93'
L147	N 03°06'16" E	253.33'
L148	N 14°07'42" E	340.46'
L149	N 16°44'35" E	203.47'

Tract 100 Pad N

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 7.54 Acres

N W E S

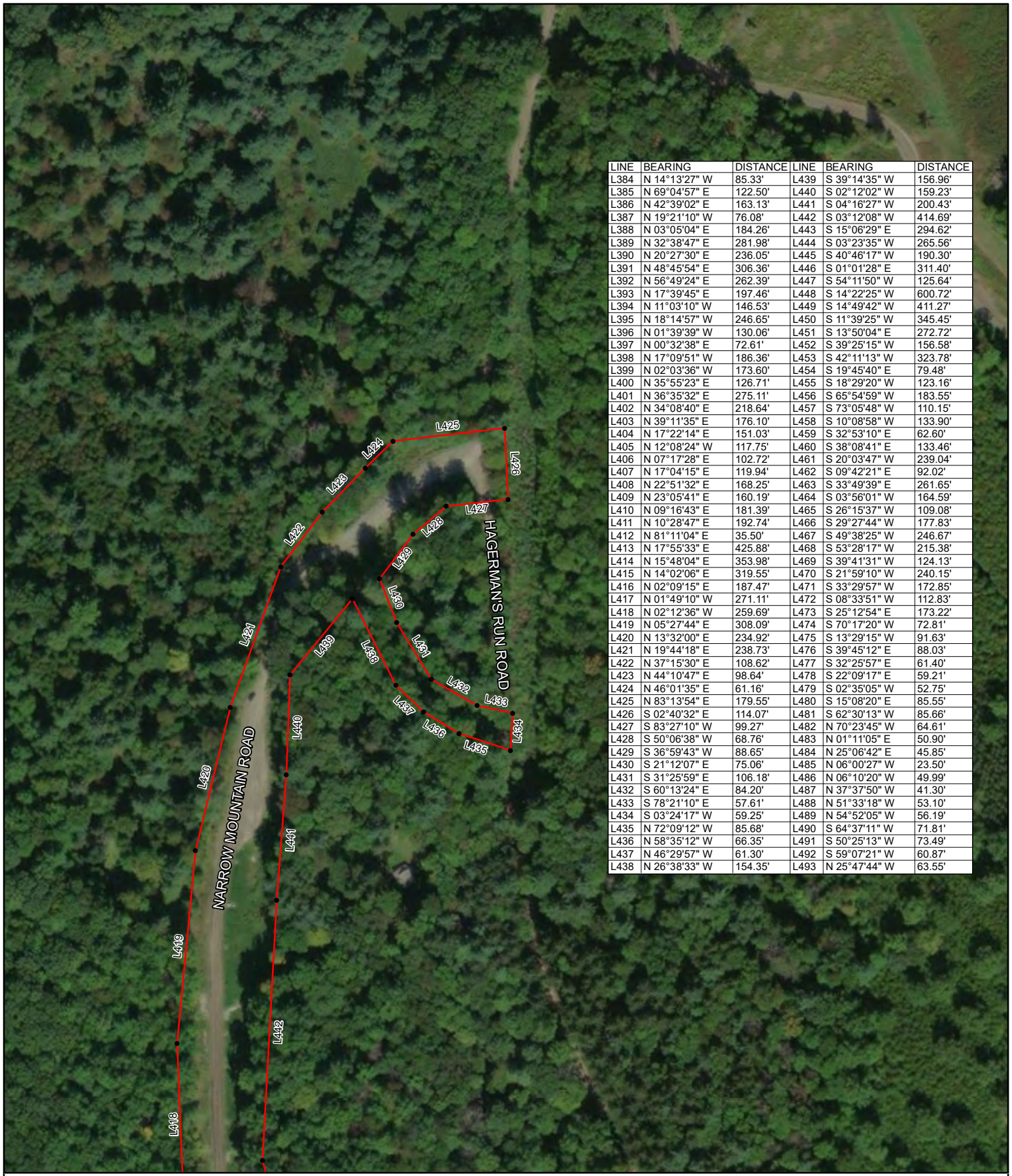
0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L384	N 14°13'27" W	85.33'	L439	S 39°14'35" W	156.96'
L385	N 69°04'57" E	122.50'	L440	S 02°12'02" W	159.23'
L386	N 42°39'02" E	163.13'	L441	S 04°16'27" W	200.43'
L387	N 19°21'10" W	76.08'	L442	S 03°12'08" W	414.69'
L388	N 03°05'04" E	184.26'	L443	S 15°06'29" E	294.62'
L389	N 32°38'47" E	281.98'	L444	S 03°23'35" W	265.56'
L390	N 20°27'30" E	236.05'	L445	S 40°46'17" W	190.30'
L391	N 48°45'54" E	306.36'	L446	S 01°01'28" E	311.40'
L392	N 56°49'24" E	262.39'	L447	S 54°11'50" W	125.64'
L393	N 17°39'45" E	197.46'	L448	S 14°22'25" W	600.72'
L394	N 11°03'10" W	146.53'	L449	S 14°49'42" W	411.27'
L395	N 18°14'57" W	246.65'	L450	S 11°39'25" W	345.45'
L396	N 01°39'39" W	130.06'	L451	S 13°50'04" E	272.72'
L397	N 00°32'38" E	72.61'	L452	S 39°25'15" W	156.58'
L398	N 17°09'51" W	186.36'	L453	S 42°11'13" W	323.78'
L399	N 02°03'36" W	173.60'	L454	S 19°45'40" E	79.48'
L400	N 35°55'23" E	126.71'	L455	S 18°29'20" W	123.16'
L401	N 36°35'32" E	275.11'	L456	S 65°54'59" W	183.55'
L402	N 34°08'40" E	218.64'	L457	S 73°05'48" W	110.15'
L403	N 39°11'35" E	176.10'	L458	S 10°08'58" W	133.90'
L404	N 17°22'14" E	151.03'	L459	S 32°53'10" E	62.60'
L405	N 12°08'24" W	117.75'	L460	S 38°08'41" E	133.46'
L406	N 07°17'28" E	102.72'	L461	S 20°03'47" W	239.04'
L407	N 17°04'15" E	119.94'	L462	S 09°42'21" E	92.02'
L408	N 22°51'32" E	168.25'	L463	S 33°49'39" E	261.65'
L409	N 23°05'41" E	160.19'	L464	S 03°56'01" W	164.59'
L410	N 09°16'43" E	181.39'	L465	S 26°15'37" W	109.08'
L411	N 10°28'47" E	192.74'	L466	S 29°27'44" W	177.83'
L412	N 81°11'04" E	35.50'	L467	S 49°38'25" W	246.67'
L413	N 17°55'33" E	425.88'	L468	S 53°28'17" W	215.38'
L414	N 15°48'04" E	353.98'	L469	S 39°41'31" W	124.13'
L415	N 14°02'06" E	319.55'	L470	S 21°59'10" W	240.15'
L416	N 02°09'15" E	187.47'	L471	S 33°29'57" W	172.85'
L417	N 01°49'10" W	271.11'	L472	S 08°33'51" W	112.83'
L418	N 02°12'36" W	259.69'	L473	S 25°12'54" E	173.22'
L419	N 05°27'44" E	308.09'	L474	S 70°17'20" W	72.81'
L420	N 13°32'00" E	234.92'	L475	S 13°29'15" W	91.63'
L421	N 19°44'18" E	238.73'	L476	S 39°45'12" E	88.03'
L422	N 37°15'30" E	108.62'	L477	S 32°25'57" E	61.40'
L423	N 44°10'47" E	98.64'	L478	S 22°09'17" E	59.21'
L424	N 46°01'35" E	61.16'	L479	S 02°35'05" W	52.75'
L425	N 83°13'54" E	179.55'	L480	S 15°08'20" E	85.55'
L426	S 02°40'32" E	114.07'	L481	S 62°30'13" W	85.66'
L427	S 83°27'10" W	99.27'	L482	N 70°23'45" W	64.61'
L428	S 50°06'38" W	68.76'	L483	N 01°11'05" E	50.90'
L429	S 36°59'43" W	88.65'	L484	N 25°06'42" E	45.85'
L430	S 21°12'07" E	75.06'	L485	N 06°00'27" W	23.50'
L431	S 31°25'59" E	106.18'	L486	N 06°10'20" W	49.99'
L432	S 60°13'24" E	84.20'	L487	N 37°37'50" W	41.30'
L433	S 78°21'10" E	57.61'	L488	N 51°33'18" W	53.10'
L434	S 03°24'17" W	59.25'	L489	N 54°52'05" W	56.19'
L435	N 72°09'12" W	85.68'	L490	S 64°37'11" W	71.81'
L436	N 58°35'12" W	66.35'	L491	S 50°25'13" W	73.49'
L437	N 46°29'57" W	61.30'	L492	S 59°07'21" W	60.87'
L438	N 26°38'33" W	154.35'	L493	N 25°47'44" W	63.55'

Tract 100 New Road to Pad N Sheet 1

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 28.66 Acres

N W E S

0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L384	N 14°13'27" W	85.33'	L439	S 39°14'35" W	156.96'
L385	N 69°04'57" E	122.50'	L440	S 02°12'02" W	159.23'
L386	N 42°39'02" E	163.13'	L441	S 04°16'27" W	200.43'
L387	N 19°21'10" W	76.08'	L442	S 03°12'08" W	414.69'
L388	N 03°05'04" E	184.26'	L443	S 15°06'29" E	294.62'
L389	N 32°38'47" E	281.98'	L444	S 03°23'35" W	265.56'
L390	N 20°27'30" E	236.05'	L445	S 40°46'17" W	190.30'
L391	N 48°45'54" E	306.36'	L446	S 01°01'28" E	311.40'
L392	N 56°49'24" E	262.39'	L447	S 54°11'50" W	125.64'
L393	N 17°39'45" E	197.46'	L448	S 14°22'25" W	600.72'
L394	N 11°03'10" W	146.53'	L449	S 14°49'42" W	411.27'
L395	N 18°14'57" W	246.65'	L450	S 11°39'25" W	345.45'
L396	N 01°39'39" W	130.06'	L451	S 13°50'04" E	272.72'
L397	N 00°32'38" E	72.61'	L452	S 39°25'15" W	156.58'
L398	N 17°09'51" W	186.36'	L453	S 42°11'13" W	323.78'
L399	N 02°03'36" W	173.60'	L454	S 19°45'40" E	79.48'
L400	N 35°55'23" E	126.71'	L455	S 18°29'20" W	123.16'
L401	N 36°35'32" E	275.11'	L456	S 65°54'59" W	183.55'
L402	N 34°08'40" E	218.64'	L457	S 73°05'48" W	110.15'
L403	N 39°11'35" E	176.10'	L458	S 10°08'58" W	133.90'
L404	N 17°22'14" E	151.03'	L459	S 32°53'10" E	62.60'
L405	N 12°08'24" W	117.75'	L460	S 38°08'41" E	133.46'
L406	N 07°17'28" E	102.72'	L461	S 20°03'47" W	239.04'
L407	N 17°04'15" E	119.94'	L462	S 09°42'21" E	92.02'
L408	N 22°51'32" E	168.25'	L463	S 33°49'39" E	261.65'
L409	N 23°05'41" E	160.19'	L464	S 03°56'01" W	164.59'
L410	N 09°16'43" E	181.39'	L465	S 26°15'37" W	109.08'
L411	N 10°28'47" E	192.74'	L466	S 29°27'44" W	177.83'
L412	N 81°11'04" E	35.50'	L467	S 49°38'25" W	246.67'
L413	N 17°55'33" E	425.88'	L468	S 53°28'17" W	215.38'
L414	N 15°48'04" E	353.98'	L469	S 39°41'31" W	124.13'
L415	N 14°02'06" E	319.55'	L470	S 21°59'10" W	240.15'
L416	N 02°09'15" E	187.47'	L471	S 33°29'57" W	172.85'
L417	N 01°49'10" W	271.11'	L472	S 08°33'51" W	112.83'
L418	N 02°12'36" W	259.69'	L473	S 25°12'54" E	173.22'
L419	N 05°27'44" E	308.09'	L474	S 70°17'20" W	72.81'
L420	N 13°32'00" E	234.92'	L475	S 13°29'15" W	91.63'
L421	N 19°44'18" E	238.73'	L476	S 39°45'12" E	88.03'
L422	N 37°15'30" E	108.62'	L477	S 32°25'57" E	61.40'
L423	N 44°10'47" E	98.64'	L478	S 22°09'17" E	59.21'
L424	N 46°01'35" E	61.16'	L479	S 02°35'05" W	52.75'
L425	N 83°13'54" E	179.55'	L480	S 15°08'20" E	85.55'
L426	S 02°40'32" E	114.07'	L481	S 62°30'13" W	85.66'
L427	S 83°27'10" W	99.27'	L482	N 70°23'45" W	64.61'
L428	S 50°06'38" W	68.76'	L483	N 01°11'05" E	50.90'
L429	S 36°59'43" W	88.65'	L484	N 25°06'42" E	45.85'
L430	S 21°12'07" E	75.06'	L485	N 06°00'27" W	23.50'
L431	S 31°25'59" E	106.18'	L486	N 06°10'20" W	49.99'
L432	S 60°13'24" E	84.20'	L487	N 37°37'50" W	41.30'
L433	S 78°21'10" E	57.61'	L488	N 51°33'18" W	53.10'
L434	S 03°24'17" W	59.25'	L489	N 54°52'05" W	56.19'
L435	N 72°09'12" W	85.68'	L490	S 64°37'11" W	71.81'
L436	N 58°35'12" W	66.35'	L491	S 50°25'13" W	73.49'
L437	N 46°29'57" W	61.30'	L492	S 59°07'21" W	60.87'
L438	N 26°38'33" W	154.35'	L493	N 25°47'44" W	63.55'

Tract 100 New Road to Pad N Sheet 2

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 28.66 Acres

N W E S

0 100 200

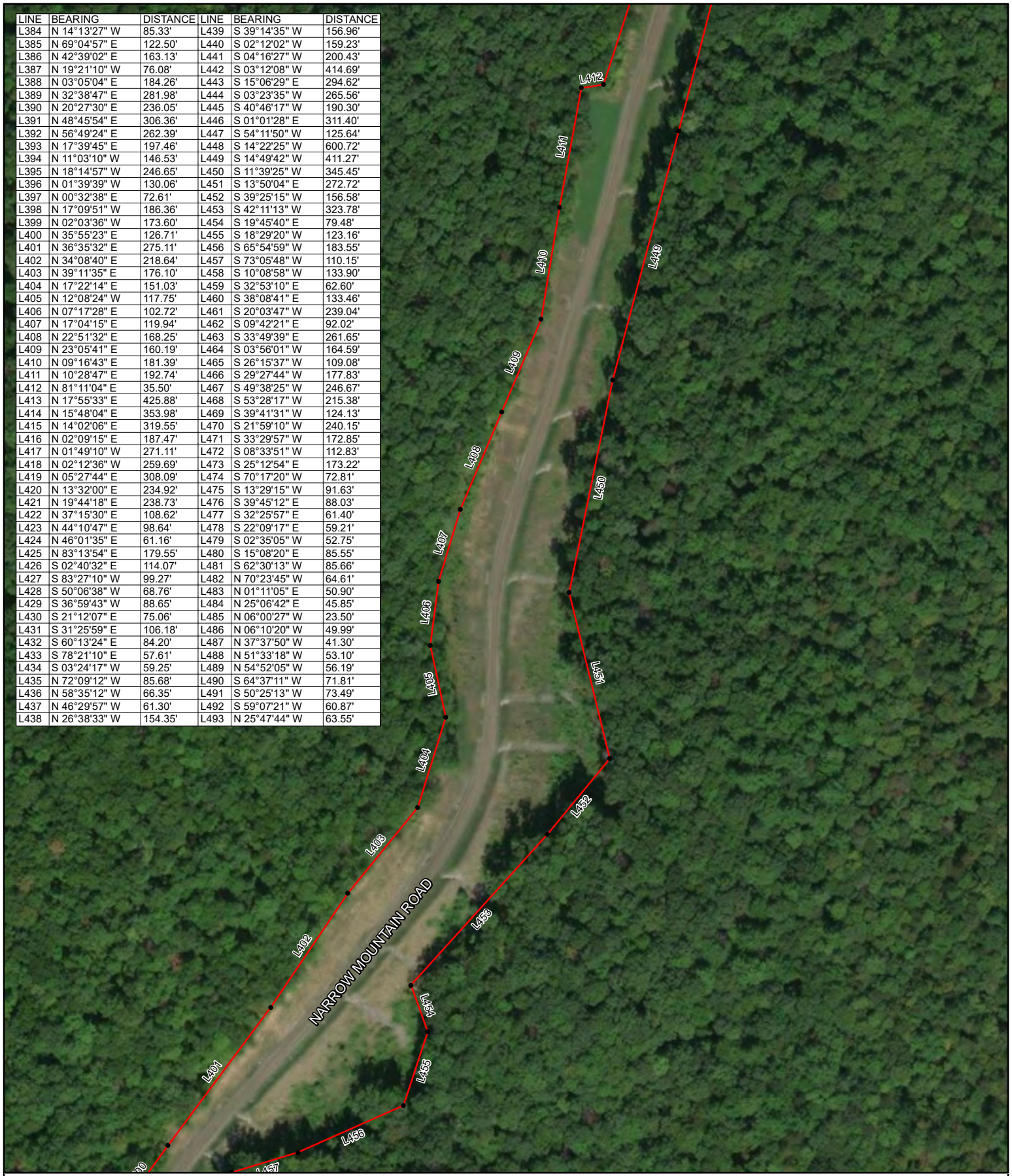
1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L384	N 14°13'27" W	85.33'	L439	S 39°14'35" W	156.96'
L385	N 69°04'57" E	122.50'	L440	S 02°12'02" W	159.23'
L386	N 42°39'02" E	163.13'	L441	S 04°16'27" W	200.43'
L387	N 19°21'10" W	76.08'	L442	S 03°12'08" W	414.69'
L388	N 03°05'04" E	184.26'	L443	S 15°06'29" E	294.62'
L389	N 32°38'47" E	281.98'	L444	S 03°23'35" W	265.56'
L390	N 20°27'30" E	236.05'	L445	S 40°46'17" W	190.30'
L391	N 48°45'54" E	306.36'	L446	S 01°01'28" E	311.40'
L392	N 56°49'24" E	262.39'	L447	S 54°11'50" W	125.64'
L393	N 17°39'45" E	197.46'	L448	S 14°22'25" W	600.72'
L394	N 11°03'10" W	146.53'	L449	S 14°49'42" W	411.27'
L395	N 18°14'57" W	246.65'	L450	S 11°39'25" W	345.45'
L396	N 01°39'39" W	130.06'	L451	S 13°50'04" E	272.72'
L397	N 00°32'38" E	72.61'	L452	S 39°25'15" W	156.58'
L398	N 17°09'51" W	186.36'	L453	S 42°11'13" W	323.78'
L399	N 02°03'36" W	173.60'	L454	S 19°45'40" E	79.48'
L400	N 35°55'23" E	126.71'	L455	S 18°29'20" W	123.16'
L401	N 36°35'32" E	275.11'	L456	S 65°54'59" W	183.55'
L402	N 34°08'40" E	218.64'	L457	S 73°05'48" W	110.15'
L403	N 39°11'35" E	176.10'	L458	S 10°08'58" W	133.90'
L404	N 17°22'14" E	151.03'	L459	S 32°53'10" E	62.60'
L405	N 12°08'24" W	117.75'	L460	S 38°08'41" E	133.46'
L406	N 07°17'28" E	102.72'	L461	S 20°03'47" W	239.04'
L407	N 17°04'15" E	119.94'	L462	S 09°42'21" E	92.02'
L408	N 22°51'32" E	168.25'	L463	S 33°49'39" E	261.65'
L409	N 23°05'41" E	160.19'	L464	S 03°56'01" W	164.59'
L410	N 09°16'43" E	181.39'	L465	S 26°15'37" W	109.08'
L411	N 10°28'47" E	192.74'	L466	S 29°27'44" W	177.83'
L412	N 81°11'04" E	35.50'	L467	S 49°38'25" W	246.67'
L413	N 17°55'33" E	425.88'	L468	S 53°28'17" W	215.38'
L414	N 15°48'04" E	353.98'	L469	S 39°41'31" W	124.13'
L415	N 14°02'06" E	319.55'	L470	S 21°59'10" W	240.15'
L416	N 02°09'15" E	187.47'	L471	S 33°29'57" W	172.85'
L417	N 01°49'10" W	271.11'	L472	S 08°33'51" W	112.83'
L418	N 02°12'36" W	259.69'	L473	S 25°12'54" E	173.22'
L419	N 05°27'44" E	308.09'	L474	S 70°17'20" W	72.81'
L420	N 13°32'00" E	234.92'	L475	S 13°29'15" W	91.63'
L421	N 19°44'18" E	238.73'	L476	S 39°45'12" E	88.03'
L422	N 37°15'30" E	108.62'	L477	S 32°25'57" E	61.40'
L423	N 44°10'47" E	98.64'	L478	S 22°09'17" E	59.21'
L424	N 46°01'35" E	61.16'	L479	S 02°35'05" W	52.75'
L425	N 83°13'54" E	179.55'	L480	S 15°08'20" E	85.55'
L426	S 02°40'32" E	114.07'	L481	S 62°30'13" W	85.66'
L427	S 83°27'10" W	99.27'	L482	N 70°23'45" W	64.61'
L428	S 50°06'38" W	68.76'	L483	N 01°11'05" E	50.90'
L429	S 36°59'43" W	88.65'	L484	N 25°06'42" E	45.85'
L430	S 21°12'07" E	75.06'	L485	N 06°00'27" W	23.50'
L431	S 31°25'59" E	106.18'	L486	N 06°10'20" W	49.99'
L432	S 60°13'24" E	84.20'	L487	N 37°37'50" W	41.30'
L433	S 78°21'10" E	57.61'	L488	N 51°33'18" W	53.10'
L434	S 03°24'17" W	59.25'	L489	N 54°52'05" W	56.19'
L435	N 72°09'12" W	85.68'	L490	S 64°37'11" W	71.81'
L436	N 58°35'12" W	66.35'	L491	S 50°25'13" W	73.49'
L437	N 46°29'57" W	61.30'	L492	S 59°07'21" W	60.87'
L438	N 26°38'33" W	154.35'	L493	N 25°47'44" W	63.55'



Tract 100 New Road to Pad N Sheet 3

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 28.66 Acres

N
W E
S

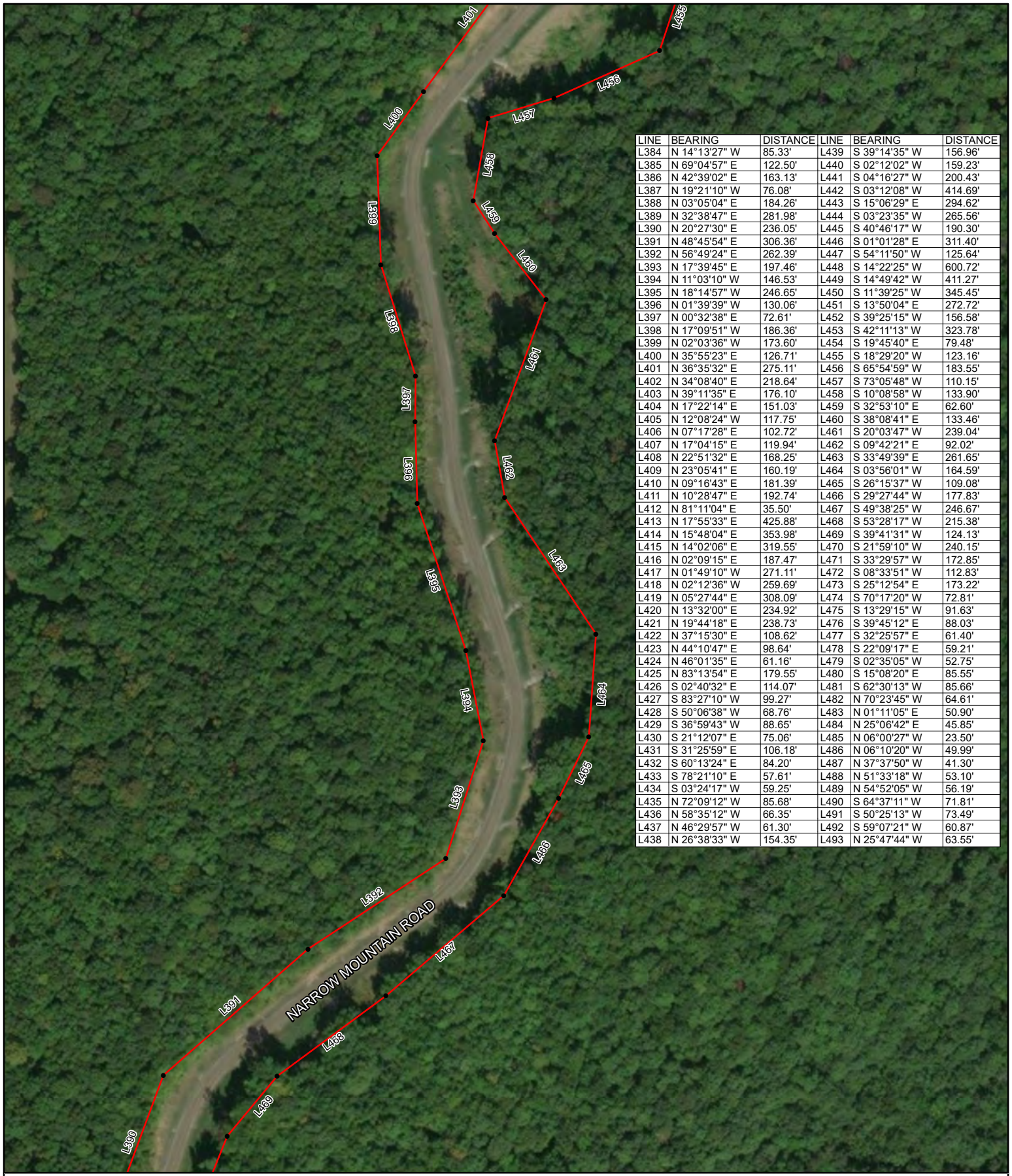
0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L384	N 14°13'27" W	85.33'	L439	S 39°14'35" W	156.96'
L385	N 69°04'57" E	122.50'	L440	S 02°12'02" W	159.23'
L386	N 42°39'02" E	163.13'	L441	S 04°16'27" W	200.43'
L387	N 19°21'10" W	76.08'	L442	S 03°12'08" W	414.69'
L388	N 03°05'04" E	184.26'	L443	S 15°06'29" E	294.62'
L389	N 32°38'47" E	281.98'	L444	S 03°23'35" W	265.56'
L390	N 20°27'30" E	236.05'	L445	S 40°46'17" W	190.30'
L391	N 48°45'54" E	306.36'	L446	S 01°01'28" E	311.40'
L392	N 56°49'24" E	262.39'	L447	S 54°11'50" W	125.64'
L393	N 17°39'45" E	197.46'	L448	S 14°22'25" W	600.72'
L394	N 11°03'10" W	146.53'	L449	S 14°49'42" W	411.27'
L395	N 18°14'57" W	246.65'	L450	S 11°39'25" W	345.45'
L396	N 01°39'39" W	130.06'	L451	S 13°50'04" E	272.72'
L397	N 00°32'38" E	72.61'	L452	S 39°25'15" W	156.58'
L398	N 17°09'51" W	186.36'	L453	S 42°11'13" W	323.78'
L399	N 02°03'36" W	173.60'	L454	S 19°45'40" E	79.48'
L400	N 35°55'23" E	126.71'	L455	S 18°29'20" W	123.16'
L401	N 36°35'32" E	275.11'	L456	S 65°54'59" W	183.55'
L402	N 34°08'40" E	218.64'	L457	S 73°05'48" W	110.15'
L403	N 39°11'35" E	176.10'	L458	S 10°08'58" W	133.90'
L404	N 17°22'14" E	151.03'	L459	S 32°53'10" E	62.60'
L405	N 12°08'24" W	117.75'	L460	S 38°08'41" E	133.46'
L406	N 07°17'28" E	102.72'	L461	S 20°03'47" W	239.04'
L407	N 17°04'15" E	119.94'	L462	S 09°42'21" E	92.02'
L408	N 22°51'32" E	168.25'	L463	S 33°49'39" E	261.65'
L409	N 23°05'41" E	160.19'	L464	S 03°56'01" W	164.59'
L410	N 09°16'43" E	181.39'	L465	S 26°15'37" W	109.08'
L411	N 10°28'47" E	192.74'	L466	S 29°27'44" W	177.83'
L412	N 81°11'04" E	35.50'	L467	S 49°38'25" W	246.67'
L413	N 17°55'33" E	425.88'	L468	S 53°28'17" W	215.38'
L414	N 15°48'04" E	353.98'	L469	S 39°41'31" W	124.13'
L415	N 14°02'06" E	319.55'	L470	S 21°59'10" W	240.15'
L416	N 02°09'15" E	187.47'	L471	S 33°29'57" W	172.85'
L417	N 01°49'10" W	271.11'	L472	S 08°33'51" W	112.83'
L418	N 02°12'36" W	259.69'	L473	S 25°12'54" E	173.22'
L419	N 05°27'44" E	308.09'	L474	S 70°17'20" W	72.81'
L420	N 13°32'00" E	234.92'	L475	S 13°29'15" W	91.63'
L421	N 19°44'18" E	238.73'	L476	S 39°45'12" E	88.03'
L422	N 37°15'30" E	108.62'	L477	S 32°25'57" E	61.40'
L423	N 44°10'47" E	98.64'	L478	S 22°09'17" E	59.21'
L424	N 46°01'35" E	61.16'	L479	S 02°35'05" W	52.75'
L425	N 83°13'54" E	179.55'	L480	S 15°08'20" E	85.55'
L426	S 02°40'32" E	114.07'	L481	S 62°30'13" W	85.66'
L427	S 83°27'10" W	99.27'	L482	N 70°23'45" W	64.61'
L428	S 50°06'38" W	68.76'	L483	N 01°11'05" E	50.90'
L429	S 36°59'43" W	88.65'	L484	N 25°06'42" E	45.85'
L430	S 21°12'07" E	75.06'	L485	N 06°00'27" W	23.50'
L431	S 31°25'59" E	106.18'	L486	N 06°10'20" W	49.99'
L432	S 60°13'24" E	84.20'	L487	N 37°37'50" W	41.30'
L433	S 78°21'10" E	57.61'	L488	N 51°33'18" W	53.10'
L434	S 03°24'17" W	59.25'	L489	N 54°52'05" W	56.19'
L435	N 72°09'12" W	85.68'	L490	S 64°37'11" W	71.81'
L436	N 58°35'12" W	66.35'	L491	S 50°25'13" W	73.49'
L437	N 46°29'57" W	61.30'	L492	S 59°07'21" W	60.87'
L438	N 26°38'33" W	154.35'	L493	N 25°47'44" W	63.55'

Tract 100 New Road to Pad N Sheet 4

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 28.66 Acres

N W E S

0 100 200

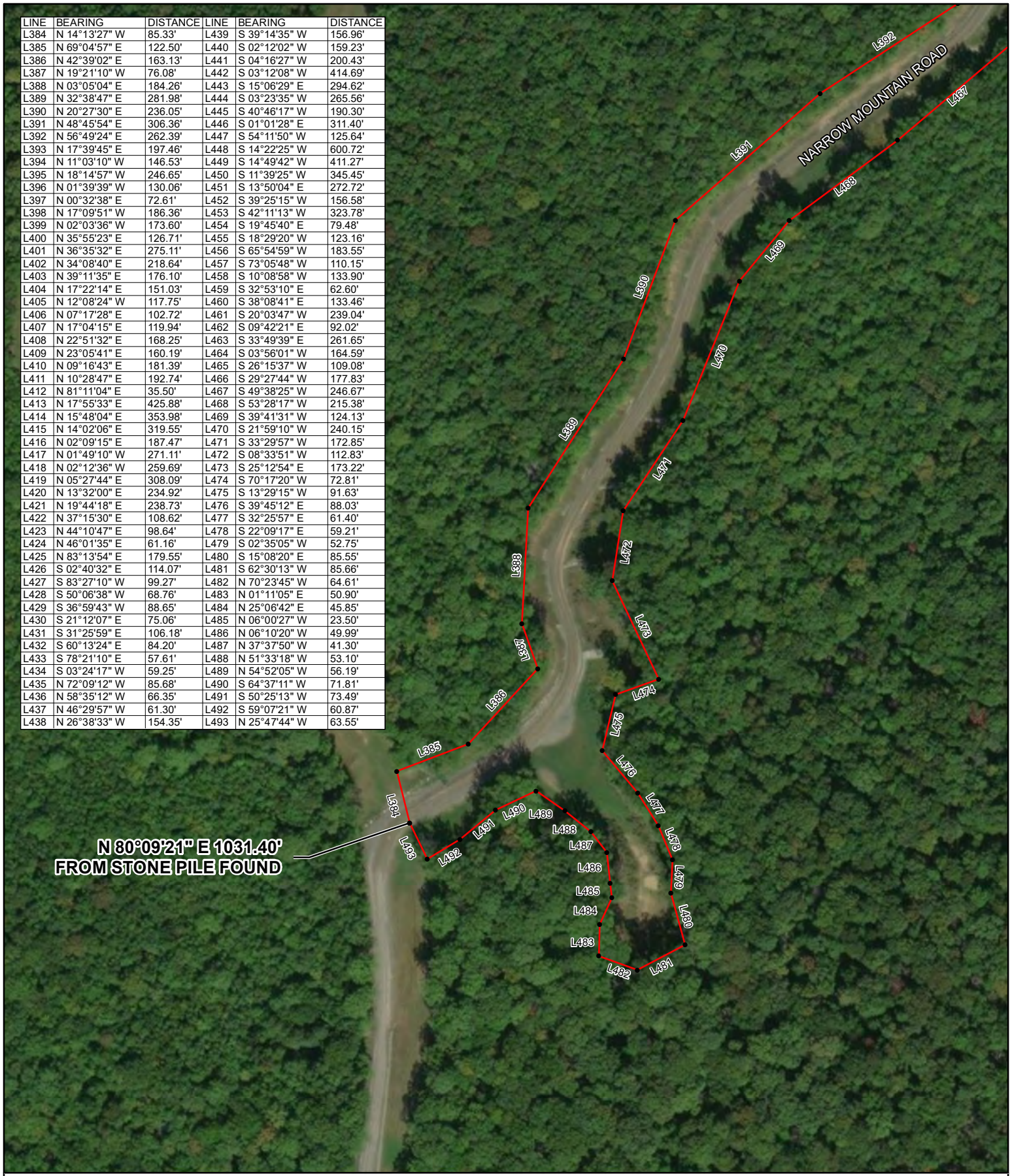
1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L384	N 14°13'27" W	85.33'	L439	S 39°14'35" W	156.96'
L385	N 69°04'57" E	122.50'	L440	S 02°12'02" W	159.23'
L386	N 42°39'02" E	163.13'	L441	S 04°16'27" W	200.43'
L387	N 19°21'10" W	76.08'	L442	S 03°12'08" W	414.69'
L388	N 03°05'04" E	184.26'	L443	S 15°06'29" E	294.62'
L389	N 32°38'47" E	281.98'	L444	S 03°23'35" W	265.56'
L390	N 20°27'30" E	236.05'	L445	S 40°46'17" W	190.30'
L391	N 48°45'54" E	306.36'	L446	S 01°01'28" E	311.40'
L392	N 56°49'24" E	262.39'	L447	S 54°11'50" W	125.64'
L393	N 17°39'45" E	197.46'	L448	S 14°22'25" W	600.72'
L394	N 11°03'10" W	146.53'	L449	S 14°49'42" W	411.27'
L395	N 18°14'57" W	246.65'	L450	S 11°39'25" W	345.45'
L396	N 01°39'39" W	130.06'	L451	S 13°50'04" E	272.72'
L397	N 00°32'38" E	72.61'	L452	S 39°25'15" W	156.58'
L398	N 17°09'51" W	186.36'	L453	S 42°11'13" W	323.78'
L399	N 02°03'36" W	173.60'	L454	S 19°45'40" E	79.48'
L400	N 35°55'23" E	126.71'	L455	S 18°29'20" W	123.16'
L401	N 36°35'32" E	275.11'	L456	S 65°54'59" W	183.55'
L402	N 34°08'40" E	218.64'	L457	S 73°05'48" W	110.15'
L403	N 39°11'35" E	176.10'	L458	S 10°08'58" W	133.90'
L404	N 17°22'14" E	151.03'	L459	S 32°53'10" E	62.60'
L405	N 12°08'24" W	117.75'	L460	S 38°08'41" E	133.46'
L406	N 07°17'28" E	102.72'	L461	S 20°03'47" W	239.04'
L407	N 17°04'15" E	119.94'	L462	S 09°42'21" E	92.02'
L408	N 22°51'32" E	168.25'	L463	S 33°49'39" E	261.65'
L409	N 23°05'41" E	160.19'	L464	S 03°56'01" W	164.59'
L410	N 09°16'43" E	181.39'	L465	S 26°15'37" W	109.08'
L411	N 10°28'47" E	192.74'	L466	S 29°27'44" W	177.83'
L412	N 81°11'04" E	35.50'	L467	S 49°38'25" W	246.67'
L413	N 17°55'33" E	425.88'	L468	S 53°28'17" W	215.38'
L414	N 15°48'04" E	353.98'	L469	S 39°41'31" W	124.13'
L415	N 14°02'06" E	319.55'	L470	S 21°59'10" W	240.15'
L416	N 02°09'15" E	187.47'	L471	S 33°29'57" W	172.85'
L417	N 01°49'10" W	271.11'	L472	S 08°33'51" W	112.83'
L418	N 02°12'36" W	259.69'	L473	S 25°12'54" E	173.22'
L419	N 05°27'44" E	308.09'	L474	S 70°17'20" W	72.81'
L420	N 13°32'00" E	234.92'	L475	S 13°29'15" W	91.63'
L421	N 19°44'18" E	238.73'	L476	S 39°45'12" E	88.03'
L422	N 37°15'30" E	108.62'	L477	S 32°25'57" E	61.40'
L423	N 44°10'47" E	98.64'	L478	S 22°09'17" E	59.21'
L424	N 46°01'35" E	61.16'	L479	S 02°35'05" W	52.75'
L425	N 83°13'54" E	179.55'	L480	S 15°08'20" E	85.55'
L426	S 02°40'32" E	114.07'	L481	S 62°30'13" W	85.66'
L427	S 83°27'10" W	99.27'	L482	N 70°23'45" W	64.61'
L428	S 50°06'38" W	68.76'	L483	N 01°11'05" E	50.90'
L429	S 36°59'43" W	88.65'	L484	N 25°06'42" E	45.85'
L430	S 21°12'07" E	75.06'	L485	N 06°00'27" W	23.50'
L431	S 31°25'59" E	106.18'	L486	N 06°10'20" W	49.99'
L432	S 60°13'24" E	84.20'	L487	N 37°37'50" W	41.30'
L433	S 78°21'10" E	57.61'	L488	N 51°33'18" W	53.10'
L434	S 03°24'17" W	59.25'	L489	N 54°52'05" W	56.19'
L435	N 72°09'12" W	85.68'	L490	S 64°37'11" W	71.81'
L436	N 58°35'12" W	66.35'	L491	S 50°25'13" W	73.49'
L437	N 46°29'57" W	61.30'	L492	S 59°07'21" W	60.87'
L438	N 26°38'33" W	154.35'	L493	N 25°47'44" W	63.55'



Tract 100 New Road to Pad N Sheet 5

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 28.66 Acres

N

W E

S

0 100 200

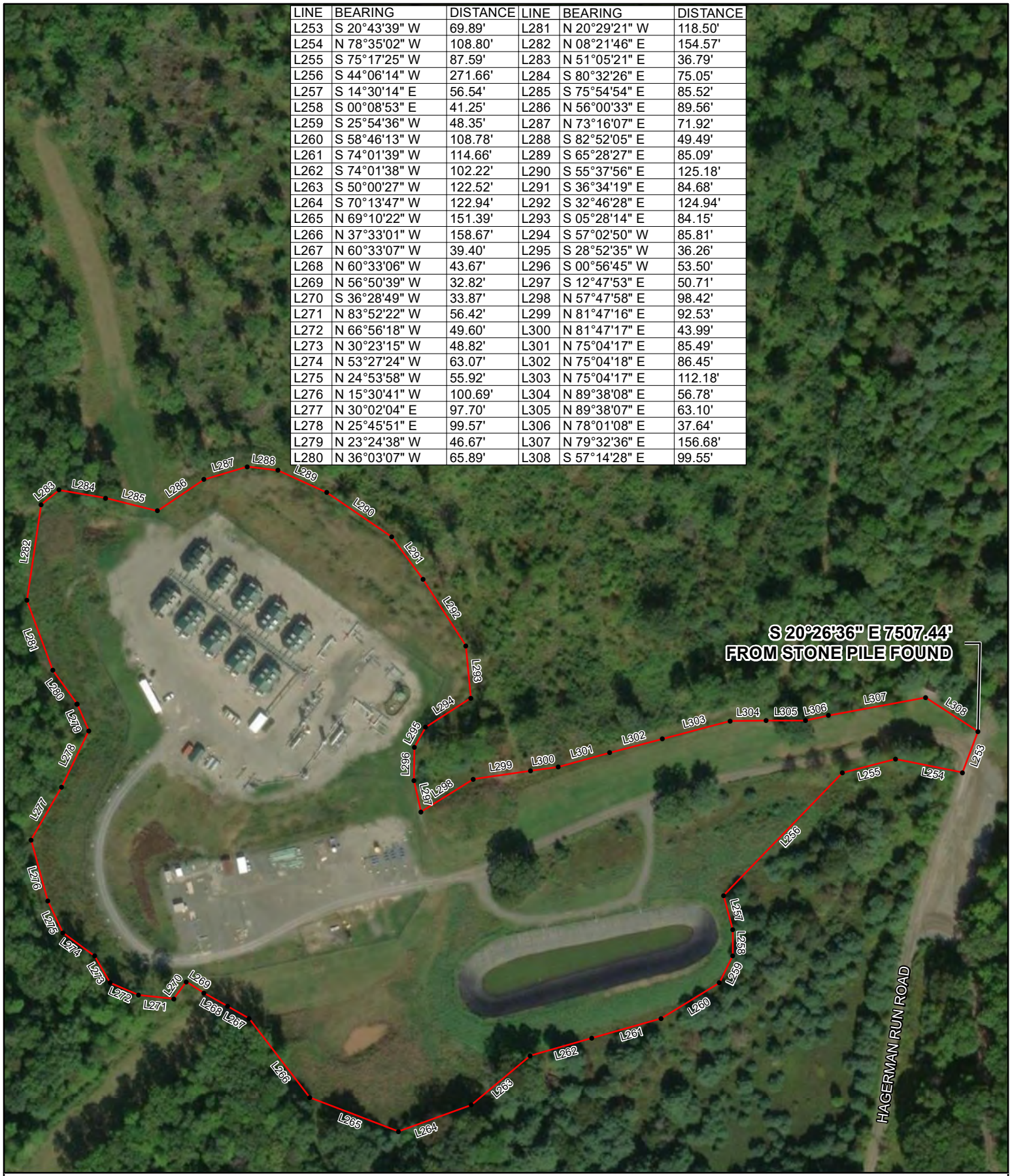
1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L253	S 20°43'39" W	69.89'	L281	N 20°29'21" W	118.50'
L254	N 78°35'02" W	108.80'	L282	N 08°21'46" E	154.57'
L255	S 75°17'25" W	87.59'	L283	N 51°05'21" E	36.79'
L256	S 44°06'14" W	271.66'	L284	S 80°32'26" E	75.05'
L257	S 14°30'14" E	56.54'	L285	S 75°54'54" E	85.52'
L258	S 00°08'53" E	41.25'	L286	N 56°00'33" E	89.56'
L259	S 25°54'36" W	48.35'	L287	N 73°16'07" E	71.92'
L260	S 58°46'13" W	108.78'	L288	S 82°52'05" E	49.49'
L261	S 74°01'39" W	114.66'	L289	S 65°28'27" E	85.09'
L262	S 74°01'38" W	102.22'	L290	S 55°37'56" E	125.18'
L263	S 50°00'27" W	122.52'	L291	S 36°34'19" E	84.68'
L264	S 70°13'47" W	122.94'	L292	S 32°46'28" E	124.94'
L265	N 69°10'22" W	151.39'	L293	S 05°28'14" E	84.15'
L266	N 37°33'01" W	158.67'	L294	S 57°02'50" W	85.81'
L267	N 60°33'07" W	39.40'	L295	S 28°52'35" W	36.26'
L268	N 60°33'06" W	43.67'	L296	S 00°56'45" W	53.50'
L269	N 56°50'39" W	32.82'	L297	S 12°47'53" E	50.71'
L270	S 36°28'49" W	33.87'	L298	N 57°47'58" E	98.42'
L271	N 83°52'22" W	56.42'	L299	N 81°47'16" E	92.53'
L272	N 66°56'18" W	49.60'	L300	N 81°47'17" E	43.99'
L273	N 30°23'15" W	48.82'	L301	N 75°04'17" E	85.49'
L274	N 53°27'24" W	63.07'	L302	N 75°04'18" E	86.45'
L275	N 24°53'58" W	55.92'	L303	N 75°04'17" E	112.18'
L276	N 15°30'41" W	100.69'	L304	N 89°38'08" E	56.78'
L277	N 30°02'04" E	97.70'	L305	N 89°38'07" E	63.10'
L278	N 25°45'51" E	99.57'	L306	N 78°01'08" E	37.64'
L279	N 23°24'38" W	46.67'	L307	N 79°32'36" E	156.68'
L280	N 36°03'07" W	65.89'	L308	S 57°14'28" E	99.55'



Tract 100 Neuman Field Compressor Station and Pond

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 18.2 Acres

N W E S

0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE
L227	S 62°36'48" E	513.64'
L228	S 04°58'42" E	119.79'
L229	S 02°05'35" E	57.27'
L230	S 24°27'46" W	85.87'
L231	S 58°44'38" W	95.95'
L232	N 88°47'17" W	145.15'
L233	N 70°32'15" W	232.08'
L234	N 51°39'06" W	161.02'
L235	N 11°55'51" W	110.73'
L236	N 30°48'04" E	196.76'
L237	N 36°26'20" E	103.35'

Tract 100 Pad G

Loyalsock State Forest

McIntyre Township, Lycoming County

Converted Area = 5.22 Acres

N W E S

0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE
L150	S 35°55'19" W	618.81'
L151	S 28°30'58" W	101.81'
L152	S 27°04'50" W	117.88'
L153	S 34°30'50" W	81.18'
L154	S 73°37'50" W	51.38'
L155	S 47°52'17" W	65.19'
L156	S 66°15'59" W	66.04'
L157	N 82°34'18" W	107.25'
L158	N 65°38'28" W	24.23'
L159	N 24°11'50" W	36.66'
L160	N 01°13'25" E	39.72'
L161	N 26°35'44" E	47.28'
L162	N 53°01'21" E	38.72'
L163	N 34°18'55" E	36.13'
L164	N 32°47'34" W	20.59'
L165	N 47°29'21" W	236.90'
L166	N 34°37'05" E	308.01'
L167	N 10°00'27" W	105.82'
L168	N 42°11'09" E	352.03'
L169	N 51°33'20" E	332.24'
L170	S 35°32'45" E	179.99'
L171	S 41°32'38" E	157.57'
L172	S 37°05'53" E	104.44'

Tract 100 Pad P and Impoundment

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 12.39 Acres

N
W E
S

0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE
L173	N 25°10'17" W	259.71'
L174	S 52°22'23" E	83.53'
L175	S 56°00'53" E	254.22'
L176	S 70°19'50" E	159.26'
L177	S 77°24'06" E	87.97'
L178	S 88°43'39" E	99.85'
L179	S 82°59'23" E	298.38'
L180	S 73°18'42" E	144.25'
L181	S 62°38'47" E	168.74'
L182	S 42°11'05" E	166.35'
L183	S 36°43'19" E	158.11'
L184	S 12°53'02" E	119.64'
L185	S 27°55'00" E	88.33'
L186	S 71°06'33" E	60.43'
L187	S 80°07'07" E	110.95'
L188	N 72°41'49" E	113.61'
L189	N 48°15'14" E	97.69'
L190	N 06°30'29" E	110.09'
L191	N 06°47'49" W	128.12'
L192	N 03°41'11" E	133.40'
L193	N 14°54'51" E	213.68'
L194	N 42°25'13" E	98.18'
L195	N 88°24'53" E	398.64'
L196	S 72°20'24" E	390.68'
L197	S 02°32'17" E	141.75'
L198	S 13°11'31" W	157.70'
L199	S 57°56'30" W	64.72'
L200	S 81°04'55" W	168.09'
L201	S 16°26'57" W	128.12'
L202	S 13°24'04" W	91.75'
L203	N 56°44'37" W	138.38'
L204	N 36°29'42" W	104.87'
L205	N 80°56'37" W	100.79'
L206	S 74°50'45" W	104.31'
L207	S 21°49'06" E	76.37'
L208	S 19°57'23" E	151.60'
L209	S 16°22'05" E	306.07'
L210	S 09°06'34" W	119.90'
L211	S 36°25'07" W	71.26'
L212	S 78°40'47" W	127.47'
L213	N 58°19'02" W	177.94'
L214	N 53°58'33" W	350.94'
L215	N 46°36'03" W	247.38'
L216	N 20°27'40" W	102.38'
L217	N 27°49'26" W	241.32'
L218	N 49°00'35" W	217.81'
L219	N 64°22'18" W	169.85'
L220	N 73°45'48" W	206.53'
L221	N 84°46'17" W	143.19'
L222	N 83°13'14" W	202.49'
L223	N 68°48'35" W	114.28'
L224	N 61°09'17" W	101.41'
L225	N 73°57'52" W	41.06'
L226	S 51°37'32" W	53.82'

Tract 100 Pad T

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 20.13 Acres

N W E S

0 200 400

1 Inch = 400 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LINE	BEARING	DISTANCE
L122	N 66°38'39" W	534.16'
L123	N 25°42'23" E	687.15'
L124	S 68°40'16" E	58.99'
L125	N 76°12'34" E	206.16'
L126	S 03°54'05" E	118.00'
L127	S 39°17'41" E	87.45'
L128	S 51°45'10" E	56.31'
L129	N 74°52'42" E	54.94'
L130	S 30°29'29" E	53.75'
L131	S 00°10'50" W	74.11'
L132	S 32°57'27" W	163.34'
L133	S 19°35'25" W	161.60'
L134	S 06°33'10" E	91.69'
L135	S 06°08'48" W	62.91'
L136	N 82°03'53" W	48.03'
L137	S 33°34'34" W	115.13'

Tract 100 Pad R

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 8.65 Acres

N W E S

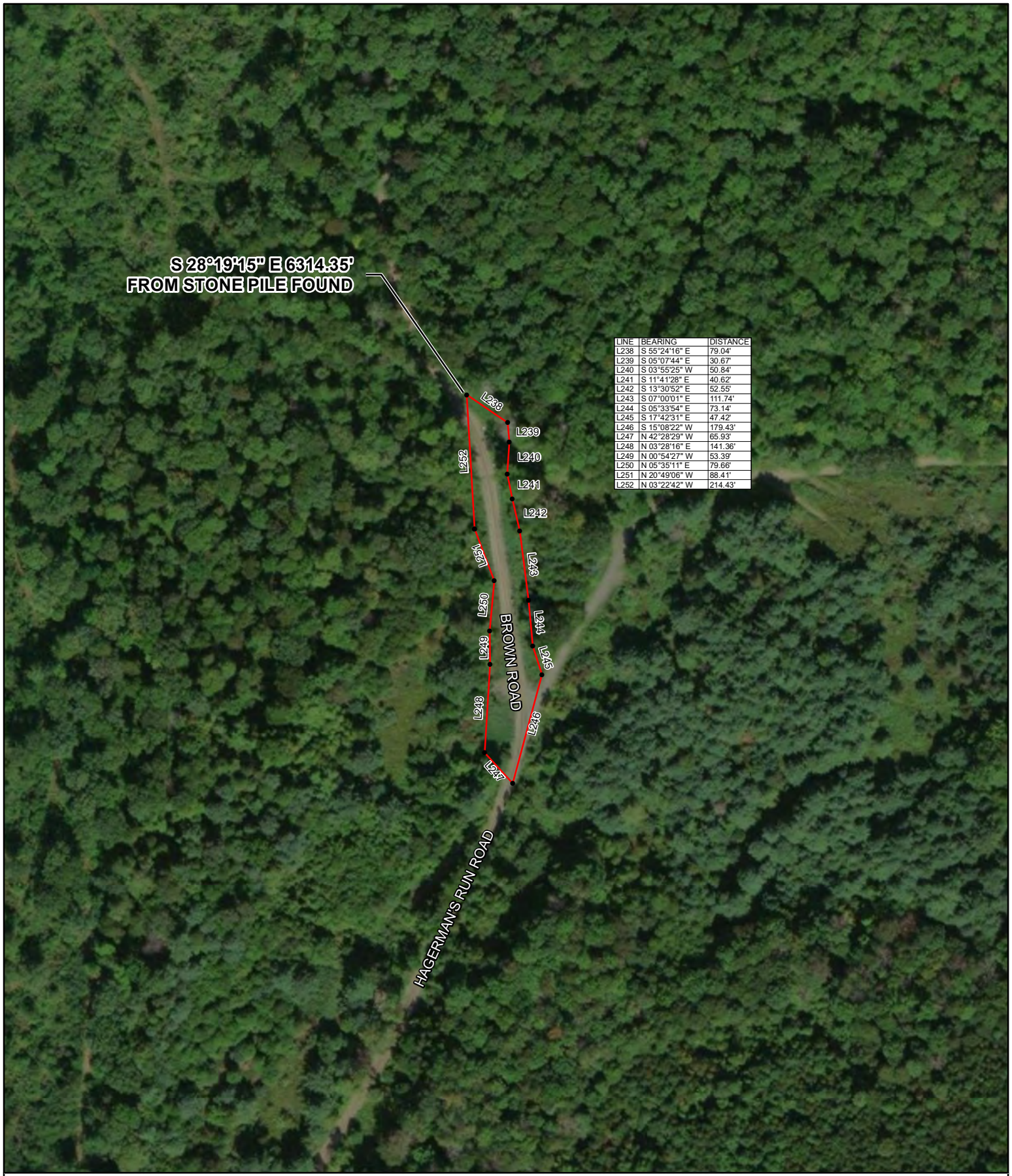
0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



LINE	BEARING	DISTANCE
L238	S 55°24'16" E	79.04'
L239	S 05°07'44" E	30.67'
L240	S 03°55'25" W	50.84'
L241	S 11°41'28" E	40.62'
L242	S 13°30'52" E	52.55'
L243	S 07°00'01" E	111.74'
L244	S 05°33'54" E	73.14'
L245	S 17°42'31" E	47.42'
L246	S 15°08'22" W	179.43'
L247	N 42°28'29" W	65.93'
L248	N 03°28'16" E	141.36'
L249	N 00°54'27" W	53.39'
L250	N 05°35'11" E	79.66'
L251	N 20°49'06" W	88.41'
L252	N 03°22'42" W	214.43'

Tract 100 Brown Road Relocation

Loyalsock State Forest

Lewis Township, Lycoming County

Converted Area = 0.85 Acres

N W E S

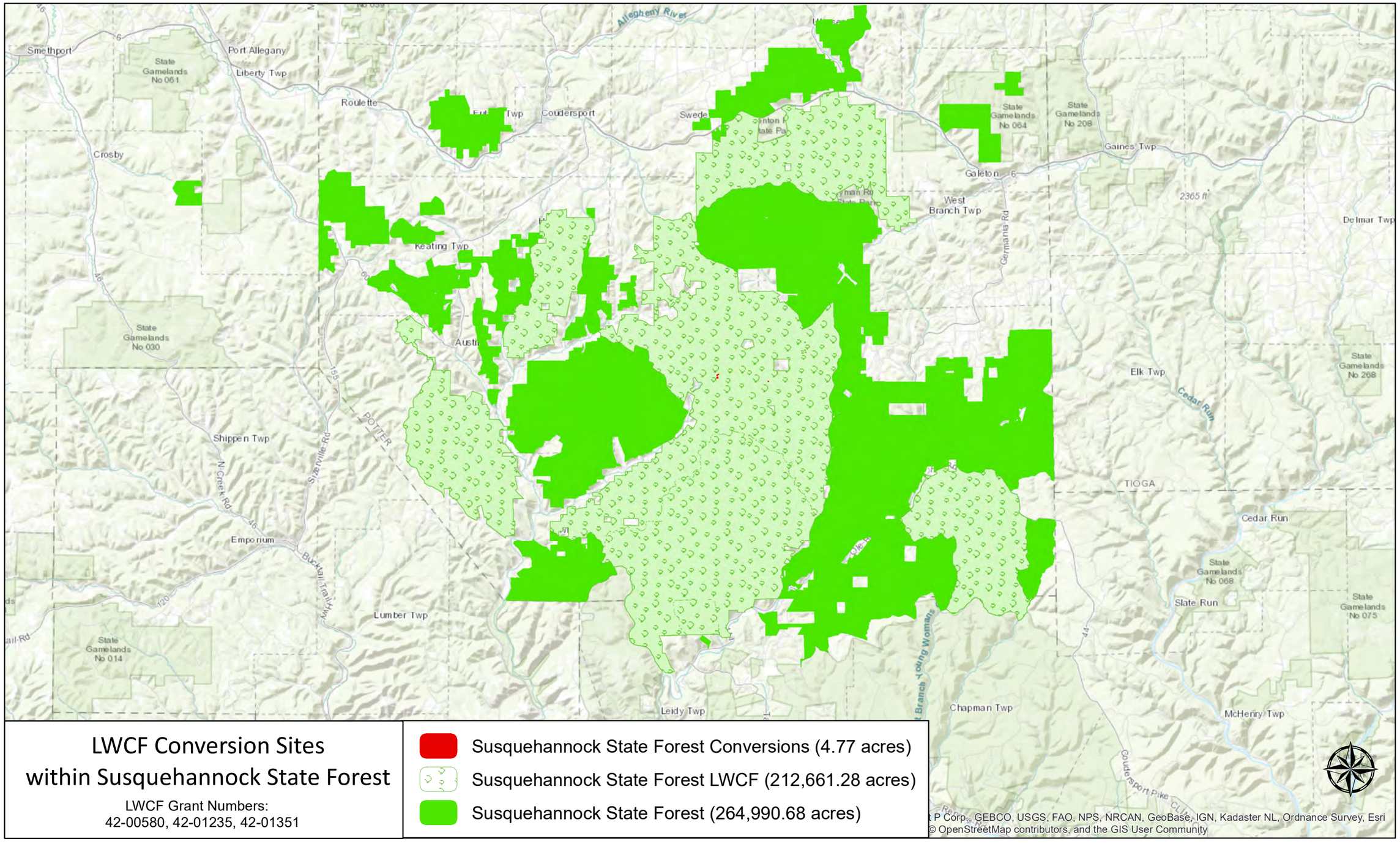
0 100 200

1 Inch = 200 Feet

Legend

Converted Area

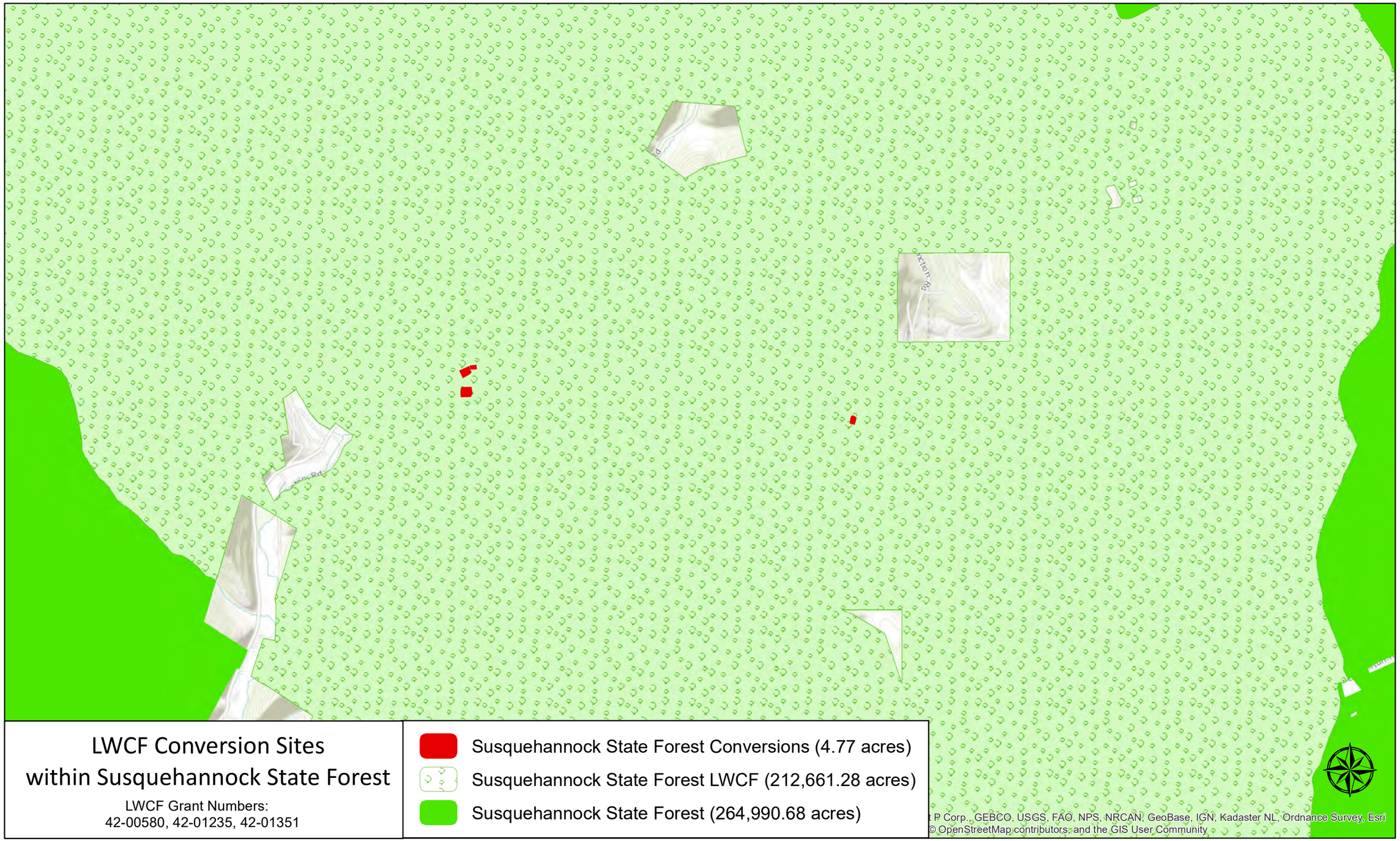
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



LWCF Conversion Sites within Susquehannock State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Susquehannock State Forest Conversions (4.77 acres)
- Susquehannock State Forest LWCF (212,661.28 acres)
- Susquehannock State Forest (264,990.68 acres)

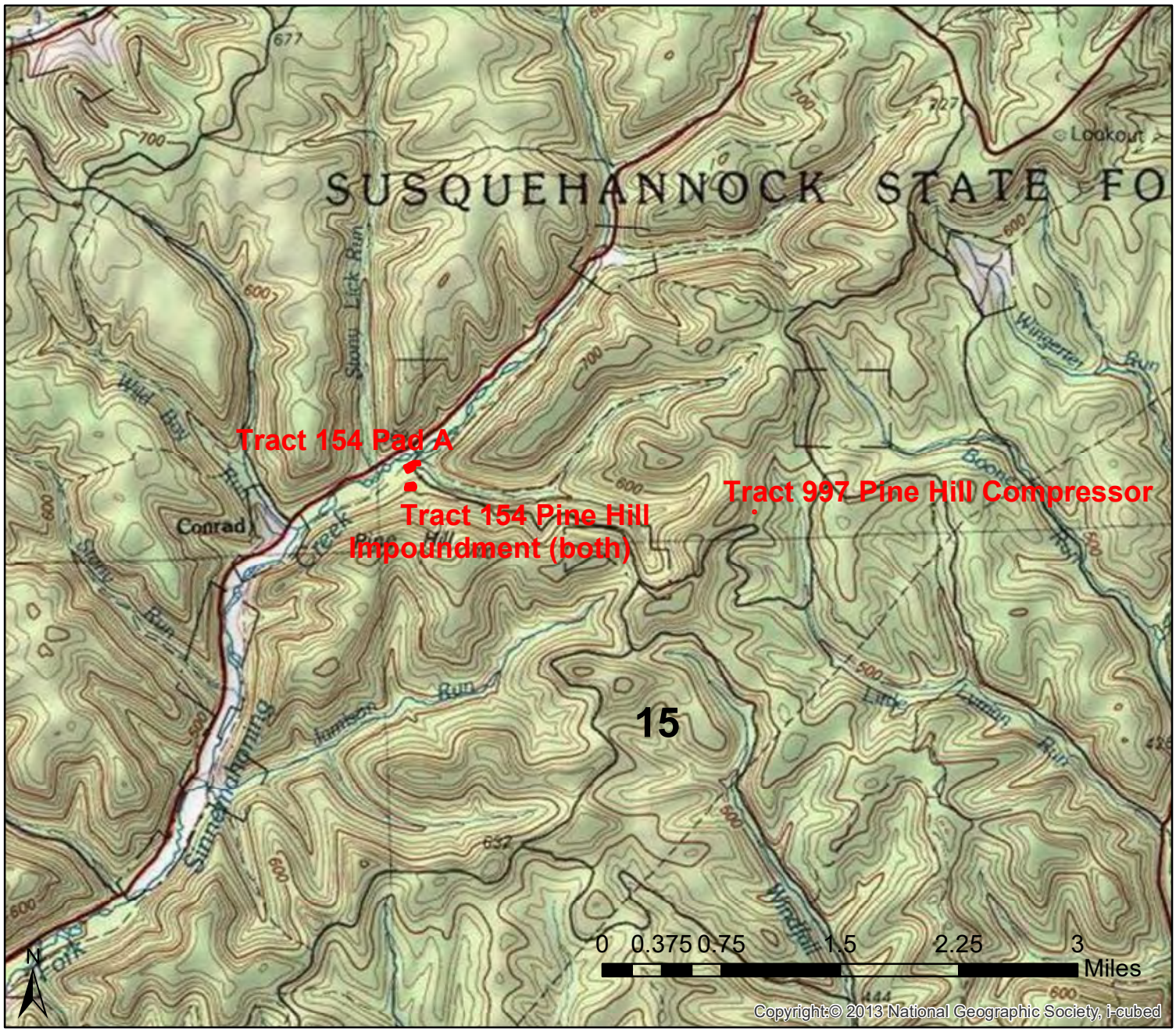


LWCF Conversion Sites within Susquehannock State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Susquehannock State Forest Conversions (4.77 acres)
- Susquehannock State Forest LWCF (212,661.28 acres)
- Susquehannock State Forest (264,990.68 acres)

t P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri
© OpenStreetMap contributors, and the GIS User Community



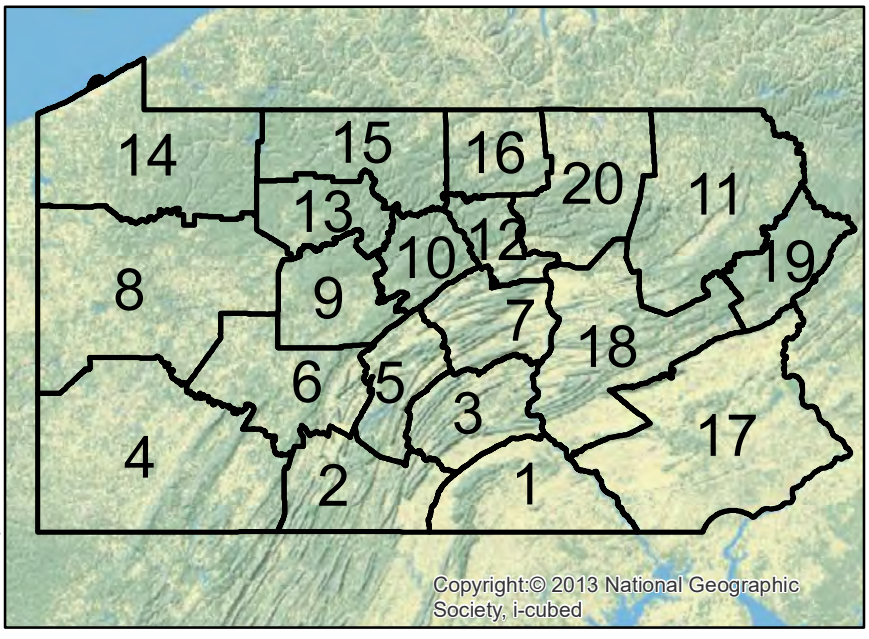
Forest District 15
Susquehannock State Forest
Potter County

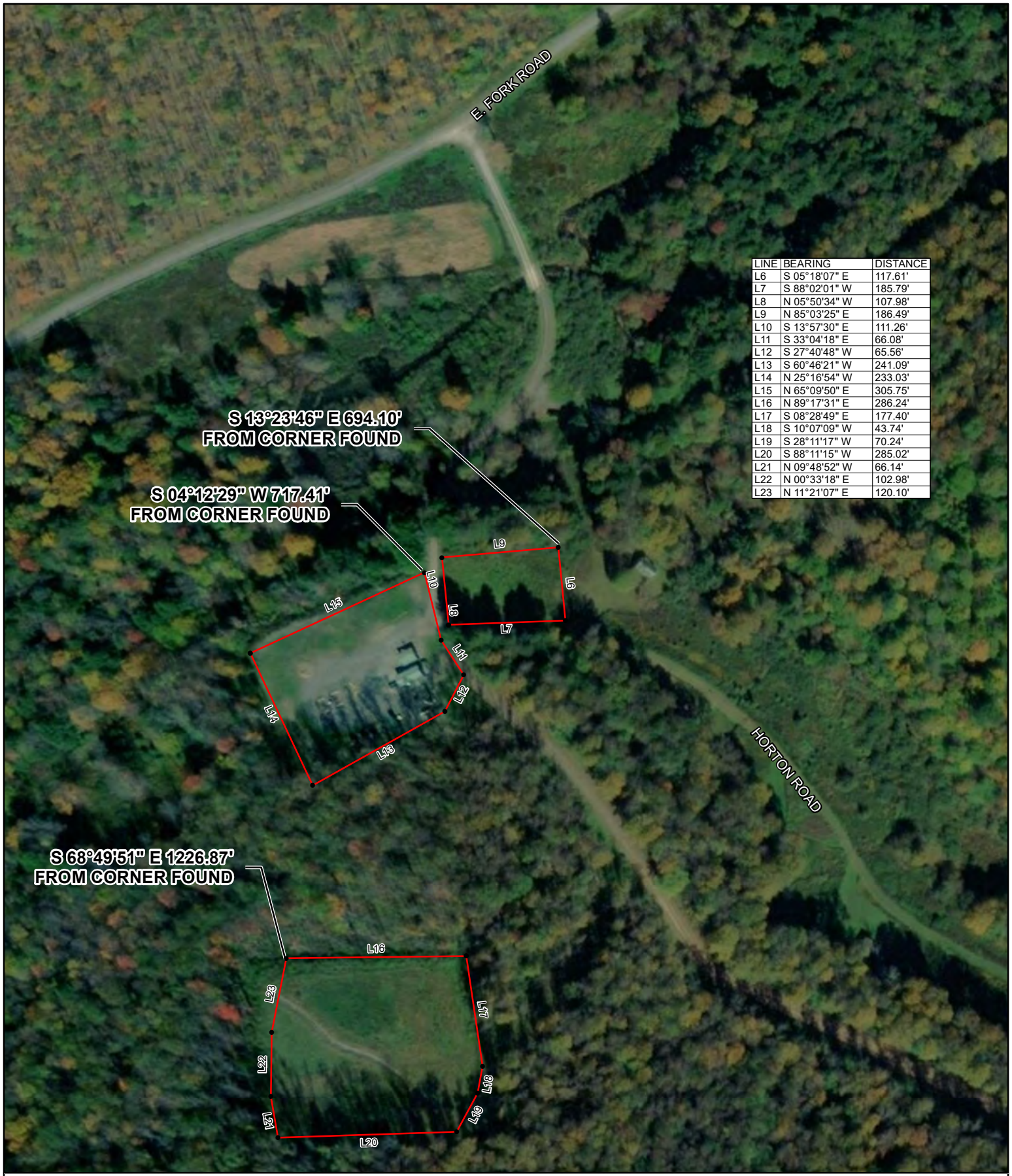
Sites:
Tract 154 Pad A: 41.614882, -77.876248 (Wharton Twp.)

Tract 154 Pine Hill Impoundment: 41.615206, -77.875562 (Wharton Twp.)

Tract 154 Impoundment A: 41.613269, -77.876187 (Wharton Twp.)

Tract 997 Pine Hill Compressor: 41.611038, -77.834367 (Wharton Twp.)





LINE	BEARING	DISTANCE
L6	S 05°18'07" E	117.61'
L7	S 88°02'01" W	185.79'
L8	N 05°50'34" W	107.98'
L9	N 85°03'25" E	186.49'
L10	S 13°57'30" E	111.26'
L11	S 33°04'18" E	66.08'
L12	S 27°40'48" W	65.56'
L13	S 60°46'21" W	241.09'
L14	N 25°16'54" W	233.03'
L15	N 65°09'50" E	305.75'
L16	N 89°17'31" E	286.24'
L17	S 08°28'49" E	177.40'
L18	S 10°07'09" W	43.74'
L19	S 28°11'17" W	70.24'
L20	S 88°11'15" W	285.02'
L21	N 09°48'52" W	66.14'
L22	N 00°33'18" E	102.98'
L23	N 11°21'07" E	120.10'

Tract 154 Pine Hill Pad A and Impoundments

Susquehannock State Forest

Wharton Township, Potter County

Converted Area = 1.47, 0.48, 2.05 Acres

N W E S

0 100 200

1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Tract 997 Pine Hill Compressor Station

Susquehannock State Forest
Wharton Township, Potter County
Converted Area = 0.77 Acres

N
W E
S

0 100 200
1 Inch = 200 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LWCF Conversion Sites within Tioga State Forest

LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Tioga State Forest Conversions (9.32 acres)
- Tioga State Forest LWCF (63,760.65 acres)
- Tioga State Forest (161,890.00 acres)

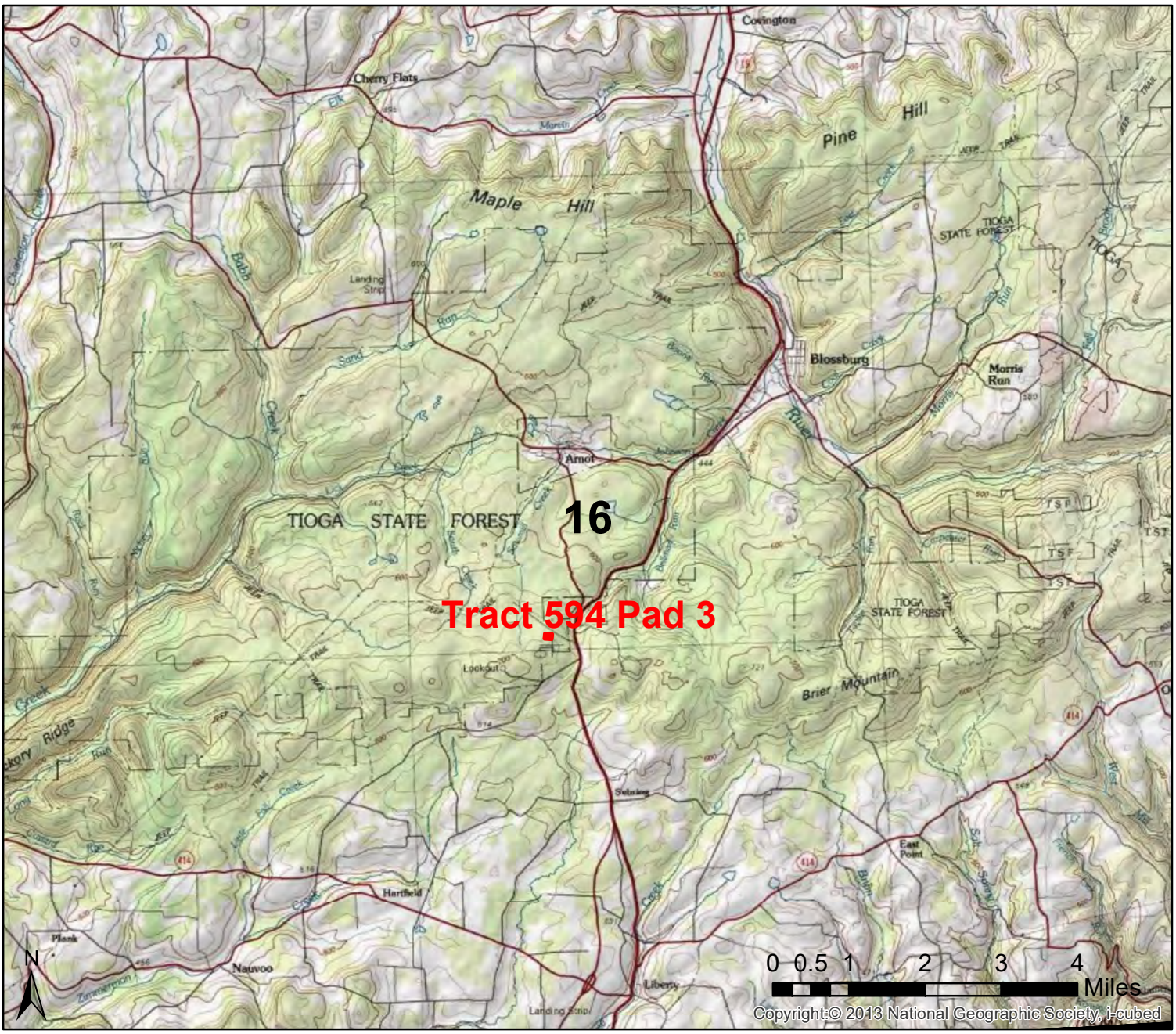
Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri
na (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LWCF Conversion Sites within Tioga State Forest

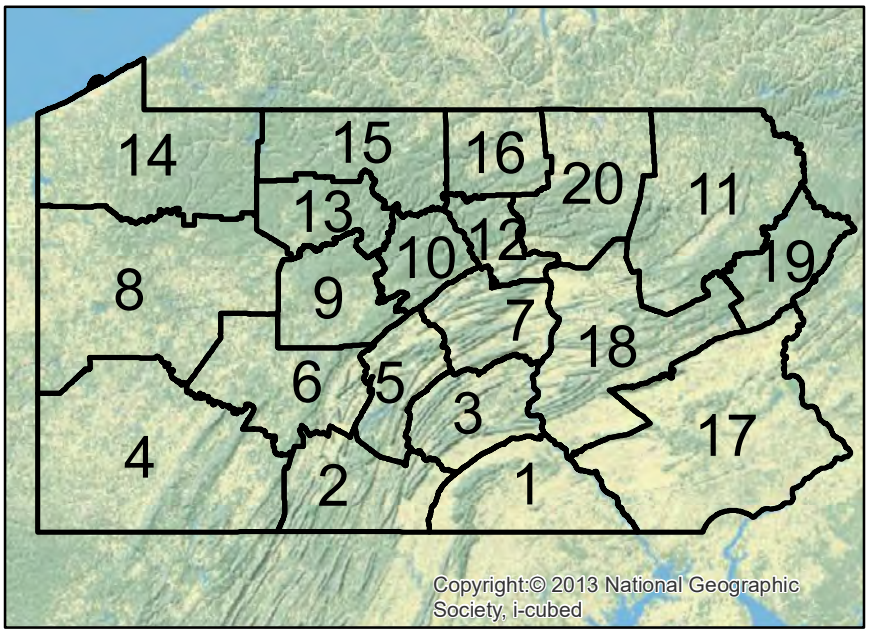
LWCF Grant Numbers:
42-00580, 42-01235, 42-01351

- Tioga State Forest Conversions (9.32 acres)
- Tioga State Forest LWCF (63,760.65 acres)
- Tioga State Forest (161,890.00 acres)

Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri
na (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community



Forest District 16
Tioga State Forest
Tioga County



Site:
Tract 594 Pad 3: 41.626330, -77.125147
(Liberty Twp.)

LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L309	N 85°26'48" W	34.02'	L337	S 60°50'44" E	55.21'
L310	N 58°05'13" W	62.44'	L338	S 83°54'23" E	248.78'
L311	N 36°52'32" W	77.95'	L339	S 76°04'05" E	177.21'
L312	N 25°02'13" W	129.18'	L340	S 17°47'54" W	182.25'
L313	N 23°39'48" W	159.47'	L341	S 03°29'54" W	98.23'
L314	N 21°49'36" W	132.83'	L342	S 37°07'13" E	76.42'
L315	N 52°47'32" W	90.03'	L343	N 85°35'44" E	37.47'
L316	N 62°37'43" W	101.42'	L344	N 51°11'22" E	161.84'
L317	N 65°42'00" W	100.37'	L345	N 51°48'02" E	102.45'
L318	N 65°33'38" W	109.26'	L346	N 51°20'50" E	135.78'
L319	N 56°22'12" W	70.62'	L347	N 57°11'55" E	75.43'
L320	S 82°31'15" W	43.89'	L348	S 85°44'46" E	81.73'
L321	S 51°11'28" W	106.33'	L349	S 57°22'38" E	88.14'
L322	S 47°59'51" W	115.57'	L350	S 67°35'47" E	85.60'
L323	S 51°30'02" W	179.44'	L351	S 67°46'02" E	98.03'
L324	S 62°50'16" W	61.26'	L352	S 67°09'41" E	76.00'
L325	S 12°49'53" W	118.96'	L353	S 51°27'39" E	76.82'
L326	N 82°45'30" W	44.21'	L354	S 55°45'18" E	62.45'
L327	S 83°21'30" W	98.75'	L355	S 20°47'08" E	86.85'
L328	S 84°02'10" W	127.42'	L356	S 24°12'22" E	86.09'
L329	N 86°08'14" W	185.56'	L357	S 22°18'35" E	96.65'
L330	N 69°25'20" W	204.93'	L358	S 39°05'31" E	49.49'
L331	N 03°47'10" E	190.15'	L359	S 10°40'53" E	33.27'
L332	N 10°50'07" W	97.70'	L360	S 22°38'21" E	91.47'
L333	N 32°48'47" E	100.92'	L361	S 45°49'00" E	78.12'
L334	N 32°59'10" W	96.38'	L362	N 66°50'29" E	27.20'
L335	N 61°31'15" E	145.41'	L363	S 06°59'46" W	64.22'
L336	S 79°19'49" E	47.79'			

Tract 594 Pad 3

Tioga State Forest

Liberty Township, Tioga County

Converted Area = 9.32 Acres

N

W E

S

0 125 250

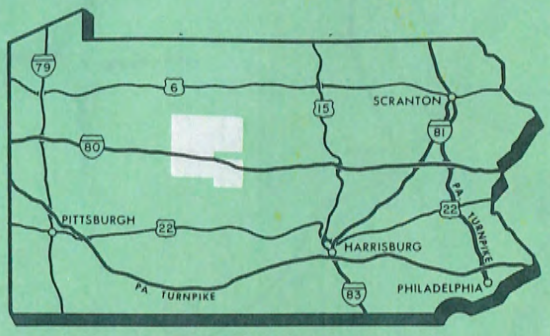
1 Inch = 250 Feet

Legend

Converted Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LWCF 6(f) Boundary Maps



LOCATION MAP

FOREST DISTRICT HEADQUARTERS

District Forester
Moshannon State Forest
P.O. Box 341
Clearfield, PA 16830

HARRISBURG HEADQUARTERS

Department of Environmental Resources
Bureau of Forestry
P.O. Box 1467
Harrisburg, PA 17120

PREVENT FOREST FIRES

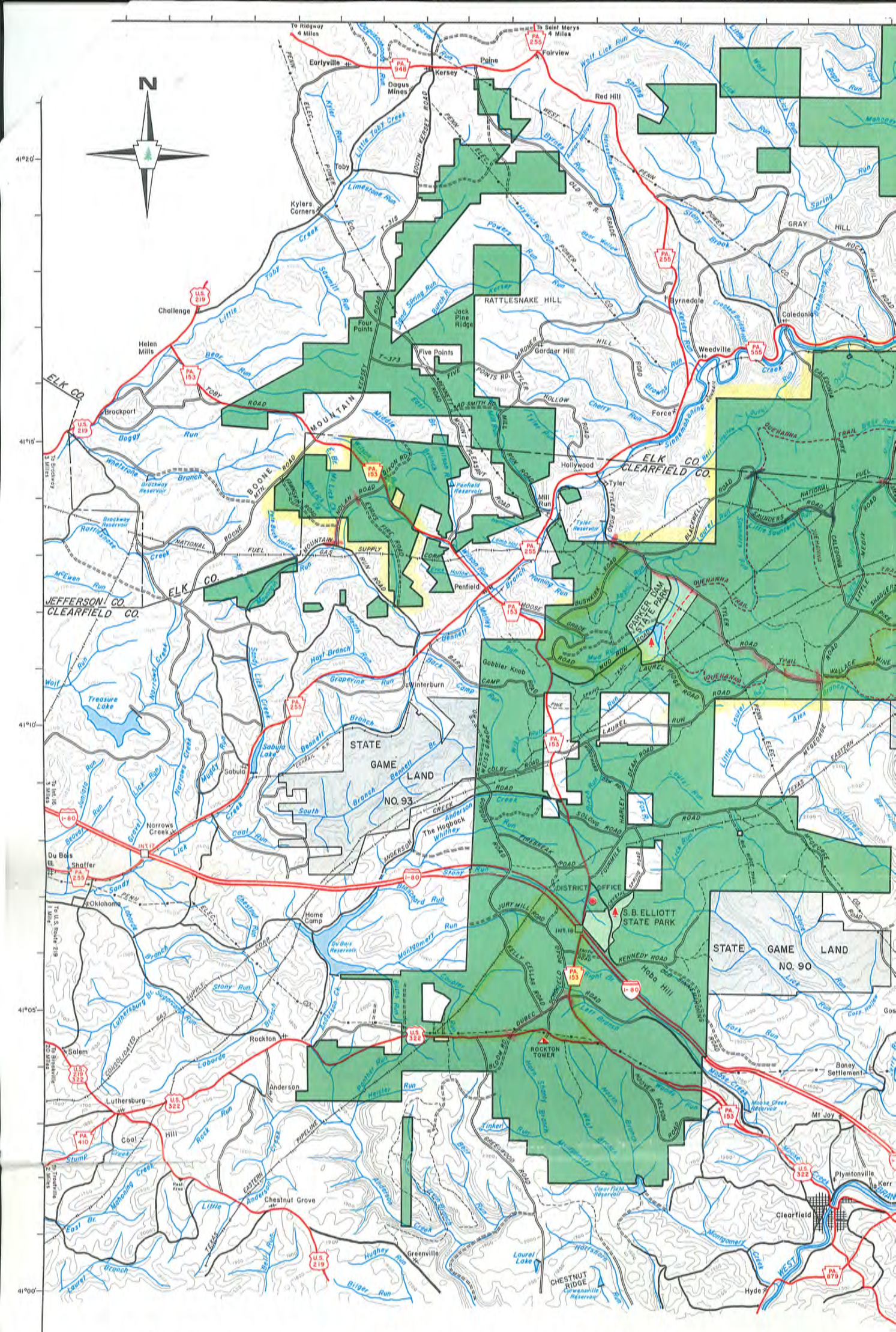
Rehab State Forest Roads
District #9
Law CF Project (6f map) 11/90

The MOSHANNON STATE FOREST PUBLIC USE MAP

Located in
Elk, Cameron, Centre
and Clearfield Counties

DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF FORESTRY

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF RESOURCES MANAGEMENT
HARRISBURG



MOSHANNON STATE FOREST

DEPARTMENT OF ENVIRONMENTAL RESOURCES

OFFICE OF RESOURCES MANAGEMENT

BUREAU OF FORESTRY

Lawcf Roads Projects

42-01351

6f boundary 11/90

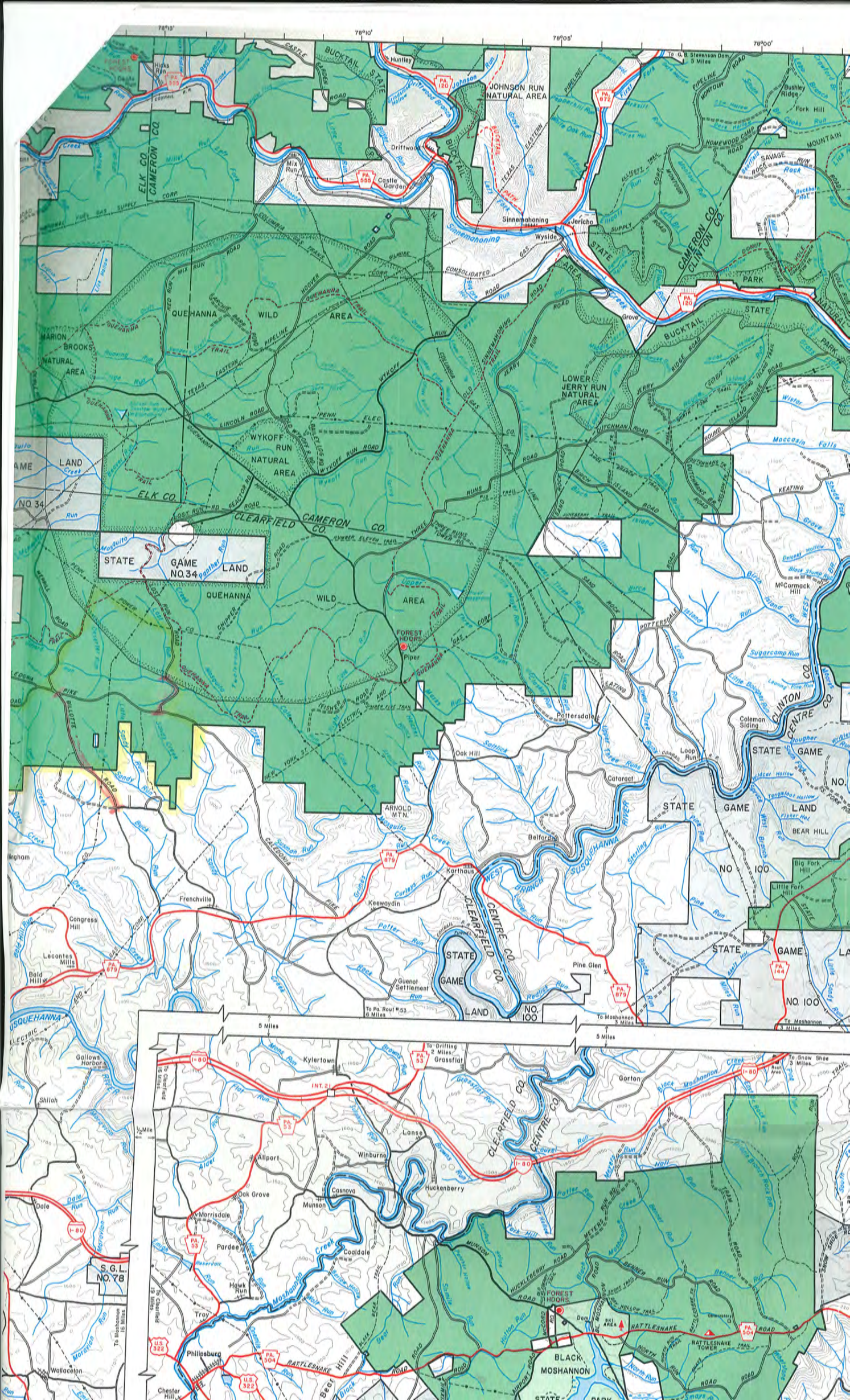
LEGEND

State Forest

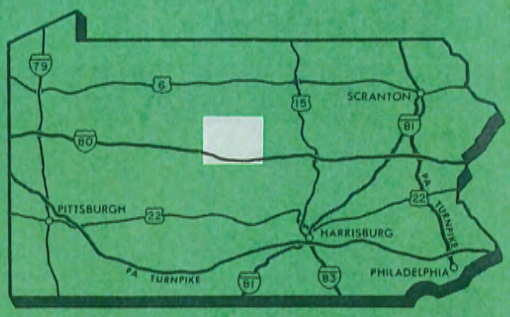
State Park L

State Game L

Natural or Wi


78°15'
78°10'
78°05'
78°00'
JOHNSON RUN NATURAL AREA
BUCKTAIL STATE PARK NATURAL AREA
LOWER JERRY RUN NATURAL AREA
WYKOFF RUN NATURAL AREA
QUEHANNA WILD AREA
UPPER QUEHANNA WILD AREA
MARION BROOKS NATURAL AREA
ELK CO.
CAMERON CO.
CLINTON CO.
CLEARFIELD CO.
CENTRE CO.
STATE GAME LAND NO. 34
STATE GAME LAND NO. 100
STATE GAME LAND NO. 144
S.G.L. NO. 78
BLACK MOSHANNON STATE PARK
SUSQUEHANNA RIVER
WEST BRANCH SUSQUEHANNA RIVER
Sinnemahoning
Driftwood
Huntley
Castle Garden
Mix Run
Hicks Run
Wyside
Jericho
Grove
Sterling Run
Bear Meadows
Forest Hdqrs.
Piper
Pottersdale
Coleman Siding
Loop Run
Cataract
Oak Hill
Belford
Karthaus
Keewaydin
Frenchville
Pine Glen
Guenot Settlement
Arnold Mtn.
Bear Hill
Big Fork Hill
Little Fork Hill
McCormack Hill
Savage Rock
Bushley Ridge
Fork Hill
Mountain Park
Meccasin Falls
Kylertown
Grassflat
Gorton
Lanse
Winburne
Allport
Oak Grove
Morrisdale
Pardee
Casanova
Munson
Huckenberry
Coaldale
Troy
Hawk Run
Philipsburg
Wallaceton
Chester Hills
Dale
Shiloh
Gallows Harbor
Lecontes Mills
Bald Hills
Congress Hill
Rattlesnake
Rattlesnake Tower
Black Moshannon
Forest Hdqrs.
Snow Shoe
Moshannon
Sandy Ridge
Clearfield
Curwensville
Osceola Mills
Port Matilda
Julian
Howard
Bellefonte
Milesburg
Centre Hall
Boalsburg
Pine Grove Mills
State College
Lemont
Houserville
Spring Mills
Aaronsburg
Millheim
Penns Creek
Coburn
Madisonburg
Rebersburg
Centre Furnace
Tusseyville
Linden Hall
Fisher Hol
Wildcat Hollow
Tanglefoot Hollow
Sugarcamp Run
Keating
Potter Run
Meyers Run
Benner Run
Smays Run
Moshannon Creek
Black Moshannon Creek
Sandy Creek
Laurel Run
Alder Run
Moravian Run
Wolf Run
Beaver Run
Deer Creek
Big Run
Little Run
Trout Run
Cold Stream
Pine Run
Rock Run
Redlick Run
Curleys Run
Potter Run
Sawmill Run
Caledonia
Summon Run
Buck Run
Sandy Run
Slab Cabin Run
Wykoff Run
Lick Run
Little Laurel Run
Big Run
Big Fork Run
Little Fork Run
Sugarcamp Run
Loop Run
Pine Run
Sterling Run
Curleys Run
Potter Run
Redlick Run
Rock Run
Guenot Run
Keewaydin Run
Frenchville Run
Karthaus Run
Belford Run
Cataract Run
Oak Hill Run
Pottersdale Run
Coleman

Rehab State Forest Roads
District #10
LWCF Project 6 (map) 11/90



The SPROUL STATE FOREST PUBLIC USE MAP

Located in Clinton and Centre Counties

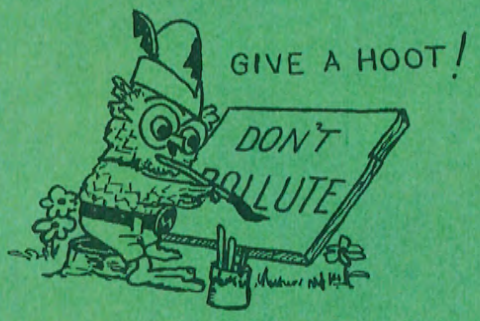
FOREST DISTRICT HEADQUARTERS

District Forester
HCR 62 Box 90
Renovo, PA 17764
717-923-1450

HARRISBURG HEADQUARTERS

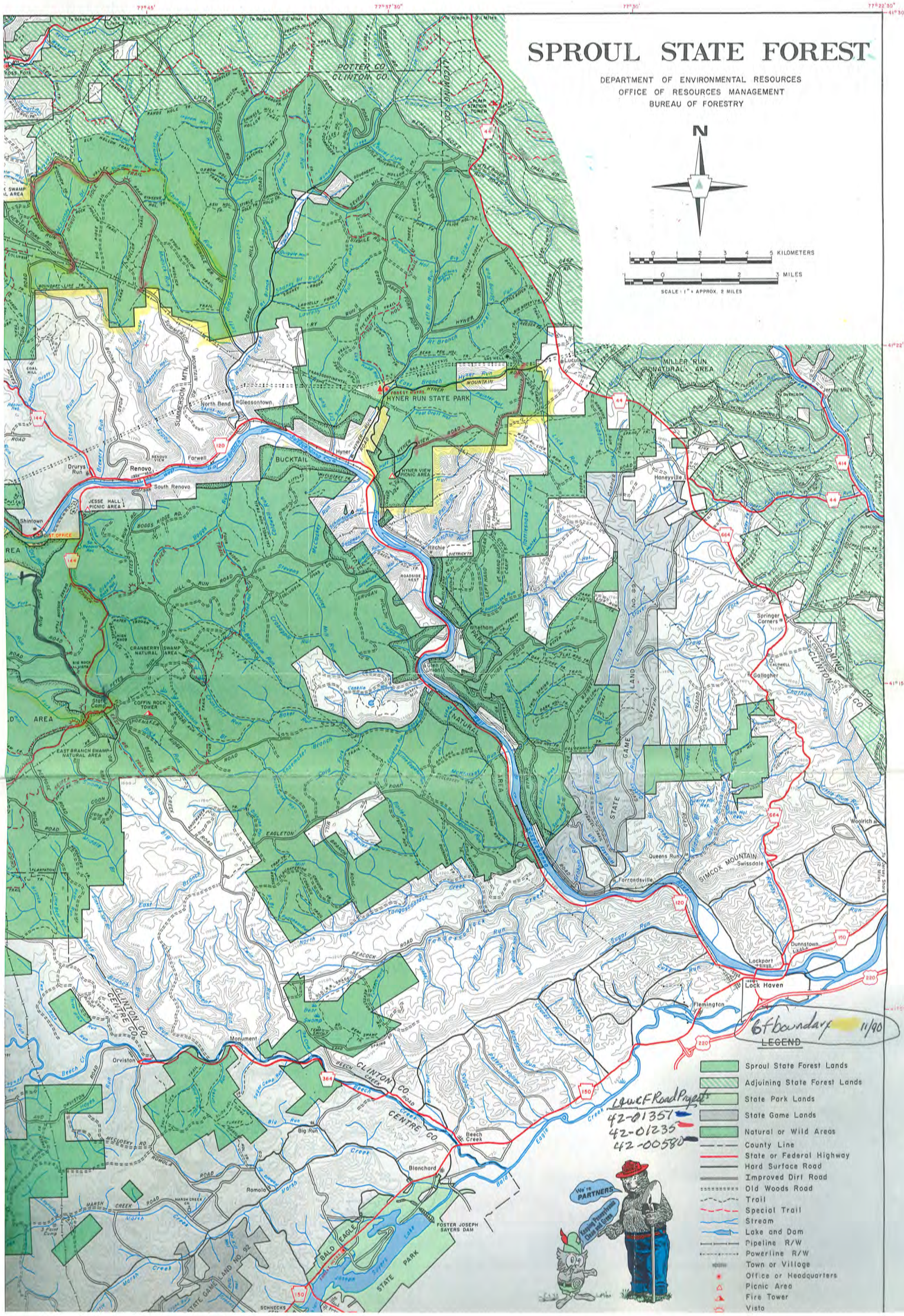
Department of Environmental Resources
Bureau of Forestry
P.O. Box 1467
Harrisburg, PA 17120

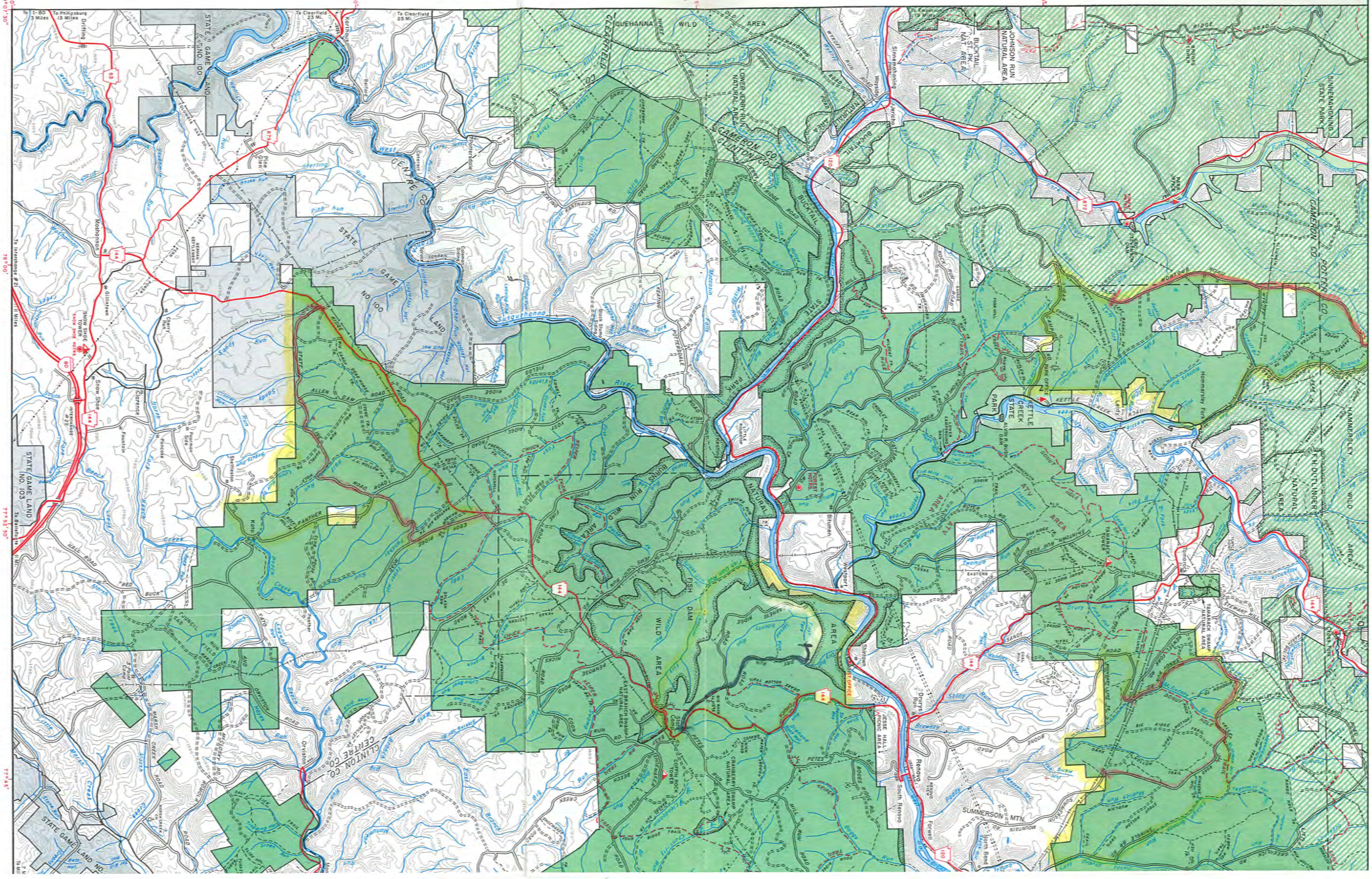
PREVENT FOREST FIRES



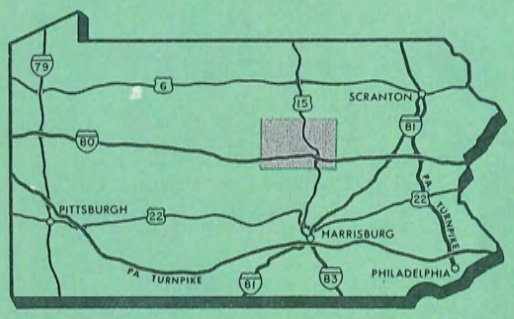
PENNSYLVANIA DER

COMMONWEALTH OF PENNSYLVANIA
Robert P. Casey, *Governor*
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Arthur A. Davis, *Secretary*


SPROUL STATE FOREST
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF RESOURCES MANAGEMENT
BUREAU OF FORESTRY
N
0 1 2 3 4 5 KILOMETERS
0 1 2 3 MILES
SCALE 1" = APPROX. 2 MILES
77°45'
77°37'30"
77°30'
77°22'30"
41°30'
41°22'30"
41°15'
POTTER CO.
CLINTON CO.
HYNER RUN STATE PARK
MILLER RUN NATURAL AREA
BUCKTAIL
Renovo
South Renovo
Gleasontown
North Bend
Farwell
Drurys Run
Shintown
Hyner
Hyner View
Honeyville
Jersey Mills
Springer Corners
Gallagher
Woolrich
Queens Run
Farrandsville
Swissdale
Dunnstown
Lockport
Lock Haven
Flemington
Orviston
Monument
Big Run
Beech Creek
Blanchard
Romola
Foster Joseph Sayers Dam
Bald Eagle State Park
JESSE HALL PICNIC AREA
COFFIN ROCK TOWER
CRANBERRY SWAMP NATURAL AREA
EAST BRANCH SWAMP NATURAL AREA
EAGLETON
HYNER VIEW PICNIC AREA
SIMCOX MOUNTAIN
STATE GAME LAND NO. 176
STATE GAME LAND NO. 92
CENTRE CO.
CLINTON CO.
LYCOMING CO.
6f boundary 11/90
LEGEND
Sproul State Forest Lands
Adjoining State Forest Lands
State Park Lands
State Game Lands
Natural or Wild Areas
County Line
State or Federal Highway
Hard Surface Road
Improved Dirt Road
Old Woods Road
Trail
Special Trail
Stream
Lake and Dam
Pipeline R/W
Powerline R/W
Town or Village
Office or Headquarters
Picnic Area
Fire Tower
Vista
Lower F Road Project
42-01351
42-01235
42-00580
We're PARTNERS
Leave No Trace
Clean and Green


QUEHANNA WILD AREA
CLEARFIELD CO
CENTRE CO
CLINTON CO
CAMERON CO
POTTER CO
STATE GAME LAND NO. 100
STATE GAME LAND NO. 103
LOWER JERRY RUN NATURAL AREA
BUCKTAIL STATE NAT. AREA
JOHNSON RUN NATURAL AREA
SINNEMAHONING STATE PARK
KETTLE CREEK STATE PARK
HAMMERSLEY WILD AREA
FISH DAM WILD AREA
CRANBERRY SWAMP NATURAL AREA
SUMMERSON MTN.
Renovo
Westport
Bitumen
Drifting
Karthaus
Grampian
Snow Shoe
Moshannon
Orviston
Sinnemahoning
Keating
Susquehanna
West Keating
Sterling Run
Pine Creek
Kettle Creek
Young Woman Creek
Hammersley Fork
Bucktail Road
Ridge Road
Allen Dam Road
Fish Dam Road
Kettle Creek Road
Hall Road
Red Buck Trail
Marsh Creek Road
Orviston Road
Keating Road
Sterling Run Road
Pine Creek Road
Susquehanna River
Sinnemahoning Creek
Kettle Creek
Young Woman Creek
Hammersley Fork
Drury Run
Renovo
South Renovo
Bitumen
Westport
Grampian
Snow Shoe
Moshannon
Orviston
Karthaus
Drifting
To I-80 5 Miles
To Philipsburg 19 Miles
To Clearfield 23 Mi.
To Clearfield 25 Mi.
To Emporium 19 Miles
To Interchange #23
To Bellefonte
To Renovo
To Lock Haven
To Emporium
To Sinnemahoning
To Karthaus
To Grampian
To Snow Shoe
To Moshannon
To Orviston
To Keating
To Susquehanna
To Westport
To Bitumen
To Renovo
To Lock Haven
41°00'
78°07'30"
41°07'30"
41°15'
78°00'
77°52'30"
77°45'
Scale 1:62,500
1 Mile
1 Kilometer

Rehab State Forest Roads
District #12
LWCF Project (6 map) 11/90



LOCATION MAP

The TIADAGHTON STATE FOREST PUBLIC USE MAP

Located in
Lycoming, Tioga, Potter
and Union Counties

FOREST DISTRICT HEADQUARTERS

District Forester
423 E. Central Avenue
South Williamsport, Pa. 17701

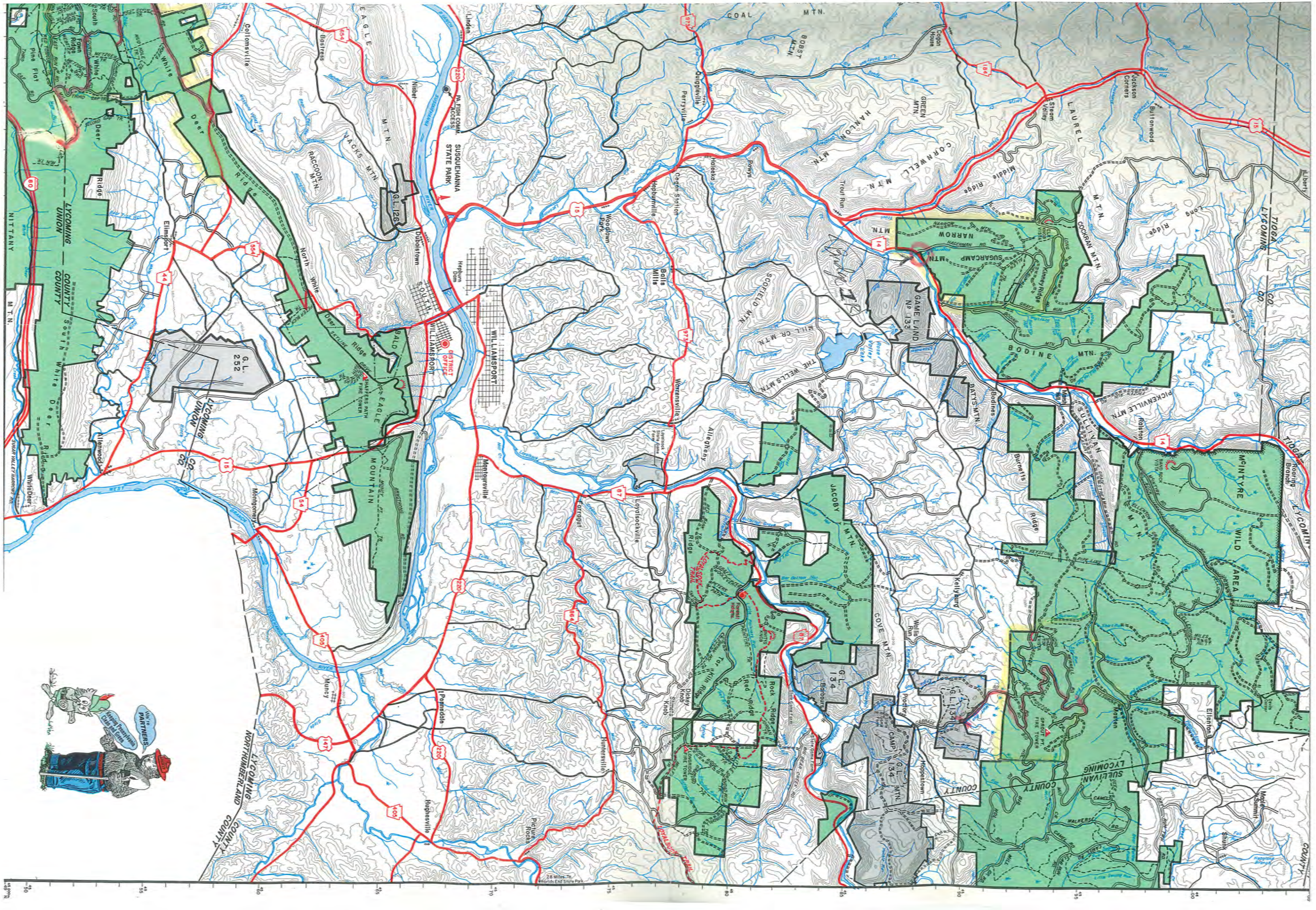
HARRISBURG HEADQUARTERS

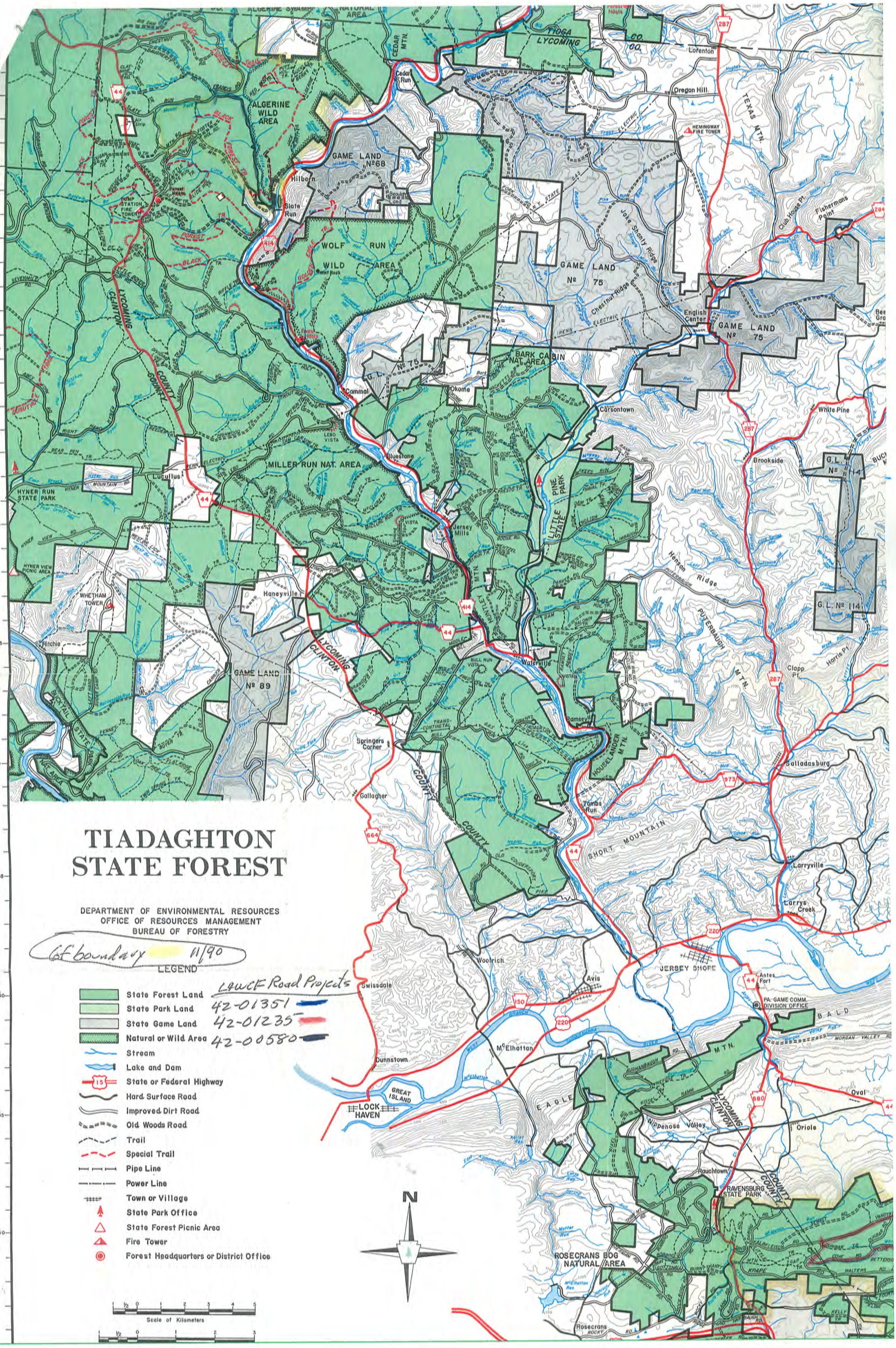
Department of Environmental Resources
Bureau of Forestry
P.O. Box 1467
Harrisburg, Pennsylvania 17120

PREVENT FOREST FIRES

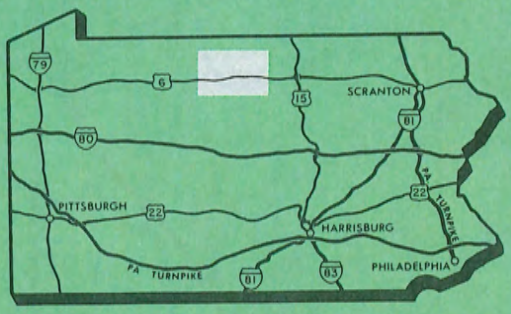
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF FORESTRY

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF RESOURCES MANAGEMENT
HARRISBURG


COAL MTN.
BOGGS MTN.
GREEN MTN.
NARROW MTN.
CORNWELL MTN.
LAUREL MTN.
Middle Ridge
Long Ridge
Trout Run
Cogan House
Jackson Corners
Steam Valley
Buttonwood
Liberty
T106A
LYCOMING CO.
GOCKRAN MTN.
NARROW
SUSQUEHANNA
Kinney Ridge
GAME LAND No. 133
BODINE MTN.
PATTY'S MTN.
Bodines
Ralston
PICKENVILLE MTN.
SULLIVAN COUNTY
McINTYRE WILD AREA
Roaring Branch
LYCOMING COUNTY
Linden
PA FISH COMM. ACCESS
SUSQUEHANNA STATE PARK
Hepburn Dam
WILLIAMSPORT
DISTRICT OFFICE
WILLIAMSPORT
Hepburnville
Cogan Station
Woodtown Park
Bolls Mills
Bodines
Dougleville
Perryville
Hollabaugh
Powys
Trout Run
Bastress
Nisbet
Jacksonville
Dubbstown
Elimsport
North White
South White
Deer
Ridge
Eagle
Bald
Lookout
Tower
Maffers Path
Fire Tower
Raccoon Mtn.
Yacks Mtn.
G.L. 126
G.L. 252
Lycoming County
Union County
Nittany Mtn.
Montgomery
Montgomeryville
Muncy
Muncy Creek
Penndale
Hughesville
Picture Rocks
Loyalsock Creek
Loyalsockville
Forrester
Hunterville
Scofield Mtn.
Hill Or Mtn.
The Wells Mtn.
Worrensville
Allenberry
Jacoby Mtn.
Cove Mtn.
Kellyburg
Willie Run
Rock Ridge
Dickey Knob
Sinnett's Knob
Rattlesnake Knob
Rattlesnake Trail
Loyalsock Trail
Appalachian Trail
Rattlesnake Fire Tower
Sinnett's Knob Fire Tower
Camp Mtn.
Hogestown
Mordon
Ellenton
Maple Summit
Shunk
Forksville
Sullivan County
Lycoming County
Northumberland County
G.L. 134
G.L. 134-A
G.L. 134-B
Rattlesnake Trail
Loyalsock Trail
Appalachian Trail
2.6 Miles To Worlds End State Park
Keystone
Pipe Line
Camp
Spring
Fire Tower
Lookout
Tower
Lookout Tower
Overlook
Vista
Scenic
Historic
Marker
Monument
Cemetery
Church
School
Dam
Bridge
Creek
Run
Branch
Mountain
Ridge
Hill
Knob
Peak
Summit
Valley
Hollow
Gap
Pass
Trail
Road
Turnpike
Interstate
Route
Boundary
County
Township
Borough
City
Park
Forest
Game Land
Wild Area
Natural Area
Scenic River
Recreation Area
Campground
Picnic Area
Boat Access
Fishing Access
Hunting Area
Trailhead
Parking
Information
Restroom
Water
Electric
Phone
Gas
Station
Store
Restaurant
Lodge
Cabin
Tent
Trailer
Hookup
Dump
Shower
Laundry
Swimming
Boating
Canoeing
Kayaking
Rafting
Fishing
Hunting
Hiking
Biking
Horseback
Skiing
Snowmobile
ATV
Motorcycle
Four Wheel Drive
Off Road
Restricted
Closed
Seasonal
Year Round
Day Use
Overnight
Fee
Free
Reservation
First Come
Handicap
Accessible
Not Accessible
Partial
Unknown
Other
Your Partners
Keystone Recreation, Parks and Conservation
Pennsylvania Department of Conservation and Natural Resources
Bureau of State Parks
Bureau of Forestry
Bureau of Recreation and Conservation
Bureau of Facility Design and Construction
Bureau of Administration
Bureau of Information and Education
Bureau of Law Enforcement
Bureau of Personnel
Bureau of Planning and Research
Bureau of Publications
Bureau of Real Estate
Bureau of Technical Services
Bureau of Water Resources
Bureau of Wildlife Protection
Bureau of Wildlife Management
Bureau of Wildlife Habitat
Bureau of Wildlife Research
Bureau of Wildlife Surveys
Bureau of Wildlife Education
Bureau of Wildlife Information
Bureau of Wildlife Publications
Bureau of Wildlife Law Enforcement
Bureau of Wildlife Personnel
Bureau of Wildlife Planning and Research
Bureau of Wildlife Real Estate
Bureau of Wildlife Technical Services
Bureau of Wildlife Water Resources
Bureau of Wildlife Protection
Bureau of Wildlife Management
Bureau of Wildlife Habitat
Bureau of Wildlife Research
Bureau of Wildlife Surveys
Bureau of Wildlife Education
Bureau of Wildlife Information
Bureau of Wildlife Publications
Bureau of Wildlife Law Enforcement
Bureau of Wildlife Personnel
Bureau of Wildlife Planning and Research
Bureau of Wildlife Real Estate
Bureau of Wildlife Technical Services
Bureau of Wildlife Water Resources


TIADAGHTON
STATE FOREST
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF RESOURCES MANAGEMENT
BUREAU OF FORESTRY
Cf boundary 11/90
LEGEND
LWCE Road Projects
42-01351
42-01235
42-00580
State Forest Land
State Park Land
State Game Land
Natural or Wild Area
Stream
Lake and Dam
State or Federal Highway
Hard Surface Road
Improved Dirt Road
Old Woods Road
Trail
Special Trail
Pipe Line
Power Line
Town or Village
State Park Office
State Forest Picnic Area
Fire Tower
Forest Headquarters or District Office
Scale of Kilometers
N
ALGERINE WILD AREA
GAME LAND No 68
WOLF RUN WILD AREA
GAME LAND No 75
BARK CABIN NAT. AREA
MILLER RUN NAT. AREA
GAME LAND No 89
ROSECRANS BOG NATURAL AREA
HYNER RUN STATE PARK
PINE GROVE
LITTLE STATE
SHORT MOUNTAIN
HOUSELANDER MTN.
PUTTENBAUGH MTN.
TEXAS MTN.
EAGLE MTN.
JERSEY SHORE
RAVENSBURG STATE PARK
LOCK HAVEN
GREAT ISLAND
Hilborn
Slate Run
Cedar Run
Lorenton
Oregon Hill
Jake Shanty Ridge
Chestnut Ridge
English Center
Fishermans Point
Club House Pt.
Carsontown
White Pine
Brookside
Commal
Okome
Glassstone
Lucullus
Jersey Mills
Haneyville
Waterville
Ramsey
Springers Corner
Gallagher
Tombs Run
Galladasburg
Larryville
Larrys Creek
Woolrich
Swissdale
Avis
Antes Fort
PA. GAME COMM. DIVISION OFFICE
McElhattan
Dunnstown
Oval
Oriole
Rauchtown
Nippenose Valley
Rosecrans
Ritchie
Whetham Tower
Hyner View Picnic Area
Hyner Mountain
Clinton County
Lycoming County

Rehab State Forest Roads
District #15
LWCF Project (6 map) 11/90



LOCATION MAP

FOREST DISTRICT HEADQUARTERS:

District Forester
P. O. Box 673
Coudersport, PA 16915

Location: Denton Hill Summit
RT 6 East of Coudersport

Telephone: 814-274-8474

HARRISBURG HEADQUARTERS:

Department of Environmental Resources
Bureau of Forestry
P. O. Box 8552
Harrisburg, PA 17105-8552

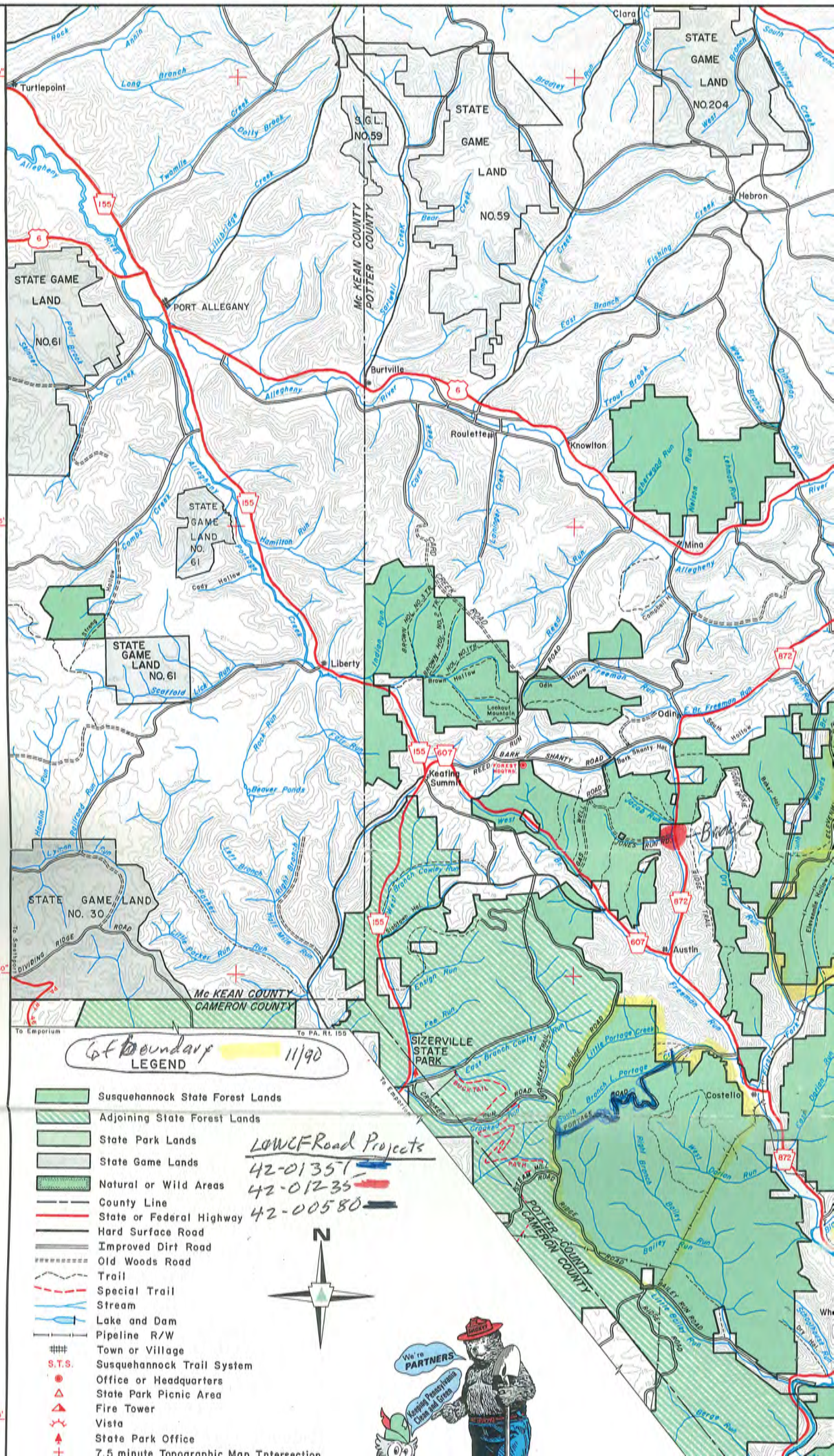
PREVENT FOREST FIRES

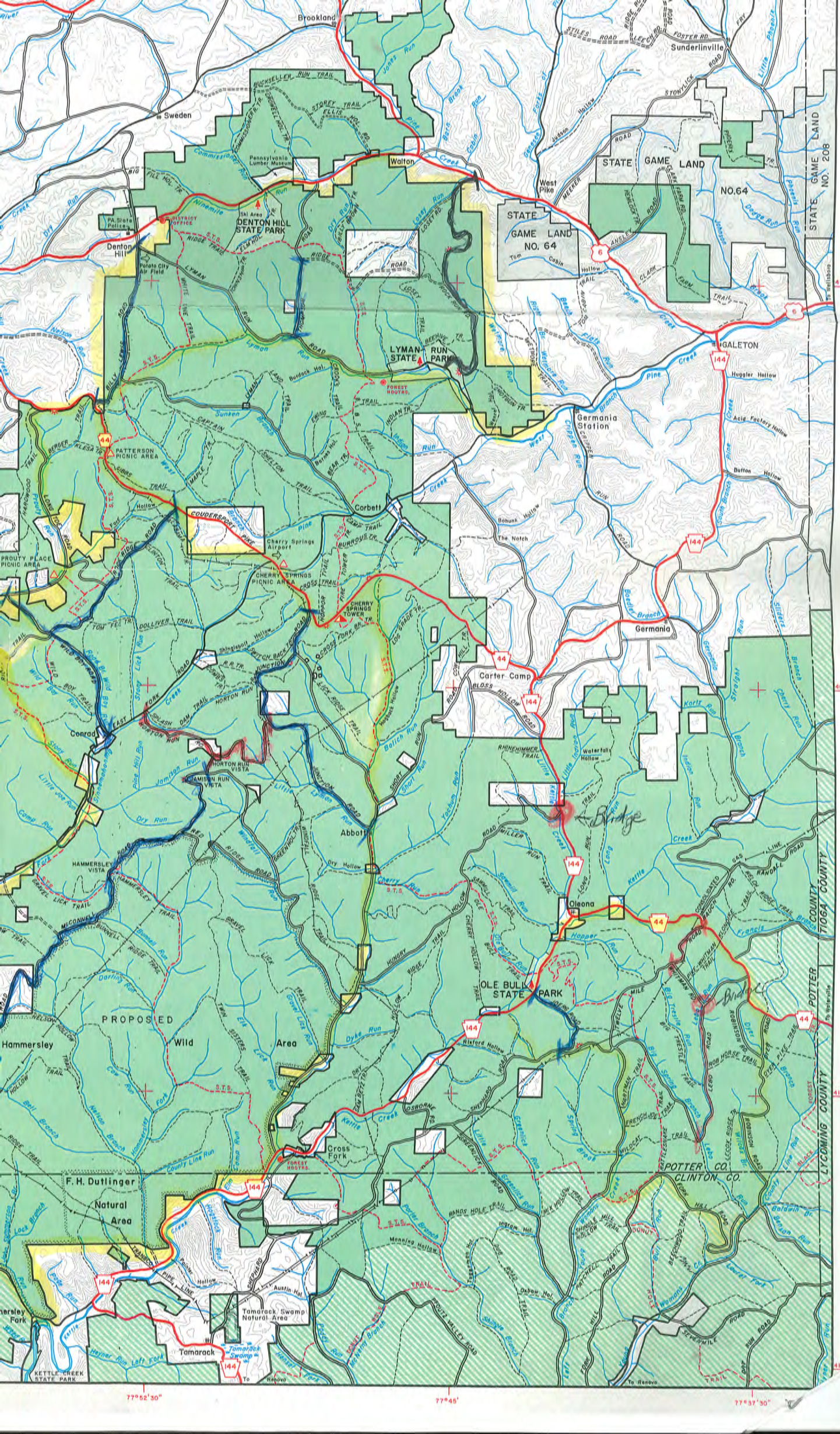
The SUSQUEHANNOCK STATE FOREST PUBLIC USE MAP

Located in Clinton, McKean,
and Potter Counties

PENNSYLVANIA
DER

COMMONWEALTH OF PENNSYLVANIA
Robert P. Casey, *Governor*
DEPARTMENT OF ENVIRONMENTAL RESOURCES
Arthur A. Davis, *Secretary*


Turtlepoint
PORT ALLEGANY
Burtville
Roulette
Knowlton
Mina
Hebron
Clara
Liberty
Keating Summit
Odin
Austin
Costello
SIZERVILLE STATE PARK
STATE GAME LAND NO.61
STATE GAME LAND NO.59
S.G.L. NO.59
STATE GAME LAND NO.204
STATE GAME LAND NO. 30
McKEAN COUNTY
POTTER COUNTY
CAMERON COUNTY
To Emporium
To PA. Rt. 155
To Smethport
Bridge
41°52'30"
41°45'
41°37'30"
41°30'
LEGEND
Susquehannock State Forest Lands
Adjoining State Forest Lands
State Park Lands
State Game Lands
Natural or Wild Areas
County Line
State or Federal Highway
Hard Surface Road
Improved Dirt Road
Old Woods Road
Trail
Special Trail
Stream
Lake and Dam
Pipeline R/W
Town or Village
S.T.S. Susquehannock Trail System
Office or Headquarters
State Park Picnic Area
Fire Tower
Vista
State Park Office
7.5 minute Topographic Map Intersection
of Boundary
11/90
LOWCF Road Projects
42-01351
42-01235
42-00580
N
We're PARTNERS
Keeping Pennsylvania Clean and Green


Brookland
Sweden
Walton
Sunderlinville
West Pike
STATE GAME LAND NO.64
STATE GAME LAND NO. 64
STATE GAME LAND NO. 208
DENTON HILL STATE PARK
Denton Hill
Potato City Air Field
LYMAN STATE RUN PARK
Germania Station
Corbett
Cherry Springs Airport
CHERRY SPRINGS PICNIC AREA
CHERRY SPRINGS TOWER
PATTERSON PICNIC AREA
PROUTY PLACE PICNIC AREA
Germania
Carter Camp
Conrad
Abbott
Oleona
OLE BULL STATE PARK
PROPOSED Wild Area
Hammersley
Cross Fork
F. H. Dutlinger Natural Area
Tamarack Swamp Natural Area
Tamarack
KETTLE CREEK STATE PARK
Sinnemahoning
Huggler Hollow
Acid Factory Hollow
Button Hollow
The Notch
Waterfall Hollow
Risford Hollow
Manning Hollow
Ingram Hol
Austin Hol
Oxbow Hol
Pepper Hollow
Bohunk Hollow
Loggers Hollow
Ogden Hollow
Wilcox Hollow
Wolf Hollow
Wagner Hollow
Shingle Mill Hollow
Ramsey Hollow
Cherry Hollow
Hopper Run
Lyman Run
Cherry Run
Short Run
Kettle Creek
Sinnemahoning Creek
Pine Creek
Little Pine Creek
Little Indian Run
Indian Run
Long Kettle Creek
Big Trestle Run
Little Trestle Run
Spring Brook
Left Fork
Right Fork
Hammersley Fork
Cross Fork
Lick Run
Dyke Run
Darling Run
Gravel Lick Run
Hungry Run
Windfall Run
Rummel Run
Camp Run
Little Joe Run
Pine Hill Run
Jamison Run
Horton Run
Yoxhum Run
Baltich Run
Rhinehimmer Run
Karlz Run
Stranger Run
Slaters Run
Francis Branch
Big Spring Branch
Little Spring Branch
Left Fork Right Fork
Left Fork Long Kettle
Left Fork Pepper Run
Left Fork Tamarack Swamp
Left Fork Hunter Run
Left Fork Kettle Creek
Left Fork Sinnemahoning Creek
Left Fork Pine Creek
Left Fork Little Pine Creek
Left Fork Indian Run
Left Fork Long Kettle Creek
Left Fork Big Trestle Run
Left Fork Little Trestle Run
Left Fork Spring Brook
Left Fork Right Fork
Left Fork Cross Fork
Left Fork Hammersley Fork
Left Fork Dyke Run
Left Fork Gravel Lick Run
Left Fork Hungry Run
Left Fork Windfall Run
Left Fork Rummel Run
Left Fork Camp Run
Left Fork Little Joe Run
Left Fork Pine Hill Run
Left Fork Jamison Run
Left Fork Horton Run
Left Fork Yoxhum Run
Left Fork Baltich Run
Left Fork Rhinehimmer Run
Left Fork Karlz Run
Left Fork Stranger Run
Left Fork Slaters Run
Left Fork Francis Branch
Left Fork Big Spring Branch
Left Fork Little Spring Branch
Left Fork Right Fork
Left Fork Cross Fork
Left Fork Hammersley Fork
Left Fork Dyke Run
Left Fork Gravel Lick Run
Left Fork Hungry Run
Left Fork Windfall Run
Left Fork Rummel Run
Left Fork Camp Run
Left Fork Little Joe Run
Left Fork Pine Hill Run
Left Fork Jamison Run
Left Fork Horton Run
Left Fork Yoxhum Run
Left Fork Baltich Run
Left Fork Rhinehimmer Run
Left Fork Karlz Run
Left Fork Stranger Run
Left Fork Slaters Run
Left Fork Francis Branch
Left Fork Big Spring Branch
Left Fork Little Spring Branch
LYCOMING COUNTY
TIOGA COUNTY
POTTER CO.
CLINTON CO.
41°45'
41°37'30"
41°30'
77°52'30"
77°45'
77°37'30"

TIOGA STATE FOREST

DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF RESOURCES MANAGEMENT
BUREAU OF FORESTRY

LEGEND (of boundary 11/90)

- State Forest Land
- State Game Land
- State Park Land
- Natural or Wild Areas
- Stream
- Lake or Dam
- State or Federal Highways
- Hard Surface Road
- Improved Dirt Road
- Old Woods Road
- Trail
- County Line
- Pipe Line
- Power Line
- Town or Village
- State Park Office
- Fire Tower
- State Forest Picnic Area
- Forest Headquarters or District Office
- 100' Ft. Elevation Intervals (1"=1700')

Low C/F Road Projects
42-01351
42-01235
42-00580

Scale of Kilometers
Scale of Miles

NOTE: SEGMENT SHOWN AS A 1235 & 580 PROJECT

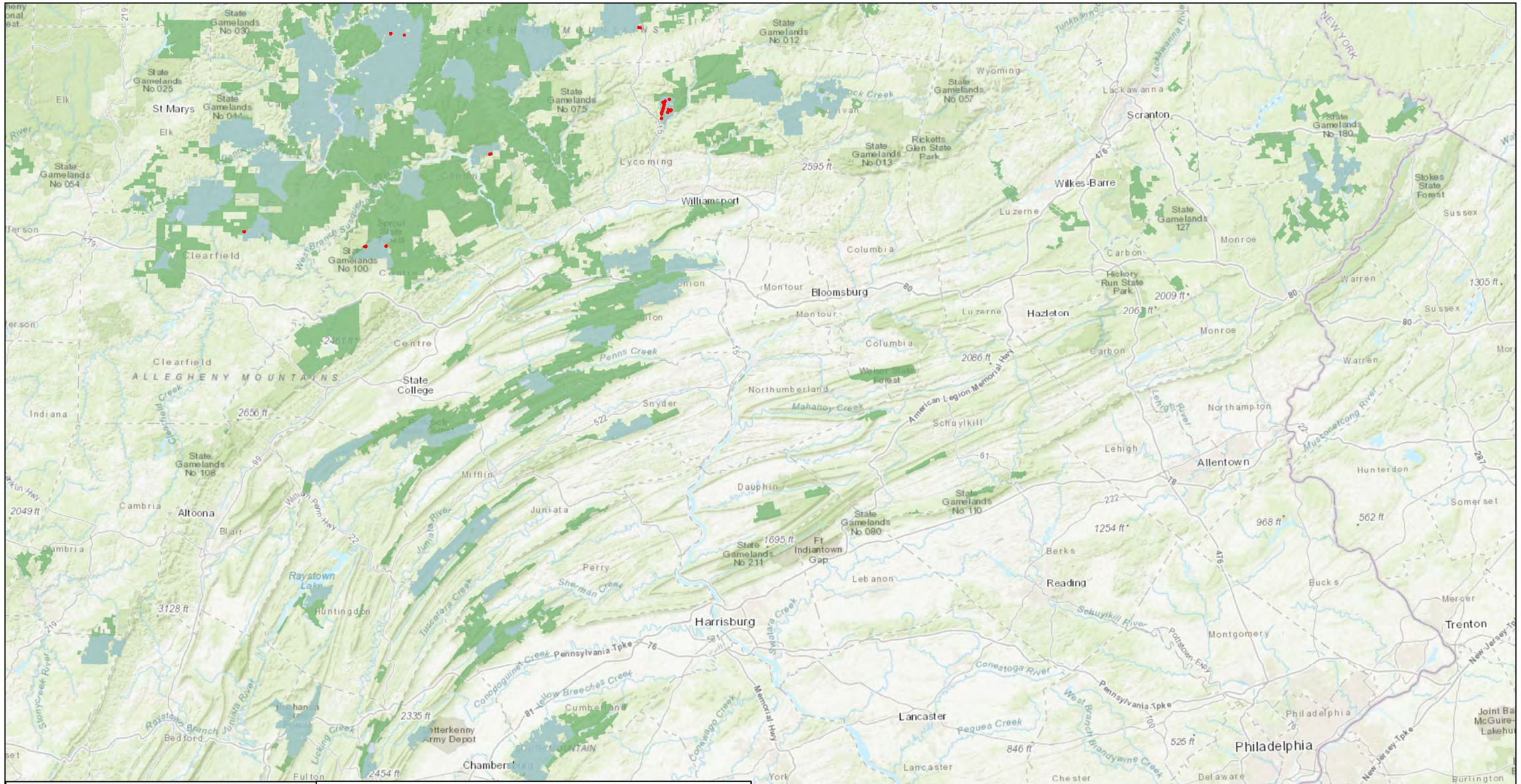
BLACK ASH SWAMP NAT. AREA
ASAPH WILD AREA
HILLS CREEK STATE PARK
COLTON PT. STATE PARK
LEONARD HARRISON STATE PARK
ALGERINE SWAMP NAT. AREA
KETTLE CREEK GORGE NATURAL AREA
McINTYRE WILD AREA
FELLOWS CREEK
COUNTY BRIDGE PICNIC AREA
FALL BROOK PICNIC AREA
LANDRUS PICNIC AREA
STONY FORK PICNIC AREA
BOAT ACCESS AREA
SGL 37
SGL 268
Bridge

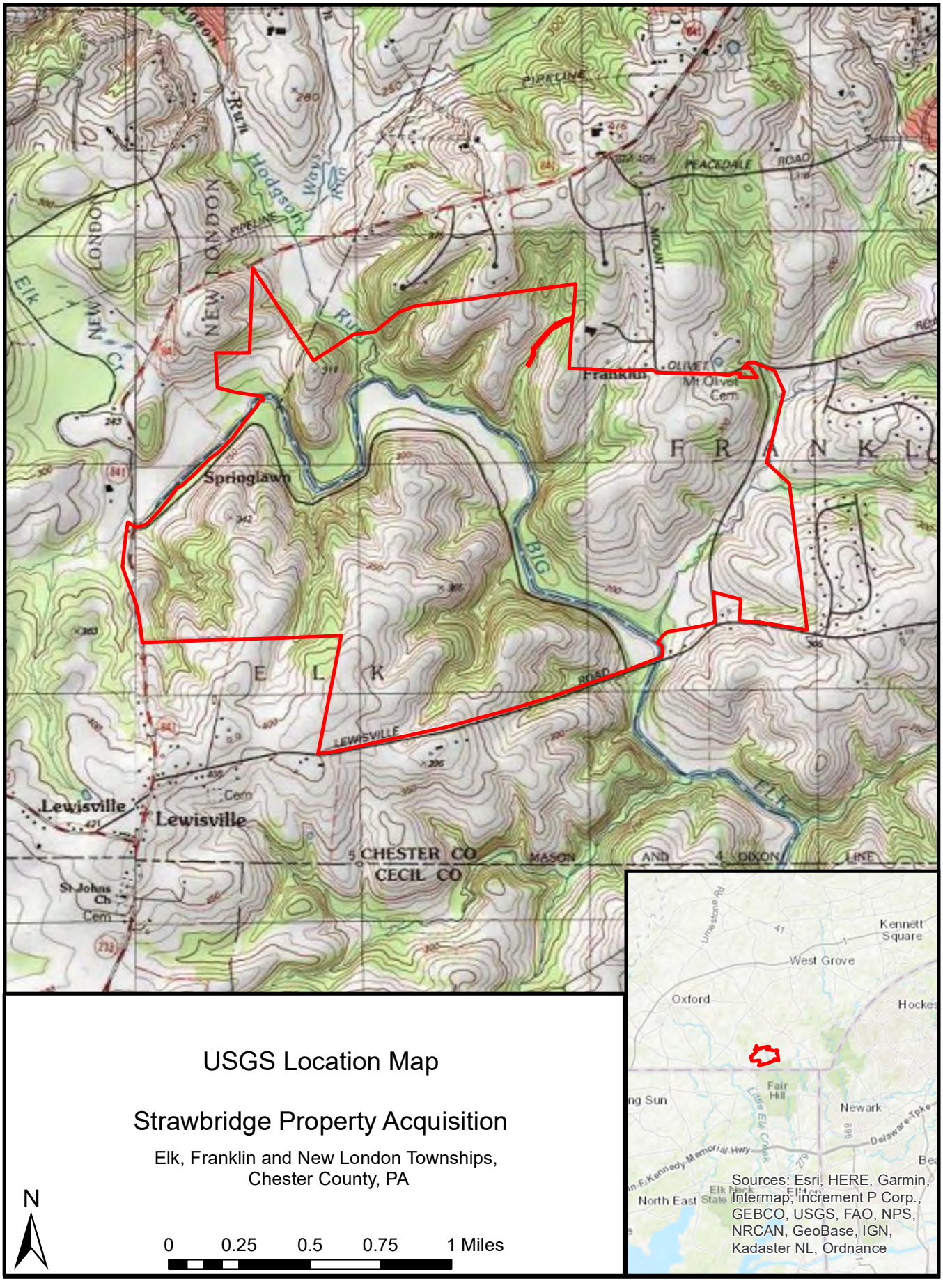
Holiday
Middlebury Center
Niles Valley
Mansfield
Whitneyville
Charleston
Wellsboro
Asaph
Ansonia
Dexter
Lake Hamilton
Cherry Flats
Covington
Stony Fork
Knapp
Clymsville
Draper
Tiadaghton
Antrim
Landrus
Klondike
Blossburg
Morris Run
Gleason
Ogdensburg
Sebring
Morris
Hoytville
Nauvoo
East Point
Roaring Branch
Blackwell
Liberty

TIOGA CO. / LYCOMING COUNTY
BRADFORD CO. / LYCOMING CO.
TIOGA CO. / BRADFORD CO.

SWAMP NAT. AREA
ASAPH WILD AREA
S.G.L. 208
Gaines
Rexford
Manhattan
Watrous
S.G.L. 208
COLTON PT. STATE PARK
LEONARD HARRISON STATE PARK
TURKEY PATH
Asaph
MT. NESMUNK
COWDELL
Arbona
Dexter
Wellsboro
Charleston
Whitneyville
HILLS CREEK STATE PARK
Mansfield
Cherry Flats
Covington
Blossburg
Morris Run
FALL BROOK PICNIC AREA
Fall Brook
Stonyfork
Knapp
Olmsville
Draper
Tiadaghton
BOAT ACCESS AREA
Lestonia
Antrim
Londrus
Klondike
Antrim
Ogdensburg
Sebring
East Point
Roaring Branch
Morris
Hoytville
Nauvoo
Liberty
Blackwell
Loreinton
Cedar Run
S.G.L. 75
S.G.L. 268
STONY FORK PICNIC AREA
BRADLEY MILES PICNIC AREA
REYNOLDS SPRING NATURAL AREA
ALGERINE SWAMP NAT. AREA
ALGERINE WILD AREA
STONY FORK CREEK GORGE NATURAL AREA
HICKORY RIDGE
POTTER TIOGA COUNTY
TIOGA LYCOMING COUNTY
TIOGA LYCOMING COUNTY
SHOWNAS A 1235 $580 PROJECT
State Game Land
State Park Land
Natural or Wild Areas
Stream
Lake or Dam
State or Federal Highways
Hard Surface Road
Improved Dirt Road
Old Woods Road
Trail
County Line
We're PARTNERS

Strawbridge Replacement Property Location Map


Converted Areas
State Forest LWCF Areas
State Forests
LWCF Conversion Sites on State Forest Land and Replacement Property
Strawbridge 2 Replacement Property
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community



USGS Location Map

Strawbridge Property Acquisition

Elk, Franklin and New London Townships,
Chester County, PA

N

0 0.25 0.5 0.75 1 Miles

APPENDIX C
Appraisal

Real Estate Appraisal Report

17 Conversion Sites
Totaling 138.37 Acres
Commonwealth of Pennsylvania

Six LWCF Areas
Centre, Clearfield, Clinton, Lycoming,
Potter & Tioga Counties Pennsylvania

Prepared For

PA Department of Conservation & Natural Resources
5th Floor
400 Market Street
Harrisburg, PA 17105

Date of Report

April 30, 2019

Effective Date of Valuation

August 22, 2018

SNYDER
Appraisal Associates

3004 Hempland Road, Suite 3
Lancaster, PA 17601
717.435.9560

SNYDER
Appraisal Associates

3004 Hempland Road, Suite 3
Lancaster, PA 17601-1389
717.435.9560
www.snyderassociates.us

April 30, 2019

Thomas Ford
Director Bureau of Recreation & Conservation
PA Department of Conservation & Natural Resources
5th Floor
400 Market Street
Harrisburg, PA 17105

Re: Estimate of Market Value of 17 Conversion Sites
Approximately a total of 138.37 acres
Six LWCF Areas
Centre, Clearfield, Clinton, Lycoming,
Potter & Tioga Counties Pennsylvania

Dear Mr. Ford:

We are transmitting a real estate appraisal report of the above referenced property. In accordance with your request, I personally inspected the properties on August 20, 21 & 22, 2018.

The purpose of this report is to develop an opinion of market value of 17 sites that total 138.37 acres described in the body of this report. Use of this report is restricted to the intended use for establishing the value of the Bureau of Forestry Land and Water Conservation Fund conversion properties as part of land exchange. The intended users are the Pennsylvania Department of Conservation and Natural Resources (client) and the National Park Service.

A *Real Estate Appraisal Report* has been prepared. This report is completed under the Standard Rule 2-2 (a) and performed under Standard 1 of the 2018-2019 Uniform Standards of Professional Appraisal Practice and the Uniform Appraisal Standards for Federal Land Acquisitions. All three approaches to value were considered, but only the Sales Comparison Approach is developed in this report.

We valued the land under the four tests of the Highest and Best Use and conclude that the Highest and Best Use of the larger parcel is wooded recreational land. Sites

#1 through 15 and 17 have their subsurface rights and site #16 does not have any subsurface rights.

The enclosed report provides the market data and analysis supporting the opinion of market value for the 17 Conversion Sites:

Conversion Site #1	**–**	***$16,000***
Conversion Site #2	**–**	***$32,000***
Conversion Site #3	**–**	***$18,000***
Conversion Site #4	**–**	***$25,000***
Conversion Site #5	**–**	***$35,000***
Conversion Site #6	**–**	***$135,000***
Conversion Site #7	**–**	***$86,000***
Conversion Site #8	**–**	***$25,000***
Conversion Site #9	**–**	***$58,000***
Conversion Site #10	**–**	***$95,000***
Conversion Site #11	**–**	***$4,000***
Conversion Site #12	**–**	***$41,000***
Conversion Site #13	**–**	***$6,000***
Conversion Site #14	**–**	***$2,000***
Conversion Site #15	**–**	***$8,000***
Conversion Site #16	**–**	***$2,000***
Conversion Site #17	**–**	***$37,000***

This opinion of value assumes a purchase in cash or its equivalent (in typically available financing terms) and negotiations free of seller or buyer duress.

The appraised value is qualified by the hypothetical conditions, extraordinary assumptions, limiting conditions, certain definitions, and certifications that are set forth within the report.

The supporting data, analysis, and conclusions on which this valuation is based are contained in the appraisal report and in the appraiser's work file. **THIS LETTER MUST REMAIN ATTACHED TO THE REPORT IN ORDER FOR THE VALUE OPINION SET FORTH TO BE CONSIDERED VALID.**

This report has been completed in compliance with the Uniform Standards of Professional Appraisal Practice (USPAP) adopted by the Appraisal Standards Board of the Appraisal Foundation and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). This appraisal has also been completed in conformity with and is subject to the requirements of the Code of Professional Ethics and Standards of Professional Conduct of the American Society of Farm Managers and Rural Appraisers with which the appraiser is affiliated.

We have verified and attest to the accuracy of the facts presented in this report.

We trust you will find the details of this analysis relevant to your decisions, and we would be pleased to answer any questions you may have.

Sincerely,

SNYDER APPRAISAL ASSOCIATES, LLC

Gregory L. Snyder

Digitally signed by Gregory L. Snyder
DN: cn=Gregory L. Snyder, o=Snyder Appraisal Associates, ou, email=greg@snyderassociates.us, c=US
Date: 2019.04.29 22:11:03 -04'00'

Gregory L. Snyder, ARA
PA State Certified General RE Appraiser
#GA-001309-L
Expires 6/30/2019

Table of Contents

Table of Contents **5**

Certification ..... **i**

Summary of Salient Facts and Conclusions ..... **iii**

Introduction **1**

Scope of Work 1
Jurisdictional Exception 2
Statement of Limiting Conditions 3
Hypothetical Conditions 5
Extraordinary Assumptions 5
Purpose 6
Types and Definition of Value Established 6
Intended Use of Appraisal 6
Intended User of Appraisal and Client 6
Property Rights Appraised 6
Larger Parcel 7
Summary of Appraisal Problem 8

Factual Data **9**

Legal Description 9
Market Area Analysis 9
Pennsylvania Wilds *9*
LWCF Area #1 Property Data 27
LWCF Area Acreage *28*
Use History *28*
Location *28*
Environmental *29*
Gas Wells in Proximity to LWCF Area *29*
Conversion Site #1 – 259 Pad B *30*
Conversion Site #2 – 706 Pad 10 ..... *39*
LWCF Area #2 Property Data 47
LWCF Area Acreage *48*
Use History *48*
Location *48*
Environmental *49*
Gas Wells in Proximity to LWCF Area *49*
Conversion Site #3 – 284 Pad A *50*
LWCF Area #3 Property Data 59
LWCF Area Acreage *60*
Use History *60*

Location *60*
Environmental *61*
Gas Wells in Proximity to LWCF Area *61*
Conversion Site #4 – COP 324 A *62*
LWCF Area #4 Property Data 70
LWCF Area Acreage *71*
Use History *71*
Location *71*
Environmental *72*
Gas Wells in Proximity to LWCF Area *72*
Conversion Site #5 – Pad N *73*
Conversion Site #6 – Road to Pad N *82*
Conversion Site #7 – Hagerman Compressor Station & Holding Pond *89*
Conversion Site #8 – T 100 Pad G *97*
Conversion Site #9 – Pad P & Impoundment *106*
Conversion Site #10 – Pad T *116*
Conversion Site #11 – Brown Road Relocation *125*
Conversion Site #12 – Pad R *131*
LWCF Area #5 Property Data 139
LWCF Area Acreage *140*
Use History *140*
Location *140*
Environmental *141*
Gas Wells in Proximity to LWCF Area #5 ..... *141*
Conversion Site #13 – PGE Pine Hill Pad A *142*
Conversion Site #14 – Pine Hill Impoundment *150*
Conversion Site #15 – PGE Pine Hill Impoundment A *156*
Conversion Site #16 – PGE Pine Hill Compressor *162*
LWCF Area #6 Property Data 169
LWCF Area Acreage *170*
Use History *170*
Location *170*
Environmental *171*
Gas Wells in Proximity to LWCF Area *171*
Conversion Site #17 – Pad 3 ..... *172*

Analysis and Conclusions 180

The Valuation Process 180
Highest and Best Use Defined *180*
Methods of Valuation *181*
Sales and Data Analysis 183
Database *183*
Market Value Analysis – LWCF Area #1 186
Highest and Best Use of LWCF Area #1: *186*
Sales Comparison Approach – Conversion Site #1 ..... *188*

Sales Comparison Approach – Conversion Site #2 ..... *192*
Market Value Analysis – LWCF Area #2 196
Highest and Best Use of LWCF Area #2: *196*
Sales Comparison Approach – Conversion Site #3 ..... *198*
Market Value Analysis – LWCF Area #3 202
Highest and Best Use of LWCF Area #3: *202*
Sales Comparison Approach – Conversion Site #4 ..... *204*
Market Value Analysis – LWCF Area #4 208
Highest and Best Use of LWCF Area #4: *208*
Sales Comparison Approach – Conversion Site #5 ..... *210*
Sales Comparison Approach – Conversion Site #6 ..... *214*
Sales Comparison Approach – Conversion Site #7 ..... *218*
Sales Comparison Approach – Conversion Site #8 ..... *221*
Sales Comparison Approach – Conversion Site #9 ..... *225*
Sales Comparison Approach – Conversion Site #10 ..... *228*
Sales Comparison Approach – Conversion Site #11 ..... *232*
Sales Comparison Approach – Conversion Site #12 ..... *235*
Market Value Analysis – LWCF Area #5 240
Highest and Best Use of LWCF Area #5: *240*
Sales Comparison Approach – Conversion Site #13 ..... *242*
Sales Comparison Approach – Conversion Site #14 ..... *246*
Sales Comparison Approach – Conversion Site #15 ..... *250*
Sales Comparison Approach – Conversion Site #16 ..... *253*
Market Value Analysis – LWCF Area #6 257
Highest and Best Use of LWCF Area #6: *257*
Sales Comparison Approach – Conversion Site #17 ..... *259*
Reconciliation and Correlation 263

ADDENDA

Engagement Letter
A - Legal Description
B - O&G Leases
C - Zoning Ordinances
D - Comparable Location Maps
E - Comparables Sales
F - Qualifications

Certification

The appraiser certifies and agrees that:

1. The statements of fact contained in the report are true and correct.
2. The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions and are the personal, unbiased professional analysis, opinions, and conclusions of the appraiser.
3. The appraiser has no present or prospective interest in the property that is the subject of this report and no personal interest with respect to the parties involved.
4. The compensation received by the appraiser for the appraisal is not contingent on the analyses, opinions, or conclusions reached or reported.
5. I have performed no services, as an appraiser or in any other capacity, regarding the property that is the subject of this report within the three-year period immediately preceding acceptance of this assignment.
6. The appraisal was made and the appraisal report was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.
7. The appraisal was developed and the appraisal report prepared in conformance with the Appraisal Standard Board's *Uniform Standards of Professional Appraisal Practice* and complies with USPAPS Jurisdictional Exception Rule when invoked by section 1.2.7.2 of the *Uniform Appraisal Standards for Federal Land Acquisition*.
8. I have no bias with respect to the property that is the subject of this report or to the parties involved in this report.
9. My engagement in this assignment was not contingent on developing or reporting predetermined results.
10. This appraisal report was made in conformity with and is subject to the requirements of the Code of Professional Ethics and Standards of Professional Conduct of the appraisal organizations with which the appraiser is affiliated.
11. All contingent and limiting conditions imposed by terms of the assignment or by the undersigned are contained herein.
12. The appraiser has made a physical inspection of the property appraised and all comparable sales used in developing the opinion of value. The subject inspection date was August 20, 21 and 22; the inspection method was on-site inspection.

The property owner, or their representative, was given the opportunity to accompany the appraiser on the subject property inspection.

13. Stephen Bolt, ARA provided significant professional assistance to the appraiser by confirming several comparable sales.

Gregory L. Snyder, ARA

Digitally signed by Gregory L. Snyder, ARA
DN: cn=Gregory L. Snyder, ARA, o=Snyder Appraisal Associates, ou, email=Greg@snyderassociates.us, c=US
Date: 2018.09.22 17:43:54 -04'00'

GREGORY L. SNYDER, ARA
Pennsylvania State Certified General RE Appraiser
GA-001309-L
Expires 6/30/2019

Summary of Salient Facts and Conclusions

Owners of Record: Commonwealth of Pennsylvania

LWCF Areas	Conversion Site #	State Forest District	District #	Tract #	County	Twp	Pad Identification
1	1	Sproul	10	259	Centre	Burnside	259PadB
1	2	Sproul	10	706	Centre	Burnside	706 Pad 10
2	3	Sproul	10	284	Clinton	Grugan	284-Pad A
3	4	Moshannon	9	324	Clearfield	Girard	COP 324 A
4	5	Loyalsock	20	100	Lycoming	Lewis	Pad N
4	6	Loyalsock	20	100	Lycoming	Lewis	Road to Pad N
4	7	Loyalsock	20	100	Lycoming	Lewis	Hagerman Compressor Station & Holding Pond
4	8	Loyalsock	20	100	Lycoming	McIntyre	T 100 Pad G
4	9	Loyalsock	20	100	Lycoming	Lewis	Pad P and impoundment
4	10	Loyalsock	20	100	Lycoming	Lewis	Pad T
4	11	Loyalsock	20	100	Lycoming	Lewis	Brown Rd Relocation
4	12	Loyalsock	20	100	Lycoming	Lewis	Pad R
5	13	Susquehannock	15	154	Potter	Wharton	PGE Pine Hill Pad A
5	14	Susquehannock	15	154	Potter	Wharton	Pine Hill Impoundment
5	15	Susquehannock	15	154	Potter	Wharton	PGE Pine Hill Impoundment A
5	16	Susquehannock	15	997	Potter	Wharton	PGE Pine Hill Compressor
6	17	Tioga	16	594	Tioga	Liberty	Pad 3

LWCF Areas	Conversion Site #	Pad Identification	Converted Acres	# of Wells	Rights	Zoning
1	1	259PadB	3.88	2	Fee	None
1	2	706 Pad 10	8.07	None	Fee	None
2	3	284-Pad A	4.44	None	Fee	Rural Forest
3	4	COP 324 A	6.25	2	Fee	None
4	5	Pad N	7.54	6	Fee	Resource Protection
4	6	Road to Pad N	28.66	N/A	Fee	Resource Protection
4	7	Hagerman Compressor Station & Holding Pond	18.20	N/A	Fee	Resource Protection
4	8	T 100 Pad G	5.22	4	Fee	Resource Protection
4	9	Pad P and impoundment	12.39	9	Fee	Resource Protection
4	10	Pad T	20.13	10	Fee	Resource Protection
4	11	Brown Rd Relocation	0.85	N/A	Fee	Resource Protection
4	12	Pad R	8.65	7	Fee	Resource Protection
5	13	PGE Pine Hill Pad A	1.47	4	Fee	None
5	14	Pine Hill Impoundment	0.48	N/A	Fee	None
5	15	PGE Pine Hill Impoundment A	2.05	N/A	Fee	None
5	16	PGE Pine Hill Compressor	0.77	N/A	Surface Only	None
6	17	Pad 3	9.32	1	Fee	Resource Protection

LWCF Areas	Conversion Site #	Pad Identification	Deed #	Lease #	Date Cleared
1	1	259PadB	79-510 Map #604	M-110259-10	Oct-09
1	2	706 Pad 10	143-523 Map #1719	M-110706-10	Jul-10
2	3	284-Pad A	108-687 Map #1475	M-110284-10	Nov-14
3	4	COP 324 A	171-569 Map #B-16-A	M-110324-9	Jul-12
4	5	Pad N	204-85 Map # 663-1	M-110100-20	Oct-12
4	6	Road to Pad N	204-85 Map #663-1	M-110100-20	Dec-11
4	7	Hagerman Compressor Station & Holding Pond	555-719 Map #2738	M-110100-20	Sep-11
4	8	T 100 Pad G	356-168 Map #2219	M-110100-20	Sep-11
4	9	Pad P and impoundment	254-418 Map #663-1	M-110100-20	Jun-12
4	10	Pad T	204-71 Map #434/663-1	M-110100-20	Jan-13
4	11	Brown Rd Relocation	555-719 Map #2738	M-110100-20	May-11
4	12	Pad R	204-85 Map #663-1	M-110100-20	Apr-13
5	13	PGE Pine Hill Pad A	108-186 Map #1145	Tract 154	Sep-07
5	14	Pine Hill Impoundment	108-186 Map #1145	Tract 154	Sep-07
5	15	PGE Pine Hill Impoundment A	108-186 Map #1145	Tract 154	May-09
5	16	PGE Pine Hill Compressor	196-1062 Map #2370	None	Jun-11
6	17	Pad 3	272-284 Map #2087	M-110594-16	Jun-13

Date of Inspection: August 20, 21 & 22, 2018
Date of Report: April 30, 2019
Effective Date of Value Opinions: August 22, 2018

Indicated Values:

Cost Approach: Not Developed
Income Approach: Not Developed
Sales Comparison Approach:

LWCF Area #1	Conversion Site #1	$16,000
	Conversion Site #2	$32,000
LWCF Area #2	Conversion Site #3	$18,000
LWCF Area #3	Conversion Site #4	$25,000
LWCF Area #4	Conversion Site #5	$35,000
	Conversion Site #6	$135,000
	Conversion Site #7	$86,000
	Conversion Site #8	$25,000
	Conversion Site #9	$58,000
	Conversion Site #10	$95,000
	Conversion Site #11	$4,000
	Conversion Site #12	$41,000
LWCF Area #5	Conversion Site #13	$6,000
	Conversion Site #14	$2,000
	Conversion Site #15	$8,000
	Conversion Site #16	$2,000
LWCF Area #6	Conversion Site #17	$37,000

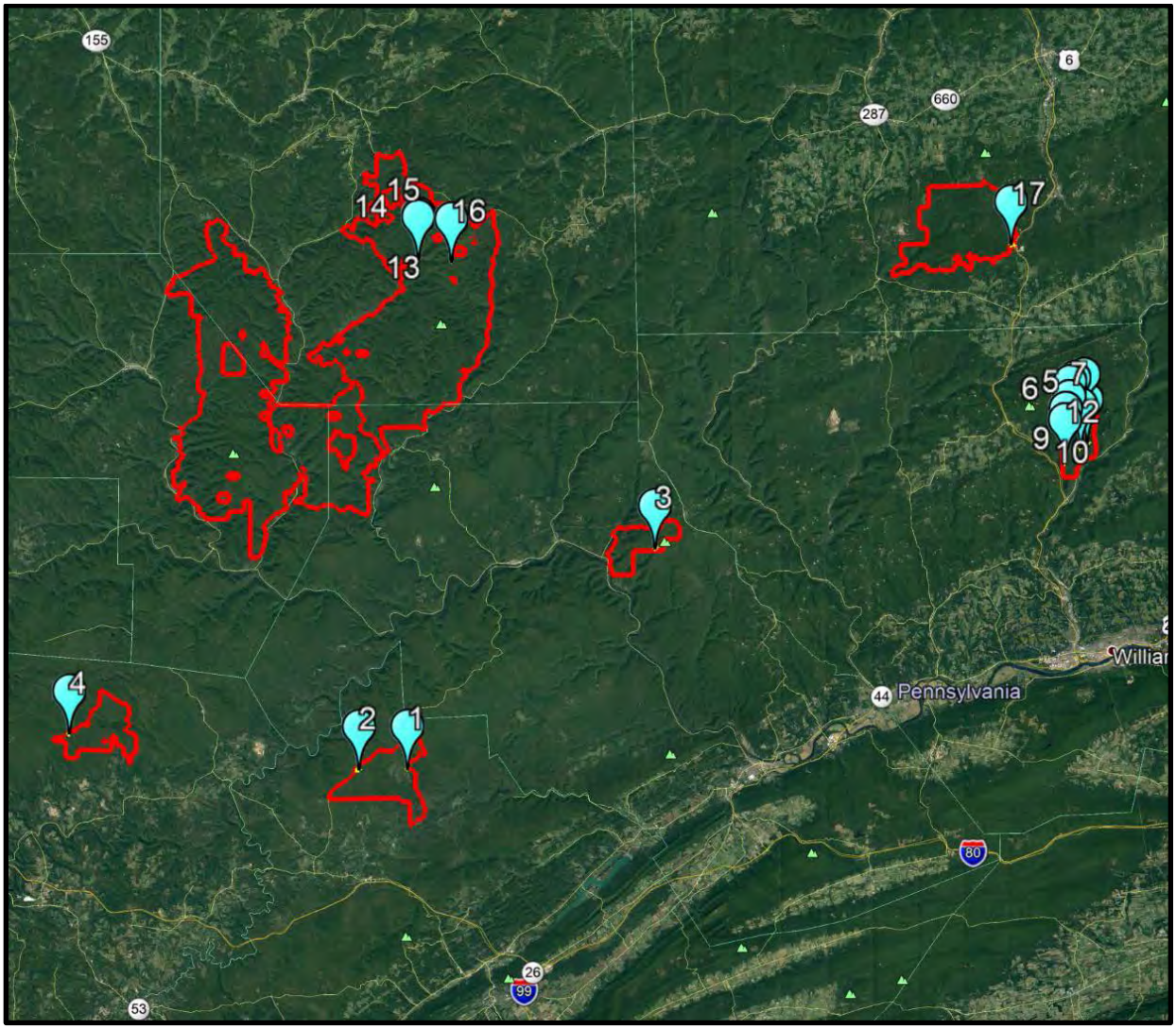
Final Opinion of Market Value:

LWCF Area #1	Conversion Site #1	$16,000
	Conversion Site #2	$32,000
LWCF Area #2	Conversion Site #3	$18,000
LWCF Area #3	Conversion Site #4	$25,000
LWCF Area #4	Conversion Site #5	$35,000
	Conversion Site #6	$135,000
	Conversion Site #7	$86,000
	Conversion Site #8	$25,000
	Conversion Site #9	$58,000

	Conversion Site #10	$95,000
	Conversion Site #11	$4,000
	Conversion Site #12	$41,000

LWCF Area #5	Conversion Site #13	$6,000
	Conversion Site #14	$2,000
	Conversion Site #15	$8,000
	Conversion Site #16	$2,000

LWCF Area #6	Conversion Site #17	$37,000



Conversion Site Locations

Introduction

Scope of Work

The scope of this Real Estate Appraisal includes:

1. Client is the Pennsylvania Department of Conservation and Natural Resources. Other intended user is the National Park Service.
2. Determine the type of value to be established in this report.
3. Establish the intended use and user of the report.
4. Ascertain any Limiting Conditions, Hypothetical Conditions and/or Extraordinary Assumptions.
5. Confirm the property rights being appraised.
6. Perform an on-site inspection of the subject including a walking inspection of the property boundaries and improvements to examine physical characteristics. All structures will be inspected noting the type of structure with special emphasis on determining the condition and utility.
7. Review site plans, deed, GIS data, soil maps, tax assessment records, etc. obtained from the county public records and the Owners.
8. Research Recorder of Deeds for easements, deed restrictions, etc.
9. Review Zoning Ordinance to determine legal restrictions created by Zoning Ordinances.
10. Identify the subject's market area and analyze pertinent characteristics.
11. Describe the subject's market area and the site.
12. Determine the Highest and Best Use of the property.
13. Research and collect comparable data of similar use sales in the subject's market area. Verify information with buyers, sellers, brokers, public records, and/or with other knowledgeable sources. The six county area (Center, Clearfield. Clinton, Lycoming, Potter and Tioga were searched for the period from 2014 to present. Several surrounding counties were included in the database established;
14. Analyze the comparables sales to determine market conditions, locational factors, physical attributes, unit sizes and other pertinent factors and/or adjustments indicated by comparable sales data.

15. Develop the Cost Approach of the subject property.

    The Cost Approach is not developed because there are no improvements on the subject other than the leasehold improvements; therefore, the development of the Cost Approach is not necessary.

16. Develop the Income Approach of the subject property.

    The Income Approach is not developed in this report due to the small larger parcel size and the limited income that is derived from such small acreage. The comparable sales with both surface and subsurface rights were purchased for investments. The buyers are holding the properties for potential future income benefits.

17. Develop the Sales Comparison Approach of the subject property.

18. Reconcile into a final opinion the *As Is* Market Value.

Jurisdictional Exception

The appraisal is being completed under the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) as required by the client. UASFLA requires the definition of Market Value be used as defined in Section 1.2.7.2 (Jurisdictional Exceptions). Purpose of the Appraisal). Contrary to the Uniform Standards of Professional Appraisal Practice (USPAP) Standards Rule 1-2(c), this definition does not call for the estimate of value to be linked to a specific exposure time estimate, but merely that the property be exposed on the open market for a reasonable length of time, given the character and its market. Therefore, the appraiser's estimate of market value shall not be linked to a specific exposure time when conducting appraisals for federal land acquisition purposes under UASFLA.

Also, Section 1.2.4 recognizes that some appraisers' client groups may require the appraiser to estimate marketing time for the property under appraisal. However, such estimates are inappropriate for, and must not be included in, appraisal reports prepared for federal land acquisitions under UASFLA. The request to provide a reasonable marketing time opinion exceeds the normal information required for the conduct of the appraisal process and is, therefore, beyond the scope of appraisal assignment.

UASFLA requirements are in conflict with USPAP. The Exposure Time and Marketing Period will not be developed in this report, which is allowed by a Jurisdictional Exception to USPAP.

Statement of Limiting Conditions

The certification of the appraiser appearing in the appraisal report is subject to the following conditions and as set forth in the report. Acceptance or use of this report constitutes acceptance of the following limiting conditions and assumptions; these can only be modified by written documents executed by both parties.

1. This appraisal is to be used only for the purpose and intended use stated herein. While distribution of this appraisal in its entirety is at the discretion of the client, individual sections shall not be distributed; this report is intended to be used in whole and not in part.
2. The appraiser assumes no responsibility for matters of a legal nature affecting the property appraised or the title thereto, nor does the appraiser render any opinion as to the title, which is assumed to be good and marketable. The property is appraised as though under responsible ownership.
3. Sketches in the report may show approximate dimensions and are included to assist the reader in visualizing the property. The appraiser made no survey of the property and does not warrant accuracy of any legal descriptions. Exact acreages have not been determined and the appraiser assumes no responsibility for such matters.
4. Necessary licenses, permits, consents, legislative or administrative authority from Federal, State, or Local government, or private entities are assumed to be in place or reasonably attainable.
5. The appraiser is not required to give testimony or appear in court because of having made the appraisal with reference to the property in question, unless arrangements have previously been made. If the appraiser is subpoenaed pursuant a court order, the client agrees to pay Snyder Appraisal Associates, LLC regular per diem rates plus expenses.
6. The appraiser assumes that there are no hidden or unapparent conditions of the property, subsoil, or structures that would render it more or less valuable. The appraiser assumes no responsibility for engineering that might be required to discover such factors.
7. Information, estimates, and opinions furnished to the appraiser and contained in the report or work file were obtained from sources considered to be reliable and believed to be true and correct. The appraiser assumes no responsibility for accuracy of such items.

8. Disclosure of the contents of the appraisal report is governed by the Bylaws and Regulations of the professional appraisal organization and Federal and State laws governing the appraiser.

9. It is assumed the property is in full compliance with all applicable Federal, State, and Local environmental regulations and laws, unless noncompliance is stated, defined, and considered in the appraisal report.

10. It is assumed no hazardous materials or products banned by the Federal, State, or Local safety commissions have been situated on the premises. No environmental impact studies were requested or made in conjunction with this appraisal, and the appraiser hereby reserves the right to alter, amend, rescind, or revise any of the value opinions, based on subsequent environmental impact studies, research or investigation.

11. Unless otherwise stated in this report, the existence of hazardous substances, including without limitations asbestos, urea-formaldehyde foam insulation, polychlorinated biphenyl, petroleum, leakage, or agricultural chemicals, which may or may not be present on the property, was not called to the attention of the appraiser nor did the appraiser become aware of such during the inspection. The appraiser has no knowledge of the existence of such materials on or in the property unless otherwise stated. The appraiser, however, is not qualified to test for such substances. The presence of such hazardous substances may affect the value of the property. The value opinion developed herein is predicated on the assumption that no hazardous substances exist on or in the property or in such proximity thereto, which could cause a loss in value. No responsibility is assumed for any such hazardous substances, or for any expertise or knowledge required to discover them.

12. ***American with Disabilities Act (ADA) of 1990*** – A civil rights act passed by Congress guaranteeing individuals with disabilities equal opportunity in public accommodations, employment, transportation, government services, and telecommunications. Statutory deadlines became effective on various dates between 1990 and 1997. Snyder Appraisal Associates, LLC has not made a determination regarding the subject's ADA compliance or non-compliance. Non-compliance could have a negative impact on value; however, this has not been considered or analyzed in this appraisal.

Hypothetical Conditions

Hypothetical Condition is defined as:

> "A condition, directly related to a specific assignment, which is contrary to what is known by the appraiser to exist on the effective date of the assignment results, but is used for the purpose of analysis."[1]

1. In order to appraise State owned land to its Highest and Best Use, a *Hypothetical Condition* is made that the property is appraised as if it were under private ownership.
2. In order to value the conversion site, the 100 to 200 acres surrounding the subject site needs to be considered. The database shows the lack of sales of small inholding tracts within the State Forests. Further sale data analysis indicates typical wooded recreational tracts range from 100 to 200 acres. Therefore, it is assumed that 100 to 200 acres surrounding the subject tracts are under similar private ownership and will be considered when determining value of the subject parcel.

Extraordinary Assumptions

Extraordinary Assumption is defined as:

> "An assignment-specific assumption as of the effective date regarding uncertain information used in an analysis which, if found to be false, could alter the appraiser's opinions or conclusions."[2]

1. The subjects are made up of 17 separate sites which range in size from 0.48 acres to 28.66 acres. The total acreage appraised in this report is 138.37 acres. The boundaries and acreage amounts are based on GIS drawings and acreage amounts provided to the appraiser by the PA DCNR.
2. The legal description of each site was provided by the client. The descriptions could not be verified by platting or comparing to tax assessment information. It is assumed that all conversion sites are owned by the Commonwealth of Pennsylvania based on legal descriptions provided by client.

[1] *Uniform Standards of Professional Appraisal Practice*, 2018-2019

[2] *Uniform Standards of Professional Appraisal Practice*, 2018-2019

Purpose

The purpose of this appraisal is to provide an opinion of the market value, as defined below, of the subject property. The appraisal must be completed in compliance with Uniform Standards of Professional Appraisal Practice, and Uniform Appraisal Standards for Federal Land Acquisitions.

Types and Definition of Value Established

The definition of **Market Value** used in this report can be stated as:

Market value is the amount in cash, or on terms reasonably equivalent to cash, for which all probability the property would have sold on the effective date of the appraisal, after a reasonable exposure time on the open competitive market, from a willing and reasonably knowledgeable seller to a willing and reasonably knowledgeable buyer, with neither acting under any compulsion to buy or sell, giving due consideration to all available economic uses of the property.[3]

Intended Use of Appraisal

The intended use of this report is restricted to the intended use for establishing the value of the Bureau of Forestry Land and Water Conservation Fund conversion properties as part of land exchange.

Intended User of Appraisal and Client

The intended users of the report are the Pennsylvania Department of Conservation and Natural Resources (client) and the National Park Service.

Property Rights Appraised

Fee Simple Estate is "the absolute ownership unencumbered by any other interest or estate, subject only to the limitations imposed by the governmental powers of taxation, eminent domain, police power, and escheat".[4]

The property rights being appraised are also subject to normal right-of-ways granted to government agencies and public utility companies for placing and maintaining utility distribution and drainage systems, as well as other easements and agreements of record.

[3] Section 1.2.4 of *Uniform Appraisal Standards of Federal Land Acquisitions*, 2016
[4] *The Dictionary of Real Estate Appraisal*, Sixth Edition, Appraisal Institute

A total of 17 tracts were appraised. Of these, the Fee Simple estate of 16 tracts was appraised. These fee rights are limited by any gas leases and unrecorded utility and highway easements. One tract was appraised as surface only; the subsurface rights were retained by a previous owner.

Larger Parcel

The Larger Parcel is defined as:

> *"The tract or tracts of land that possess a unity of ownership and have the same, or an integrated, highest and best use."*[5]

The larger parcel being appraised is the 17 individual sites. They range in size from 0.48 to 28.66 acres. They total 138.37 acres that have been converted from recreational forest use to uses for the extraction of natural gas. The 17 sites are located in 6 different LWCF areas. These areas are located in five different State Forests. The individual LWCF areas and the State Forests are much larger than typical tracts that sell in the market place.

Standard 1.12 (Special Considerations in Appraisals for Federal Land Exchanges) of the Uniform Appraisal Standards for Federal Land Acquisition states that:

For a non-assembled land exchange appraisal (similar to the typical acquisition appraisal, although the estate to be appraised has been identified in the ATI), the appraiser will apply the tests of unity of ownership, of unity of highest and best use, and of contiguity or proximity as it bears on unity of use in determining the larger parcel.

Each of the tracts meets the test of unity of ownership and of unity of highest and best use, and although they are not contiguous, they are located in a geographically similar area. For the purposes of this appraisal, the appraiser has been instructed to treat the parcels as non-assembled. Therefore, each parcel represents its own larger parcel.

The subject tracts are all within the Commonwealth of Pennsylvania State Forests. ***Hypothetical Condition #***1 assumes the subjects are under private ownership, which means they would be small acreage inholdings within the State Forests.

In order to value the conversion site, the 100 to 200 acres surrounding the subject site needs to be considered. The database shows the lack of comparable sales of small inholding tracts within the State Forests. Further sale data analysis indicates typical wooded recreational tracts range from 100 to 200 acres. Therefore, ***Hypothetical Condition #2*** assumes that 100 to 200 acres surrounding the subject tracts are under

[5]Section 4.3.3 *Uniform Appraisal Standards for Federal Land Acquisition,* 2016

similar private ownership and will be considered when determining value of the subject parcel.

Summary of Appraisal Problem

The appraisal problem is to determine the Market Value of the fee simple and surface only interests of 17 sites spread over 6 different counties in an area known as the PA Wilds.

The sites are located within five State Forests. Using ***Hypothetical Condition #1*****,** a set of comparable sales that were purchased as wooded recreational tracts was developed. Comparable sales of 50+ acres were located to develop a database.

The challenge in developing this report, was locating sales with all the fee simple rights intact. The majority of sales being transferred are surface only with the subsurface rights retained by a former owner.

Factual Data

Legal Description

Property is deeded to:	Commonwealth of Pennsylvania
Deed Reference #:	Various (*Described with each conversion site*)
Date of Recording and Purchase:	Various (*Described with each conversion site*)
Deeded Acreage:	Various (*Described with each conversion site*)

Market Area Analysis

The ever changing nature of the basic forces that motivate buyers and sellers within a given market area has a direct impact on the area's real estate values. The forces are usually considered in four major categories:

- Physical considerations
- Social considerations
- Economic considerations
- Governmental considerations

The following general analysis outlines the general economic conditions and future outlook and trends of the subject market area.

Pennsylvania Wilds

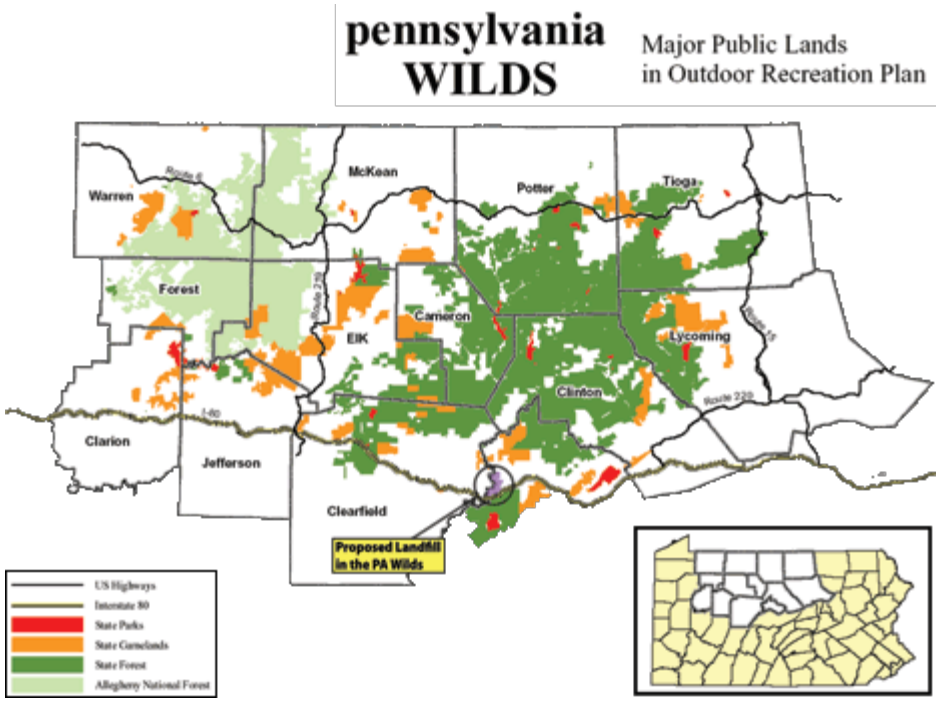
The Pennsylvania Wilds is a region in northcentral Pennsylvania.

PHYSICAL CONSIDERATIONS

LOCATION - The land mass of the northcentral Pennsylvania landscape covers 25 percent of the state and holds about 4 percent of its population. The amount of public land in the region is more than 2 million acres and is comparable to Yellowstone National Park. The Pennsylvania Wilds consists of the 13 northern and north-central counties in Pennsylvania:

- Cameron County
- Centre County
- Clarion County
- Clearfield County
- Clinton County
- Elk County
- Forest County
- Jefferson County
- Lycoming County
- McKean County
- Potter County
- Tioga County
- Warren County

The subject sites are located in the six counties - Centre, Clearfield, Clinton, Lycoming, Potter and Tioga Counties.



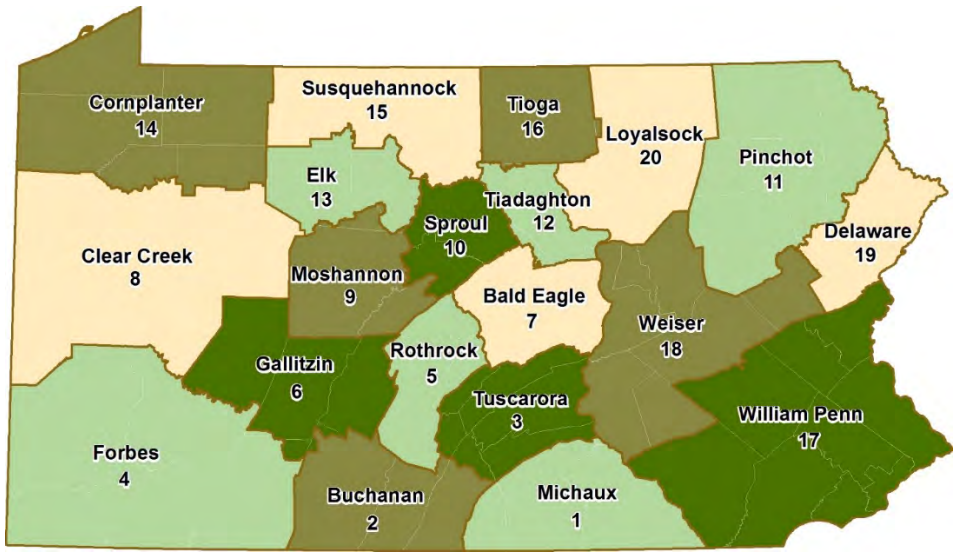
RESOURCES & RECREATION - The 12.5 county Pennsylvania Wilds offers outdoor adventures, wildlife, hundreds of miles of land and water trails, abundant lumber and oil history, and charming small towns.

The PA Wilds is a landscape abounding in recreational and cultural assets including:

- The largest elk herd in the northeast
- Some of the darkest night skies in the country and a Dark Sky Preserve at Cherry Springs State Park
- Oil and lumber heritage, history and museums
- Small towns
- Elk Scenic Drive -- 23 viewing sites that provide parking and opportunities to view elk and other wildlife
- Pennsylvania Grand Canyon -- Leonard Harrison and Colton Point State Parks sit on either side of the Pine Creek Gorge, a 18-mile rugged area with depths in excess of 1,000 feet from the rim to Pine Creek
- Pine Creek Rail-Trail -- extends 62 miles south from Wellsboro Junction to Jersey Shore in the Tiadaghton State Forest along Pine Creek; the trail is used primarily for bicycling, walking, and cross-country skiing
- 16,000 miles of waterways, including two National Wild & Scenic Rivers -- the Allegheny and the Clarion -- the West Branch of the Susquehanna, and many more

The Pennsylvania Wilds is home to several state forests. According to DCNR's Bureau of Forestry website, the state forest system comprises 2.2 million acres of forestland in 48 of Pennsylvania's 67 counties.

Pennsylvania is divided into 20 forest districts. Each district is responsible for protecting all forest land within the district from fire, destructive insects and disease.



The State Forests support a multitude of resources, uses, and values, including:

- Water and air purification
- Recreational opportunities
- Aesthetic beauty
- Plant and animal habitat
- Economic benefits through the provision of wood products
- Environmentally sound utilization of mineral resources

The five State Forests in which our subjects are located are:

- Loyalsock State Forest includes 114,552 acres in portions of Sullivan, Lycoming and Bradford Counties. The forest spans the northern tier's "Endless Mountains" region and primarily consists of northern hardwoods type forests.
- Moshannon State Forest totals 190,031 acres on the Allegheny Plateau. Small tracts of the forest are found in Cameron and Clinton counties; however, most of the forest land lies in Clearfield, Elk and Centre Counties. Moshannon State Forest lies within a transition zone between the northern hardwood and Allegheny hardwood forests to the north and the mixed oaks and oak-hickory forests to the south.
- Sproul State Forest is located in north central Pennsylvania, primarily in western Clinton and northern Centre counties. It is the largest in the state forest system, Sproul covers 305,450 acres, or slightly more than 476 square miles. It features

steep and rugged hillsides cut by the West Branch of the Susquehanna River and its tributaries.

- Susquehannock State Forest derives its name from the Susquehannock tribe that once inhabited the region. It comprises 265,000 acres in Potter, Clinton County and McKean Counties. The forest grows some of the most productive stands of black cherry trees in the world.
- Tioga State Forest derives its name from the Seneca phrase "meeting of two rivers." It covers 161,890 acres in Bradford and Tioga Counties. The forest hosts the Pine Creek Gorge, also known as the "Grand Canyon of Pennsylvania." Tioga features awe-inspiring views and miles of clean, cool streams, like Cedar Run and Babbs Creek.

SIX-COUNTY AREA CLIMATE – The following grids demonstrate the temperatures and precipitations in four major cities in the area:

State College	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	32°	35°	46°	58°	68°	78°	82°	80°	72°	61°	48°	37°
Avg. Low	16°	18°	26°	37°	47°	56°	60°	58°	51°	40°	32°	22°
Mean	25°	27°	37°	48°	58°	67°	71°	70°	62°	51°	41°	30°
Avg. Precip	2.4"	2.6"	3.3"	2.9"	3.6"	4.0"	3.6"	3.3"	3.3"	2.8"	3.3"	2.7"

Clearfield	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	31°	34°	44°	57°	68°	76°	80°	78°	71°	58°	47°	35°
Avg. Low	11°	12°	21°	30°	40°	48°	54°	52°	45°	34°	28°	18°
Mean	21°	24°	34°	44°	55°	64°	67°	66°	58°	47°	38°	27°
Avg. Precip	1.8"	2.1"	2.8"	3.1"	4.0"	4.5"	4.4"	3.8"	3.5"	2.8"	2.9"	2.3"

Mansfield	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	31°	34°	44°	57°	68°	76°	81°	78°	72°	61°	48°	35°
Avg. Low	11°	12°	22°	32°	41°	50°	55°	54°	46°	36°	28°	18°
Mean	22°	24°	34°	45°	55°	64°	68°	67°	58°	46°	38°	27°
Avg. Precip	1.7"	1.9"	2.1"	2.6"	3.1"	3.8"	3.6"	2.9"	2.8"	2.6"	2.8"	2.4"

Williamsport	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	34°	3°	47°	60°	71°	78°	84°	81°	74°	62°	48°	37°
Avg. Low	17°	18°	28°	38°	47°	56°	61°	60°	54°	41°	34°	24°
Mean	25°	28°	38°	48°	60°	68°	72°	71°	64°	52°	42°	31°
Avg. Precip	2.5"	2.8"	3.3"	3.3"	3.9"	4.3"	4.0"	3.4"	3.4"	3.3"	3.7"	3.0"

TRANSPORTATION – The main highway corridors through the area are:

- Interstate 80 – east to west across southern portion of the PA Wilds
- State Route 6 – east to west across the northern portion of the PA Wilds
- State Route 15 – north to south on the eastern portion of the PA Wilds
- There are several other state routes running north and south through the PA Wilds

Available airports in the area include:

- There are two primary commercial service airports in the area: State College (University Park Airport), and Williamsport (Williamsport Regional Airport).

- Non-primary commercial airports are located in Clearfield (Clearfield-Lawrence Airport), Lock Haven (William T Piper Memorial Airport) Philipsburg (Mid-State Airport), and Wellsboro (Wellsboro-Johnston Airport).

NATURAL GAS - In 2002, the United States Geological Survey estimated the Marcellus Shale in the Appalachian Basin Province, contained an estimated 1.9 trillion cubic feet of gas, a significant amount of gas, but spread over the enormous geographic extent of the Marcellus, not that much per acre.

In 2003, Range Resources - Appalachia, LLC drilled a Marcellus well in Washington County, in southwest Pennsylvania and found a promising flow of natural gas. The company experimented with horizontal drilling and hydraulic fracturing methods that were successful in the Barnett Shale of Texas. The first Marcellus gas production from the well began in 2005. Between then and the end of 2007 more than 375 gas wells with suspected Marcellus gas were permitted in Pennsylvania.

In early 2008, Terry Englander, a geo-science professor at Pennsylvania State University, and Gary Lash, a geology professor at the State University of New York at Fredonia, surprised everyone with estimates that the Marcellus might contain more than 500 trillion cubic feet of natural gas. It was calculated that by using horizontal drilling and hydraulic fracturing methods, perhaps 10% of that gas (50 trillion cubic feet) might be recoverable, enough to supply the entire United States for about two years and have a value of about one trillion dollars.

Early production rates from some of the new wells have been over one million cubic feet of natural gas per day. As with most gas wells, production rates will decline over time, however, a second hydraulic fracturing treatment could re-stimulate production.

Most historic wells in the Marcellus play produced gas at a very slow rate because of low permeability. This is typical for shale. The most successful historic wells in the Marcellus play share a common characteristic: they intersect numerous fractures. These fractures allow the gas to flow through the rock unit and into the well bore. An extensive fracture network allows one well to drain gas from a very large volume of shale. A single well can recover gas from many acres of surrounding land.

Fractures or "joints" in the Marcellus Shale are vertical. A vertical borehole would be expected to intersect very few of them. However, a horizontal well, drilled perpendicular to the most common fracture orientation should intersect a maximum number of fractures. Some horizontal wells in the Marcellus Shale have initial flows that suggest that they are capable of yielding millions of cubic feet of gas per day, making them some of the most productive gas wells in the eastern United States.

A second method to increase the productivity of a well increases the number of fractures in the well using a technique known as hydraulic fracturing. *Hydrofracing* is

accomplished by sealing off a portion of the well and injecting water or gel under very high pressure into the isolated portion of the hole to induce fractures in the rock surrounding the well bore. The high pressure fractures the rock and pushes the fractures open. To prevent the fractures from closing when the pressure is reduced, sand or other *propant*, is pumped into the pressurized portion of the hole. If enough grains are trapped in the fracture it will be propped partially open when the pressure is reduced providing improved permeability for the flow of gas to the well.

The Marcellus shale gas is some of the closest natural gas to the high population areas of New Jersey, New York and New England. This transportation advantage gives Marcellus gas an advantage in the marketplace. Gas produced from the shallower, western portion of the Marcellus extent might be transported to cities in the central part of the United States having a positive impact on the stability of natural gas supply of the surrounding region for at least several years if the resource estimates prove accurate.

Landowners who own the mineral rights to their property have been approached with offers to lease their land. The size of the signing bonuses that have been paid in transactions between informed buyers and informed sellers is directly related to two factors: 1) the level of uncertainty in the mind of the buyer, and 2) the number of other buyers competing to make the purchase. These factors have changed significantly in a very short time. As recently as 2005 the level of uncertainty in the minds of the buyers was very high and the signing bonuses were a few dollars per acre.

When the potential of the Marcellus was first suspected in 2006, a small number of speculators began leasing land - paying risky signing bonuses sometimes as high as $100 per acre. By late 2007 signing bonuses of a few hundred dollars per acre were common. Then, as the technology was demonstrated and publicized, signing bonuses rose rapidly. By early 2008 several wells with strong production rates were drilled, numerous investors began leasing and the signing bonuses rose from a few hundred dollars per acre to over $2000 per acre for the most desirable properties.

Although signing bonuses generate substantial interest because they are guaranteed income, royalties for a share of a well's income can be significantly higher. The customary royalty rate is 12.5 percent of the value of gas produced by a well. Higher royalty rates are sometimes paid by aggressive buyers for highly desirable properties.

The Pennsylvania Department of Environmental Protection reports that the number of drilled wells in the Marcellus Shale increased rapidly. In 2007, only 27 Marcellus Shale wells were drilled in the state, however, in 2010 the number of wells drilled had risen to 1,386. Many of these wells will yield millions of cubic feet of natural gas per day in their first year. However, the yield of individual wells usually falls rapidly over the next few years.

Hundreds of thousands of acres above the Marcellus Shale have been leased with the intent of drilling wells for natural gas. However, most of the leased properties are not adjacent to a natural gas pipeline. The total natural gas pipeline capacity currently available is a tiny fraction of what will be needed. New pipelines must be built to transport millions of cubic feet of natural gas per day to major markets. In addition, thousands of miles of natural gas gathering systems must be built to connect individual wells to the major pipelines.

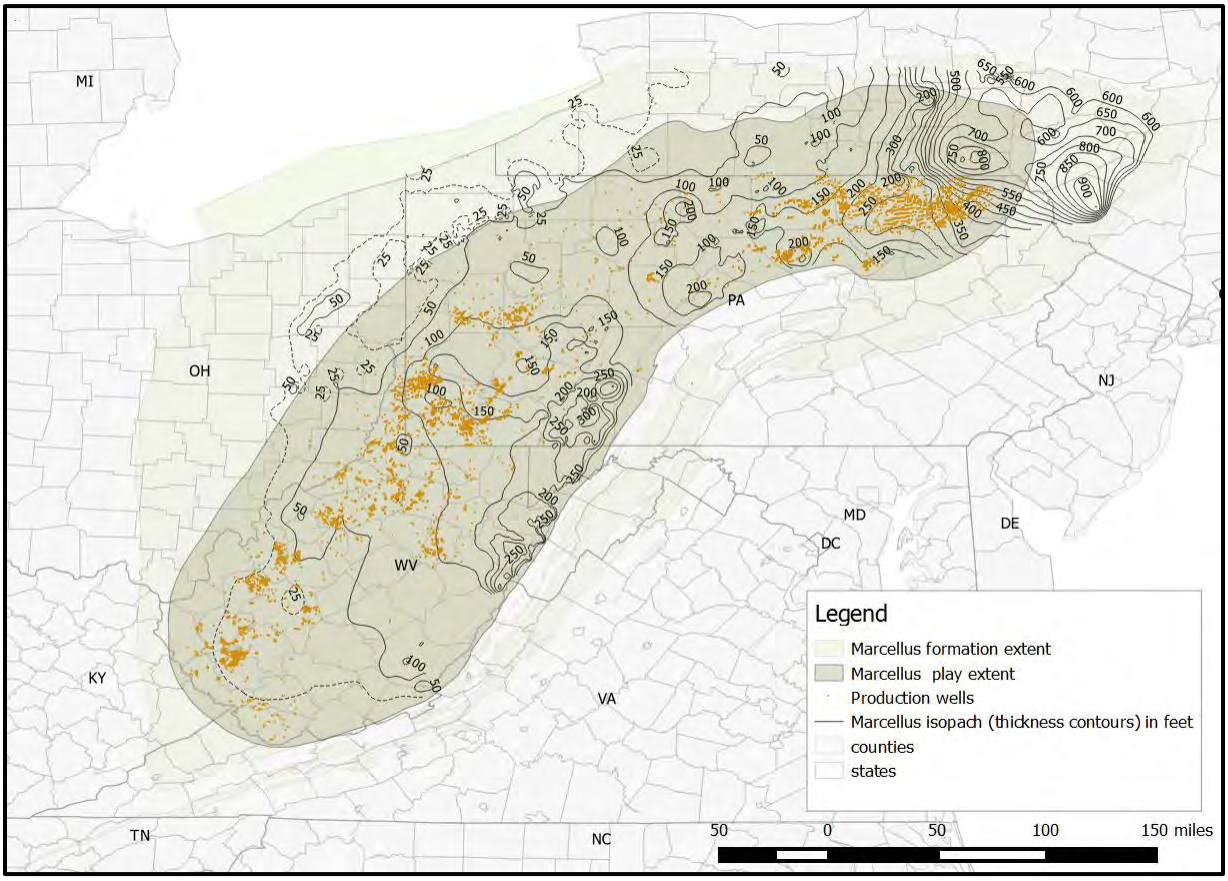
Many property owners have been asked to sign right-of-way agreements to allow natural gas pipelines and gathering systems to be built across their land. If the property owner is not associated with the gas production there could be compensation for granting the right-of-way. Payments can be as low as a few dollars per linear foot in rural areas to over $100 per foot in more developed areas.

When the yield of Marcellus Shale wells starts to decline, new wells might be drilled down to the Utica play to continue a stream of natural gas production. Drilling for the Utica will be more expensive because of the greater depth, however, the infrastructure of drill pads, right-of-ways, pipelines, permit data and other investments will reduce development costs for Utica Shale wells.

The presence of Marcellus Shale has greatly impacted the area and land values have risen due to the potential for lease payments and eventual royalty payments.

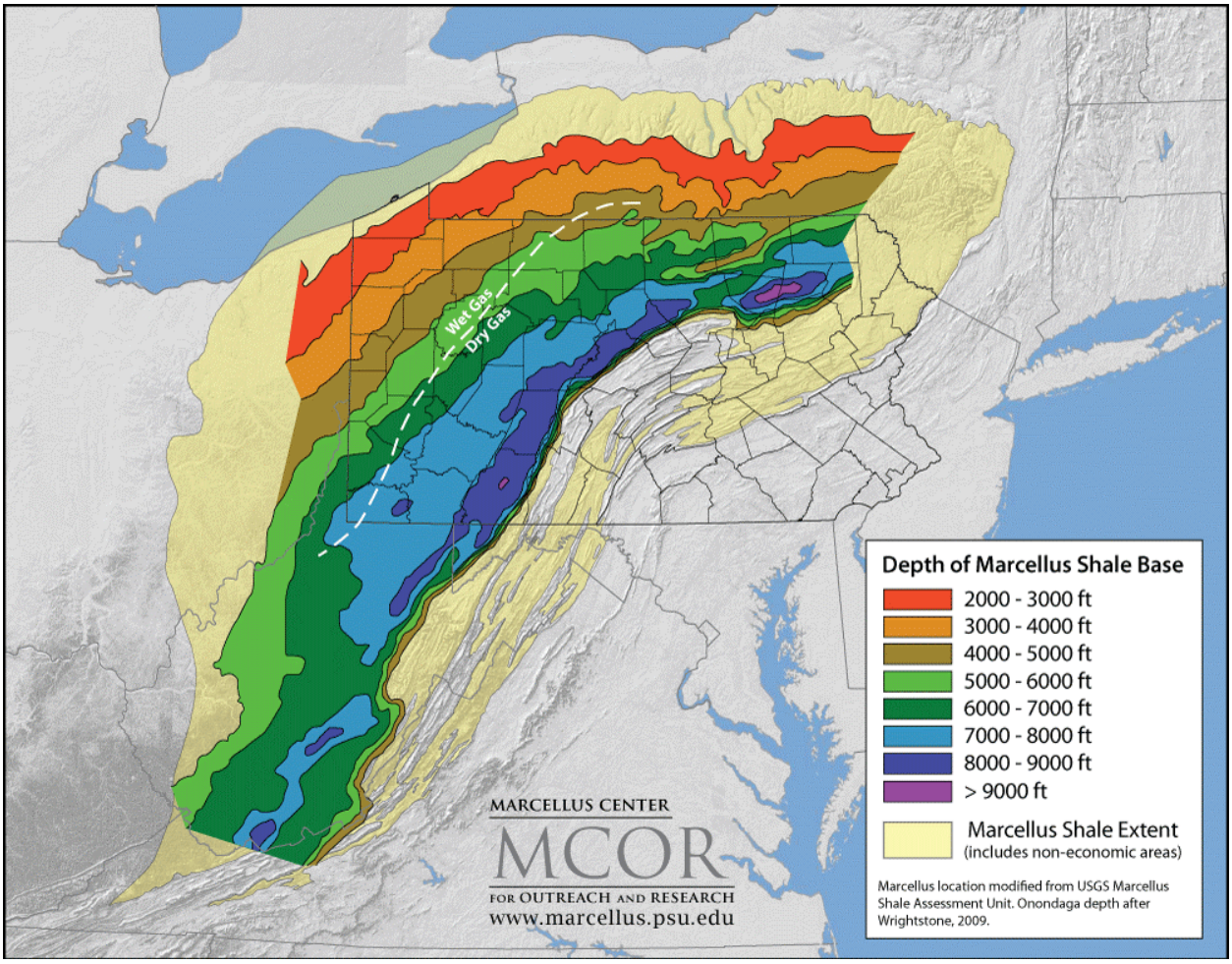
Isopach maps show the Marcellus Shale play thickness across the overall formation footprint. The Marcellus ranges in thickness from 0 to about 950 feet across the Appalachian Basin. It varies in thickness from 200 to 600 feet across northern Pennsylvania. The potentially gas-rich interval extends in an arc through New York, Pennsylvania, and West Virginia and parallels the Appalachian structural front. Most of the current production is located in areas where formation thickness is more than 50 feet.

Isopach Map of the Marcellus Formation



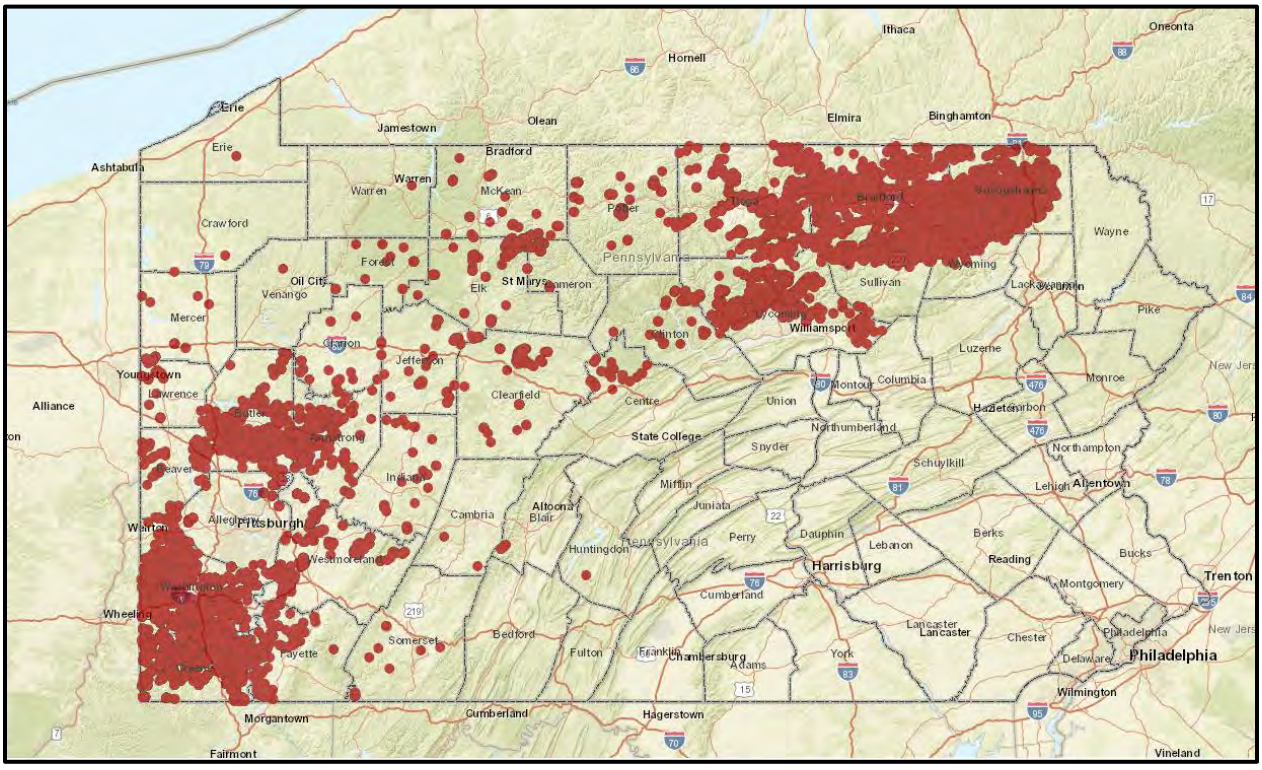
Source: U.S. Energy Information Administration based on DrillingInfo Inc., New York State Geological Survey, Ohio State Geological Survey, Pennsylvania Bureau of Topographic & Geologic Survey, West Virginia Geological & Economic Survey, U.S. Geological Survey.

A second factor to consider is the depth to the Marcellus Shale base. The following map of Appalachian Basin shows depth to the base of the Marcellus Shale. The wet gas/dry gas boundary is a function of the maximum burial temperature experienced by the shale during its history. Wells to the south and east of the boundary recover only methane (so-called "natural gas").



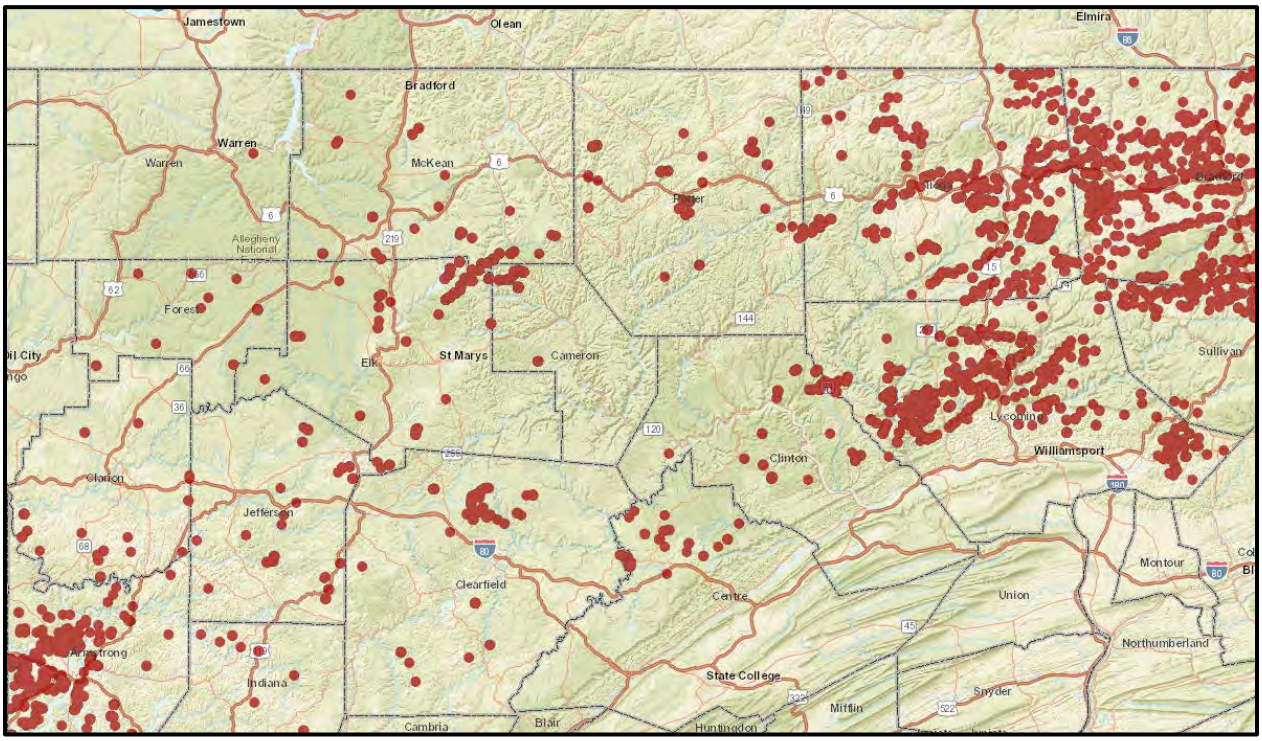
Source: Marcellus Center for Outreach and Research (MCOR), Penn State

To further illustrate the development of unconventional Marcellus Shale wells, a PA Oil and Gas Map from the PA DEP shows the locations of the active unconventional wells in PA.



This map shows the arc of unconventional gas well development in Pennsylvania with the greatest concentrations of development in the southwest and the northeast portion of the State.

The PA Wilds are located on the western edge or the most active area in the northeast. Lycoming and Tioga Counties are the most active area in the PA Wilds market area.



There are 33 counties in PA with a total of 9,972 active unconventional wells according to the PA Department of Environmental Protection. The top five counties for number of wells in the state are:

1. Washington County (16.48%)
2. Susquehanna (14.52%)
3. Greene (12.62%)
4. Bradford County (12.27%)
5. Lycoming County (8.53%).

The following is a list of the active unconventional wells in the PA Wilds.

Number of Active Wells per County		
County	**Unconventional**	**% of Total**
Cameron	54	0.54%
Centre	31	0.31%
Clarion	23	0.23%
Clearfield	98	0.98%
Clinton	81	0.81%
Elk	147	1.47%
Forest	10	0.10%
Jefferson	44	0.44%
Lycoming	851	8.53%
McKean	111	1.11%
Potter	80	0.80%
Somerset	17	0.17%
Warren	0	0.00%
Tioga	737	7.39%
State Total	9,972	
PA Department of Environmental Protection		

It is important to understand the process of unconventional drilling in order to understand the concept of pooling and how it affects the landowners associated with a particular well. Penn State's College of Earth and Mineral Sciences provides an overview of the drilling and production phase of unconventional wells:

1. Permitting - A permit is required prior to beginning operations. Once a permit is issued, a company has one year to begin drilling or the permit expires. If drilling is begun but not completed within 16 months, the permit will expire.

2. Drillsite and Drilling Operations - Most producing companies do not own or maintain their own drilling rigs and must lease rigs from a drilling or service company. For shale gas drilling in Pennsylvania, heavy duty rigs are required to

handle long (heavy) drillstrings for deep drilling. These cost upward of $250,000/day to lease and are usually top-drive rigs that are capable of "walking" short distances in order to drill multiple holes on one pad.

There is a geologic rationale to the layout of holes to be drilled on a drillsite. These producing wells are very close together at the surface and illustrate the position of the vertical parts of wells produced by a drilling rig that can drill one well and "walk" a few feet to drill another.

Professor Terry Engelder at Penn State University showed that there are natural fractures in the subsurface within the Marcellus Shale that have a similar orientation across the Appalachian Basin. There are two major sets of fractures, which Dr. Engelder calls J1 and J2.

Natural fracture sets J1 (coming out of the picture toward you) and J2, nearly perpendicular to J1 that have nearly the same orientation over the entire Appalachian Basin.

Without getting into the details of how these formed, suffice it to say that they are presently oriented relative to certain principal stress directions such that the J1 fractures, which are more closely spaced and oriented Northeast-southwest, will open somewhat if pressurized fluids are pumped along horizontal lengths of tubing placed perpendicular to them. This is the rationale for the pattern of drilling shown.

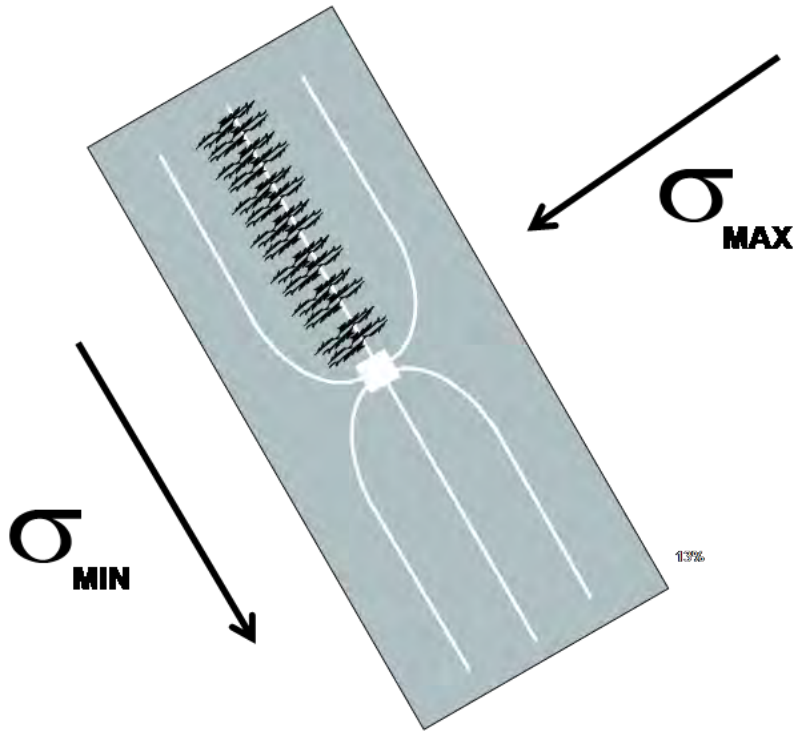


Diagram illustrating the typical orientation of lateral segments of Marcellus Shale wells. The gray area represents a square mile of area. The white box at the center represents a well pad with six wells drilled. The vertical wellheads are arrayed with the horizontals drilled in a "pitchfork" array to be perpendicular to the J1 fracture set (black squiggly lines). Regional stresses are shown as arrows.

Vertical drilling allows a well pad and several wells to be located on one site owned by one landowner, but will extract natural gas from multiple landowners' properties.

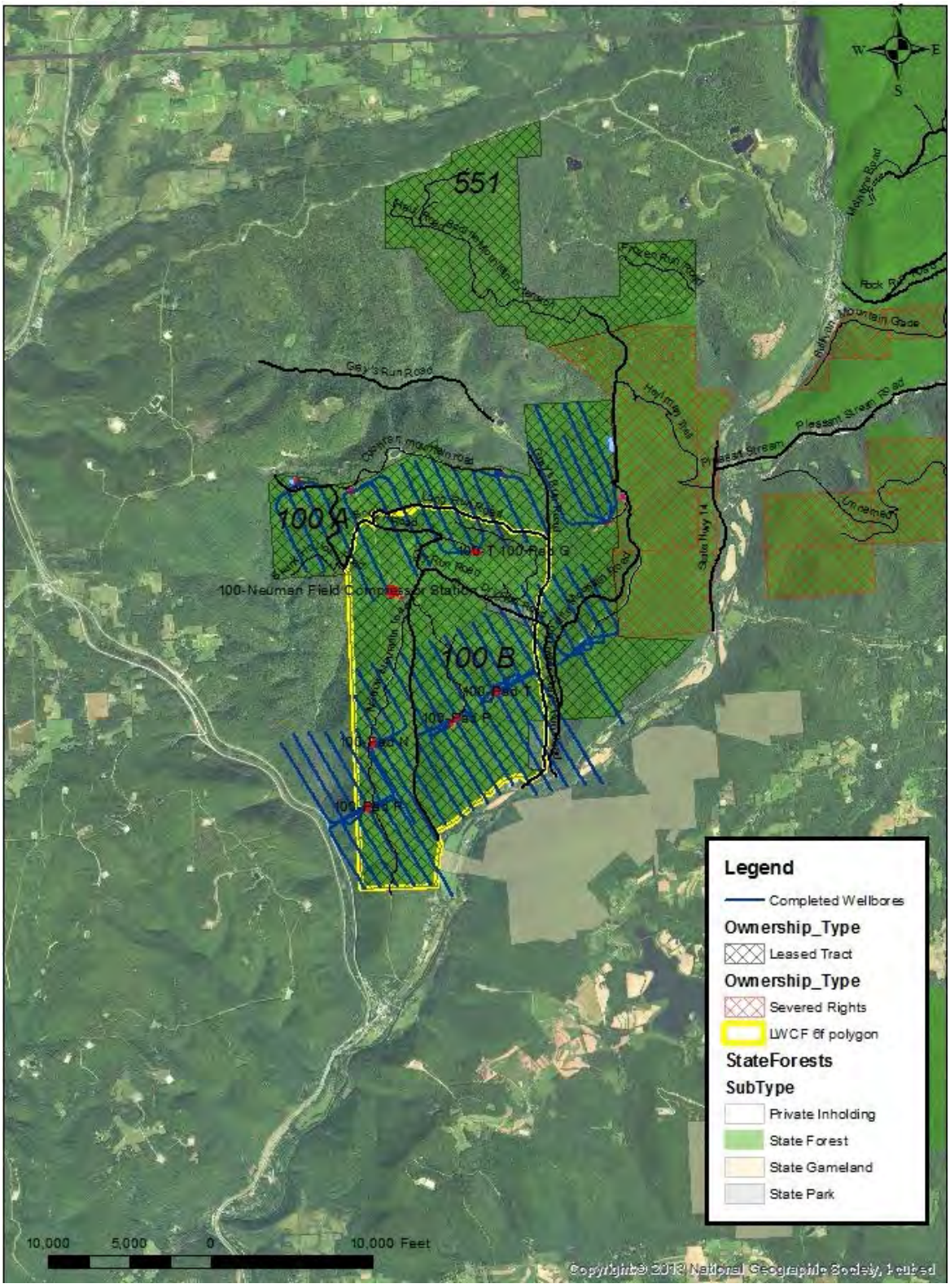
The Penn State Marcellus Center for Outreach and Research defines **Pooling or land pooling**:

"A legal process that allows exploration and production companies to compel unwilling land and mineral rights holders to lease their land and/or mineral rights for exploration and possible drilling if enough of their surrounding neighbors have already agreed. Government agencies may require a minimum number of acres of land before granting a well permit; with pooling, companies can collect smaller tracts of land that will accumulate to this total minimum acreage."

Pooling has the benefit to the production company of uniting all landowners' leases into a common pool under one drilling production company and utilizing one common underground geological reservoir.

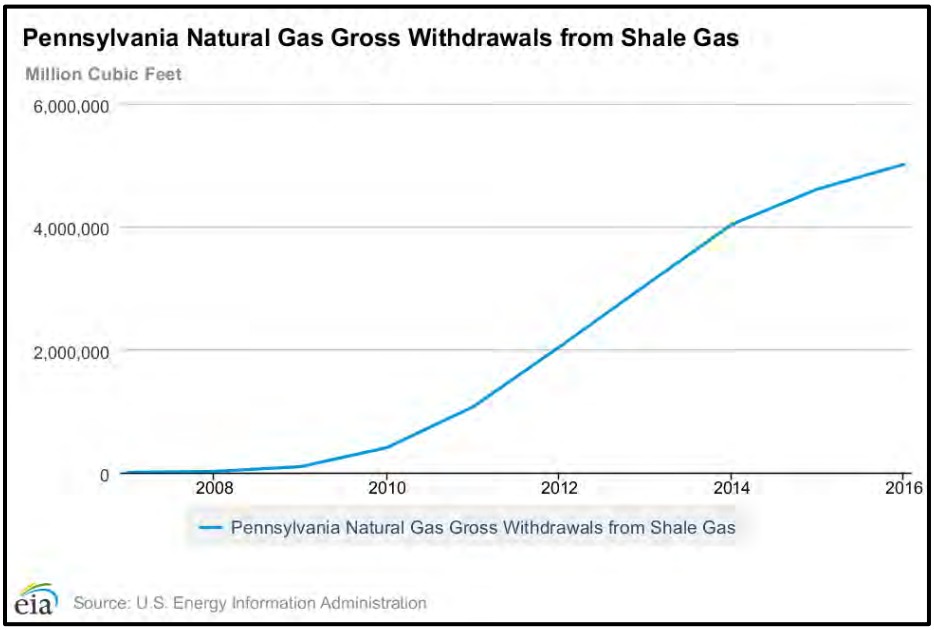
Lateral wellbore length has increased significantly and continues to do so. The first wells had laterals @ 3500', new wells are pushing 15,000'. As such, much more acreage is being developed from the same operational footprint.

An example of one of the subject areas is shown below:



Of particular interest are the horizontal legs (shown in blue) extending to the northwest and southeast. Note that they extend beyond the LWCF polygon indicating the well includes pooling with adjacent landowners.

Pennsylvania's natural gas production continues to grow.



June 2018's gross withdrawal was 16,451 million cubic feet per day.

SOCIAL *CONSIDERATIONS*

POPULATION - As shown by the following tables the population of the region in 2010 was estimated to be 450,419 residents.

Year	Centre Co. Population	Clearfield Co. Population	Clinton Co. Population	Lycoming Co. Population	Potter Co. Population	TIoga Co. Population	Regional Population
2000 Census	135,760	83,382	37,914	120,044	18,080	43,863	439,043
2010 Census	153,990	81,642	39,238	116,111	17,457	41,981	450,419
2018 Estimate	162,660	79,685	39,998	113,841	16,802	40,793	453,779
2020 Projection	168,182	82,294	41,957	118,551	18,109	43,227	472,320
2030 Projection	180,148	83,423	44,973	120,589	18,672	44,136	491,941
Source: 2010 US Census & Center for Rural Pennsylvania							

EDUCATION –

Centre County is best known for being the home of Penn State University. Founded in the late 1800's, Penn State continues to be a celebrated public research facility with undergraduate and graduate level learning supported by a profoundly large alumni network.

The County has seven school districts with 46 public schools. There are 15 public charter schools and 24 private schools with classes offered from K-12 grade levels.

Clearfield County has 9 public school districts and 14 private schools.

Clinton County has 1 higher education facility – Lock Haven University. It has 3 public school districts and 16 private schools.

Lycoming County has 2 higher education facilities – Lycoming College & Pennsylvania College of Technology. There are 11 public school districts.

Potter County has 7 public school districts and 6 private schools.

Tioga County has 1 higher education facility – Mansfield University. There are 5 public school districts and 14 private schools.

ECONOMIC CONSIDERATIONS

EMPLOYMENT – The following table identifies the top employers in the six counties:

Centre Co Major Employers	Clearfield Co Major Employers	Clinton Co Major Employers
Pennsylvania State University	Dubois Regional Medical Center	First Quality Products Inc
Mount Nittany Medical Center	Wal-Mart Associates Inc	Keystone Central SD
State Government	State Government	First Quality Tissue, LLC
State College Area School District	Dubois Area School District	PA State System of Higher Ed
Glenn O. Hawbaker, Inc.	Cen-Clear Child Services	Keane Frac LP
Wal-Mart Associates Inc.	Paris Cleaners Inc	Truck-Lite Co LLC
Weis Markets Inc.	Clearfield Area School District	Wal-Mart Associates Inc
County of Centre	Clearfield Hospital	Clinton Co Commissioners
Geisinger Clinic	Christ the King Manor	Nuteck Disposables Inc
Federal Government	Appalachian Wood Products Inc	State Government
Center for Workforce Information and Analysis		
1st Quarter 2017		

Lycoming Co Major Employers	Potter Co Major Employers	Tioga Co Major Employers
The Williamsport Hospital	Charles Cole Memorial Hospital	Ward Manafacturing LLC
State Government	Morris Compressors Inc	Northern Tioga SD
PA School of Technology	Cole Care Inc	PA System of Higher Ed
Williamsport Area SD	State Government	UPMC Susq Soldiers & Sailors
Susquehanna Health Med Group	Treasure Lake LP	Southern Tioga SD
Weis Markets	Level 3 Communications LLC	Tioga County Commisioners
Lycoming County	Sweden Valley Manorr	Wal-Mart Associates Inc
Aramark Facility	Coudersport Area SD	State Government
West Pharmaceutical Services	Northern Potter SD	Truck-Lite Co LLC
CS Group Payroll Services	Rev Hoopes Trucking LLC	Waupaca Foundry Inc
Center for Workforce Information and Analysis		
1st Quarter 2017		

Labor force and unemployment:

Labor Force	Centre	Clearfield	Clinton	Lycoming	Potter	Tioga	Regional	PA
Labor Force	77,600	35,200	18,300	55,900	7,100	19,100	213,200	6,370,000
Employed	75,200	33,500	17,400	53,400	6,800	18,200	204,500	6,103,000
Unemployed	2,400	1,700	900	2,600	400	900	8,900	267,000
Unemployment Rate	3.10%	4.90%	4.20%	4.60%	5.10%	4.70%	4.17%	4.20%
Center for Workforce Information and Analysis								
Preliminary July 2018 - Seasonally Adjusted								

AGRICULTURE - The Statistical Summary the PA Department of Agriculture gives the following 2012 Ag Census statistics for the six county area:

Total # of Farms	3,542
Land in Farms	536,000
Average Size of Farm	777
Cattle	1,565
Commercial Dairy	474
Hog	212
Sheep	145
Poultry	523

Livestock on Farms	
Hogs & Pigs	26,614
Cattle & Calves	90,800
Sheep & Lambs	4,986

Cash Receipts	
Field	$42,811,000
Field Vegetables & Potatoes	$4,245,000
Fruits	$1,176,000
Horticulture & Mushrooms	$4,132,000
Total Crops	$52,364,000
Poultry, Meat Animals & Livestock	$65,765,000
Dairy	$164,516,000
Total Livestock & Products	$230,281,000
Government Payments	$6,402,000
Total All	$249,993,000

GOVERNMENTAL CONSIDERATIONS

GOVERNMENT - Pennsylvania mandates the classification of counties according to population size.

Centre County is considered a Fourth Class County because its population is within the range of 145,000 to 209,999 persons. The governing body of Centre County consists of a Board of Commissioners with elections held for three commissioners every four years.

Clearfield County is considered a Sixth Class County because its population is within the range of 45,000 to 89,999 persons. The governing body of Clearfield County consists of a Board of Commissioners with elections held for three commissioners every four years.

Clinton County is considered a Sixth Class County because its population is within the range of 45,000 to 89,999 persons. The governing body of Clinton County consists of a Board of Commissioners with elections held for three commissioners every four years.

Lycoming County is considered a Fifth Class County because its population is within the range of 90,000 to 144,999 persons. The governing body of Lycoming County consists of a Board of Commissioners with elections held for three commissioners every four years.

Potter County is considered to Eighth Class County because its population is less than 20,000 persons. The governing body of Potter County consists of a Board of Commissioners with elections held for three commissioners every four years.

Tioga County is considered a Sixth Class County because its population is within the range of 45,000 to 89,999 persons. The governing body of Tioga County consists of a Board of Commissioners with elections held for three commissioners every four years.

Each county has municipalities (townships and boroughs) which are governed by an elected body - supervisors, councils, or commissioners, depending on the municipal designation. Each is responsible for establishing and administering municipal financial budgets and tax rates, as well as being responsible for land use controls through zoning and subdivision regulations and building permits. Local officials provide Road maintenance and other general services as well.

TAXATION - Taxes are paid twice a year. Spring taxes, due in June, are paid to the county and municipality. Fall taxes, due October, are paid to the school districts. All counties' agricultural land greater than ten acres is eligible for preferential taxation (Act 319 - Clean and Green Act). Tying the land assessed value to the value that it generates to the landowner is an important means of addressing tax fairness or equity to the land owner who chooses to use the land in agriculture, despite having other alternatives available. If a property does not continue to meet the requirements for participation in the Act, roll back taxes and penalties are incurred.

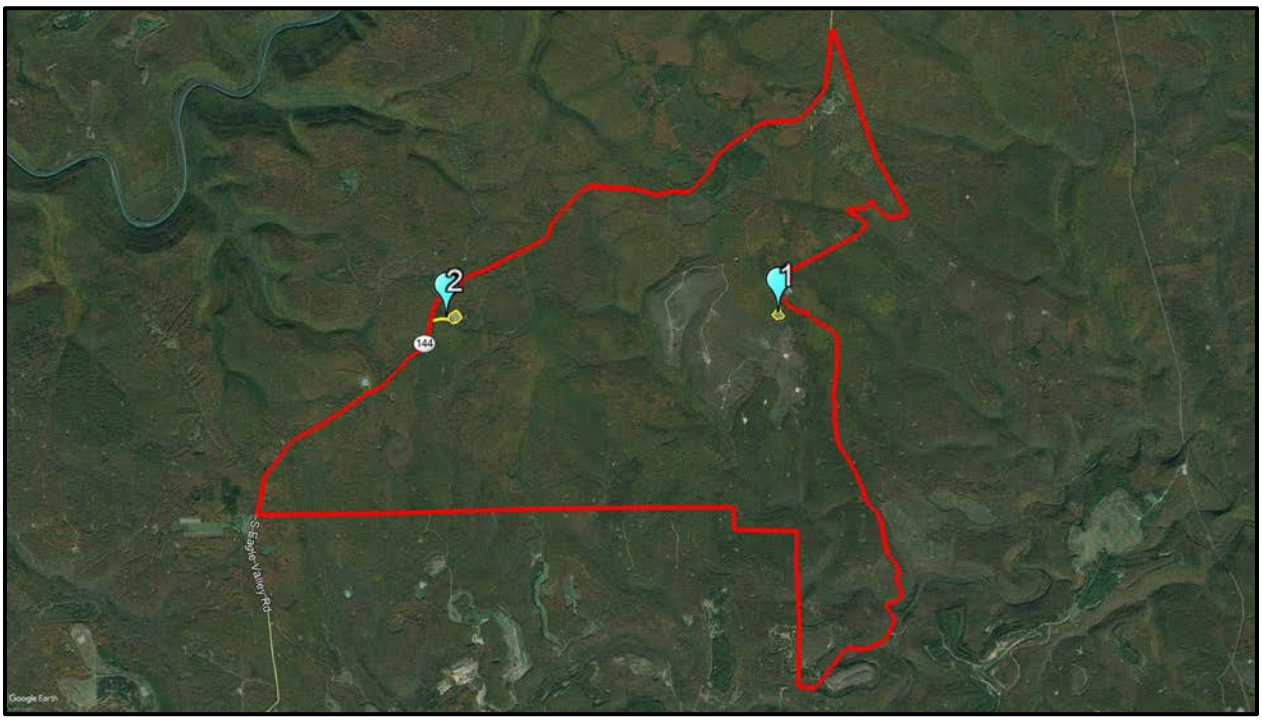
CONCLUSION

The PA Wilds is a large forested area that is known for its recreational and scenic beauty. The area has significant natural resources that are used for lumber production, as well as forest recreational uses. A large portion of it is owned by the Commonwealth of Pennsylvania under the Bureau of Forestry, Bureau of State Parks and State Gamelands.

In recent years, another natural resource has been developed; Marcellus Shale is generating considerable revenues within the region.

LWCF Area #1 Property Data

The location and size of the LWCF areas are based on GIS information provided by the PA DCNR. Locations for conversion areas #1 and #2 are identified by the blue tags.



©Google Earth 2018

LWCF Area #1 Map

Sproul State Forest District

LWCF Area Acreage

LWCF Area #1 is located within the 305,450 acre District 10 - Sproul State Forest. LWCF Area #1 is 10,241.03 Acres.

Use History

The property has been owned by the Commonwealth of PA for many decades. The Bureau of Forestry is charged with managing the State Forests for two primary reasons.

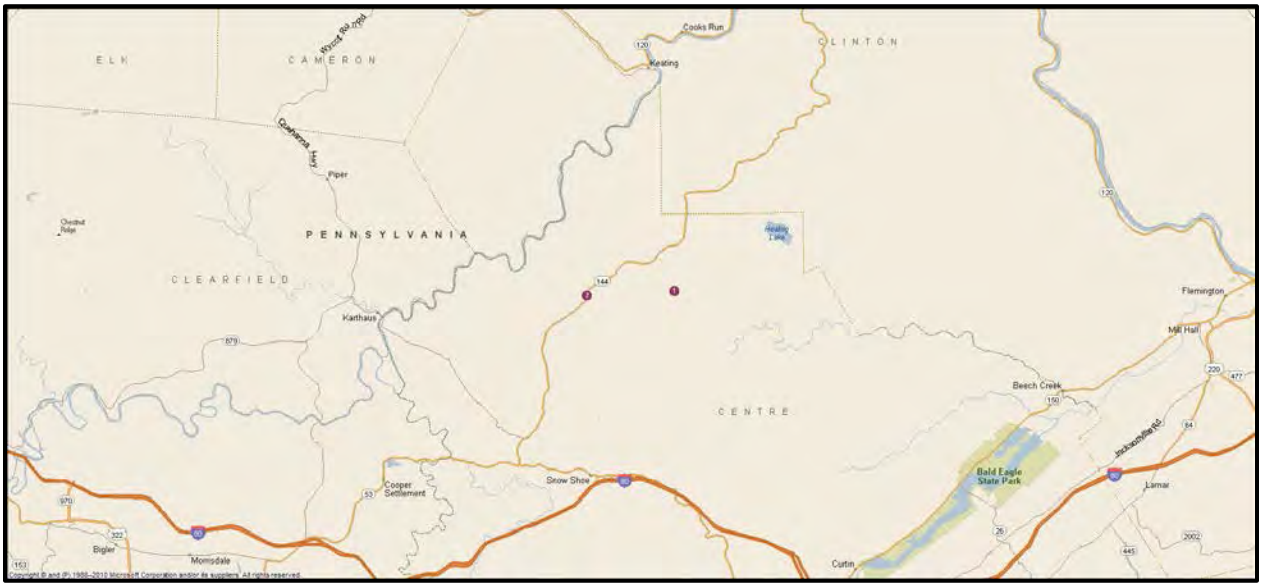
The first is forest recreation. Forest recreation is one of the most common ways that people connect with and enjoy the state forest. The state forest system provides bountiful opportunities for citizens to recreate and enjoy the forest.

The second use, Management of state forests, is guided by Penn's Woods, the bureau's strategic plan, and the State Forest Resource Management Plan. The district staff promotes wild plant conservation and private forest land conservation and stewardship.

The area has had unconventional gas well drilling into the Marcellus Shale between within the last decade. This use has caused a land use from forested recreation to well pads, impoundment areas, compressor stations and transmission pipelines.

Location

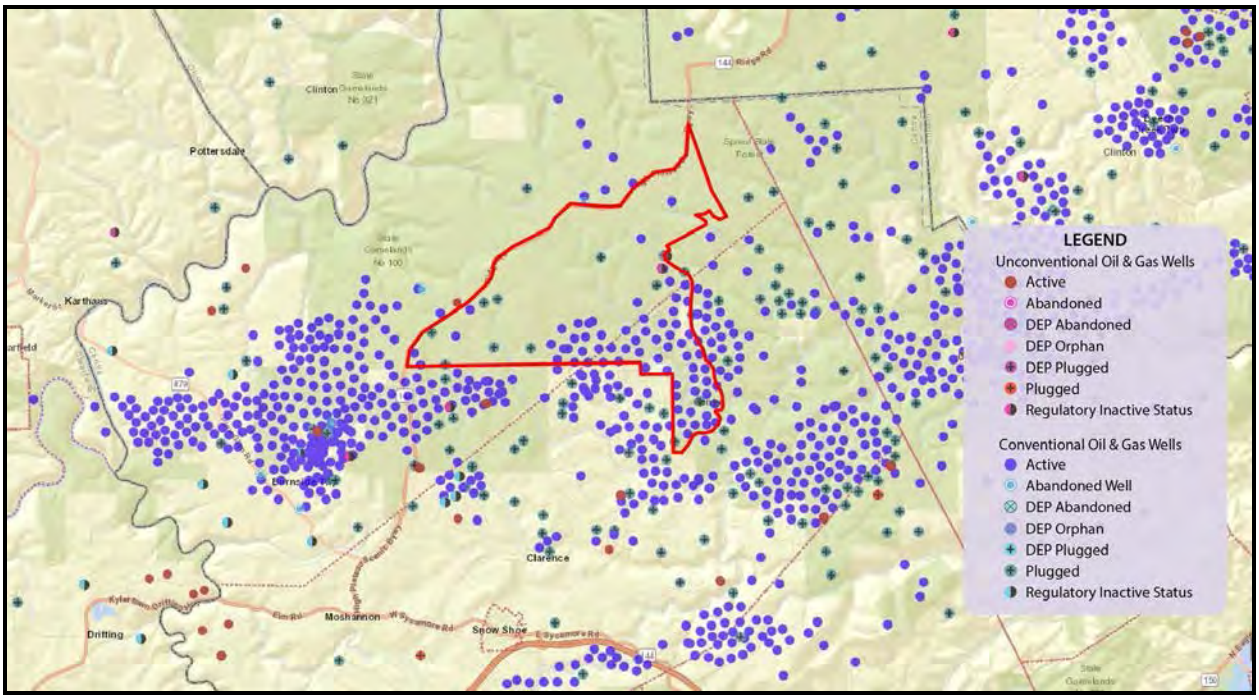
LWCF Area #1 is located in the northern portion of Centre County, in Burnside and Snow Shoe Townships. The area is approximately 8 miles north of Snow Shoe and 15 miles north of Bellefonte (Centre County Seat).



Environmental

The scope of this appraisal does not include any environmental audits or testing for hazardous materials. No apparent environmental concerns were noted. However, as in the case of all real estate, the owners of the subject property are advised to have a complete understanding of the environmental issues surrounding the subject site. As such, a Phase I environmental audit is recommended.

Gas Wells in Proximity to LWCF Area



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Conversion Site #1 – 259 Pad B

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Simon P. Wolverton et al
Deed Reference #:	79-510 (Addendum A)
Date of Recording and Purchase:	April 10, 1900
Purchase Price:	Not Stated
Deeded Acreage:	29 Tracts

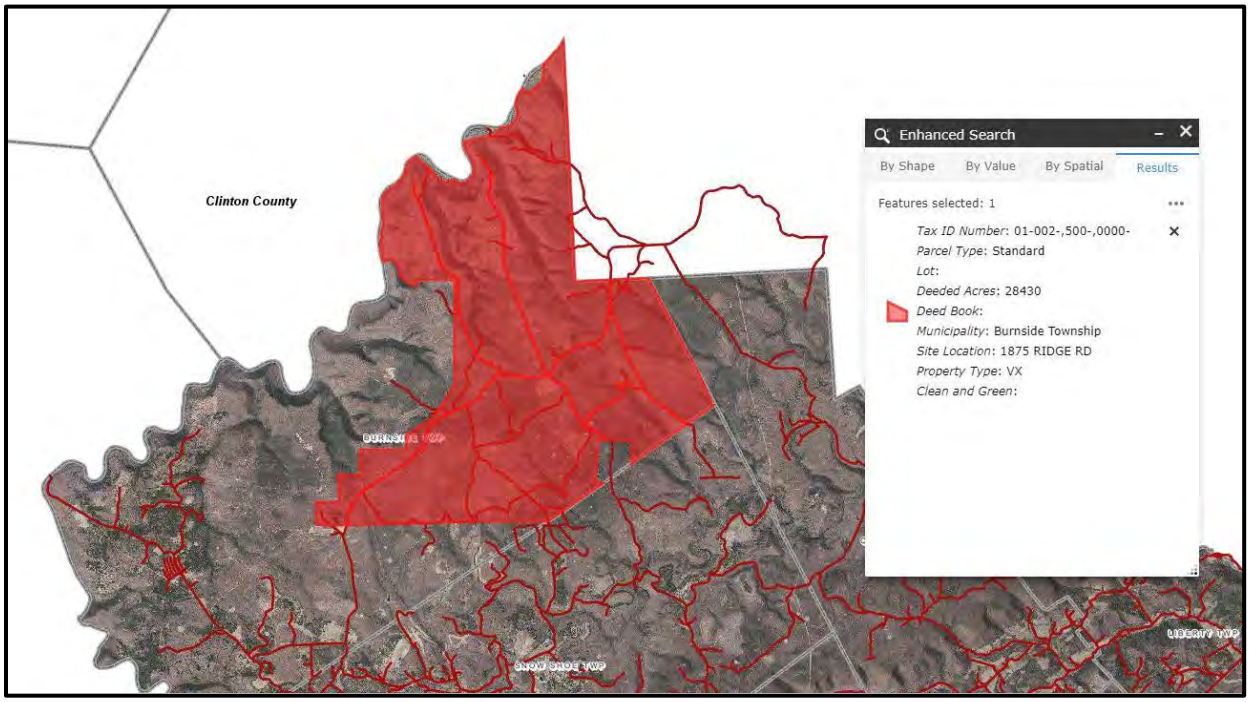
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #1 is a part of the following tax parcel.

Tax Assessment Identification:	01-002-,500-,0000-
Tax Assessment Ownership:	Commonwealth of Penna
Tax Assessment Acreage:	28,430
Market Value Tax Assessment:	$40,370,638
Act 319 Assessment:	Yes ($1,837,230)
Common Level Ratio:	3.62
Indicated Market Value:	$6,650,773
Millage Rate:	65.82
Annual Market Value Taxes:	$2,657,195
Annual Act 319 Taxes:	$437,754



Tax Parcel Map - Centre County GIS

Acreage

The acreage amount of this site is assumed to be 3.88 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

©Google Earth 2018

Photo Key Map

#1 Access looking southeast

Conversion Site #1 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

#2 Well Pad looking southwest

Conversion Site #1 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

#3 Well Pad looking west

Conversion Site #1 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

#4 Well Heads looking northwest

Conversion Site #1 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

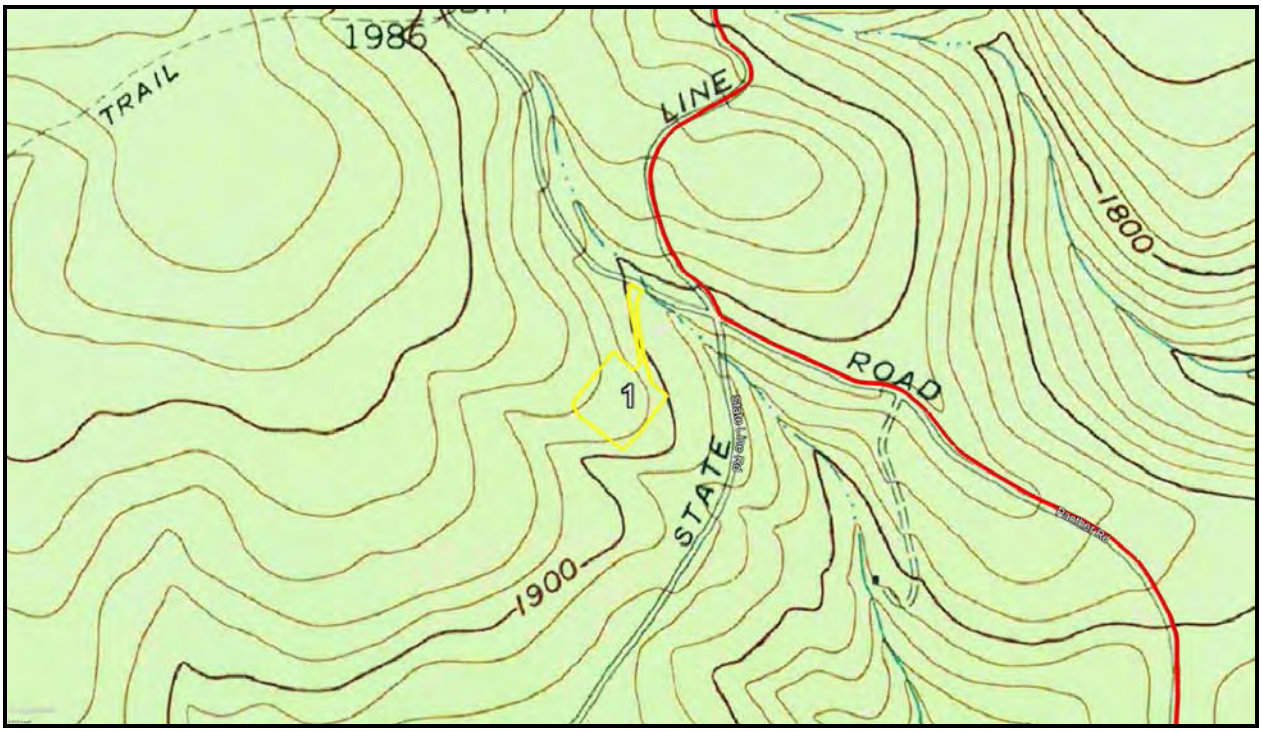
#5 Conventional Well looking southeast

Conversion Site #1 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

#6 Surrounding woodland looking north

Conversion Site #1 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

Overall Surrounding Topography: Gentle slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of a horizontal well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

Conversion Site #1 is located in Burnside Township, Centre County, on Panther Road just north of State Line Road. It is approximately 1.5 miles south SR 144 (Ridge Road). Post office is Clarence, PA 16829.

Rental History

No rental – managed by the Bureau of Forestry.

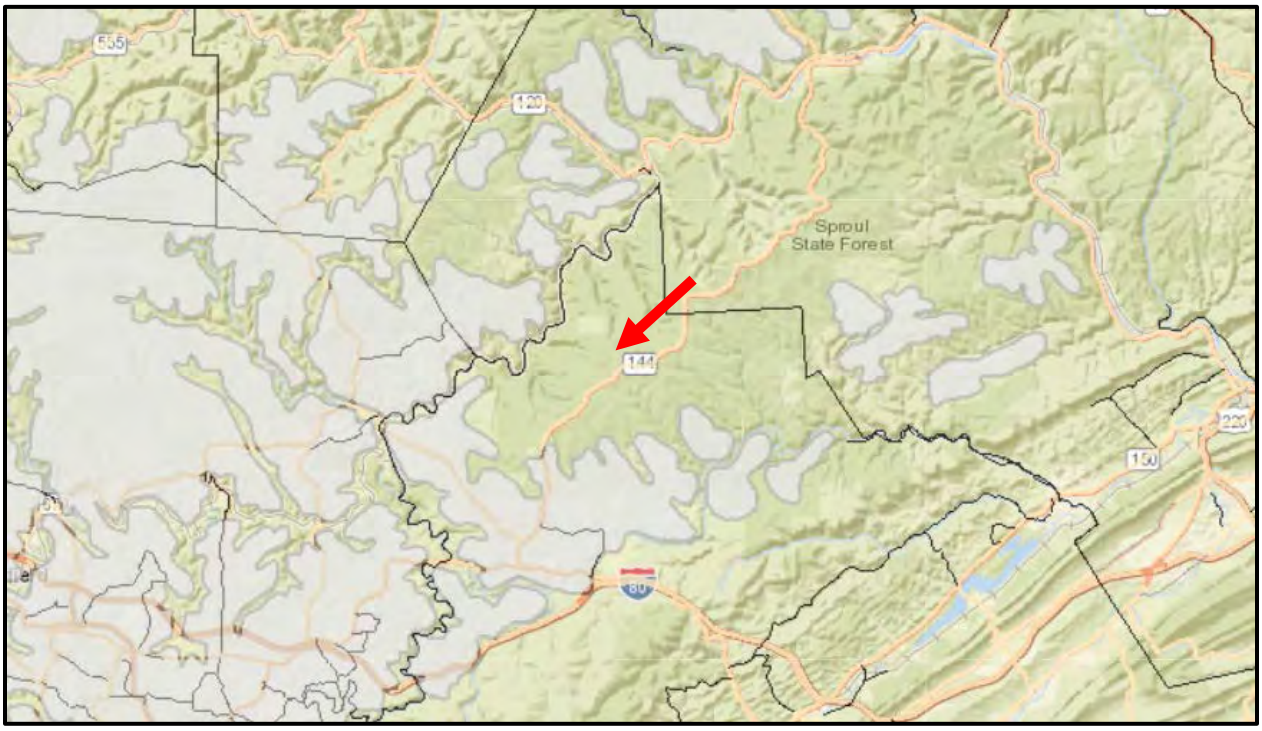
Flood Map Information

The subject is located on FEMA map 42027C0070F (map date 5/4/2009). 100% is located in Flood Zone X.

©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

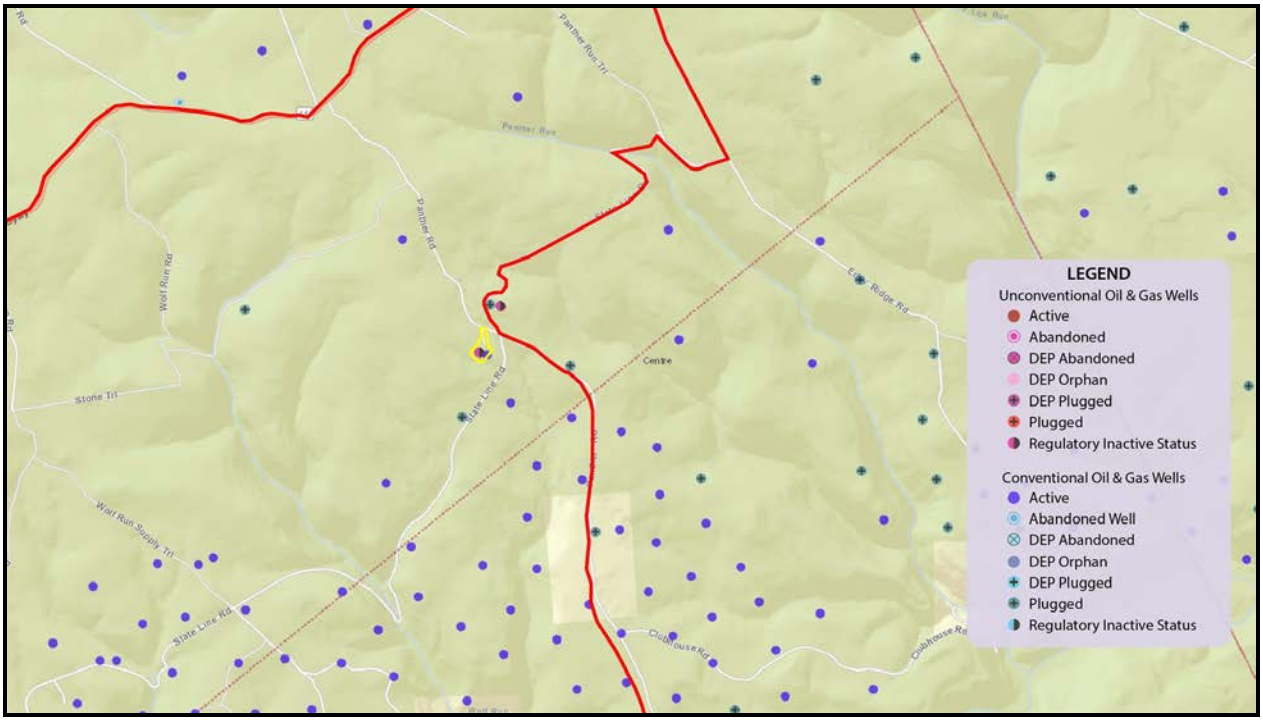
Coal: Owned by landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to ALTA Resources, LLC (Buel H. Ness is original lessee – Contract #M-110259-10)

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 2 active wells. The site also has well heads, conveyance piping, gas processing units, and condensate and brine storage tanks. Additionally, there is one conventional well southeast of the conversion site. The site was converted on October 2009.



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning

Burnside Township has no zoning. Subject complies with Centre County Subdivision and Land Development Ordinance.

Easements

Unrecorded highway ROW's.

Conversion Site #2 – 706 Pad 10

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	City of Philadelphia
Deed Reference #:	143-523 (Addendum A)
Date of Recording and Purchase:	December 26, 1930
Purchase Price:	$3,401.29
Deeded Acreage:	1,133.00 Acres

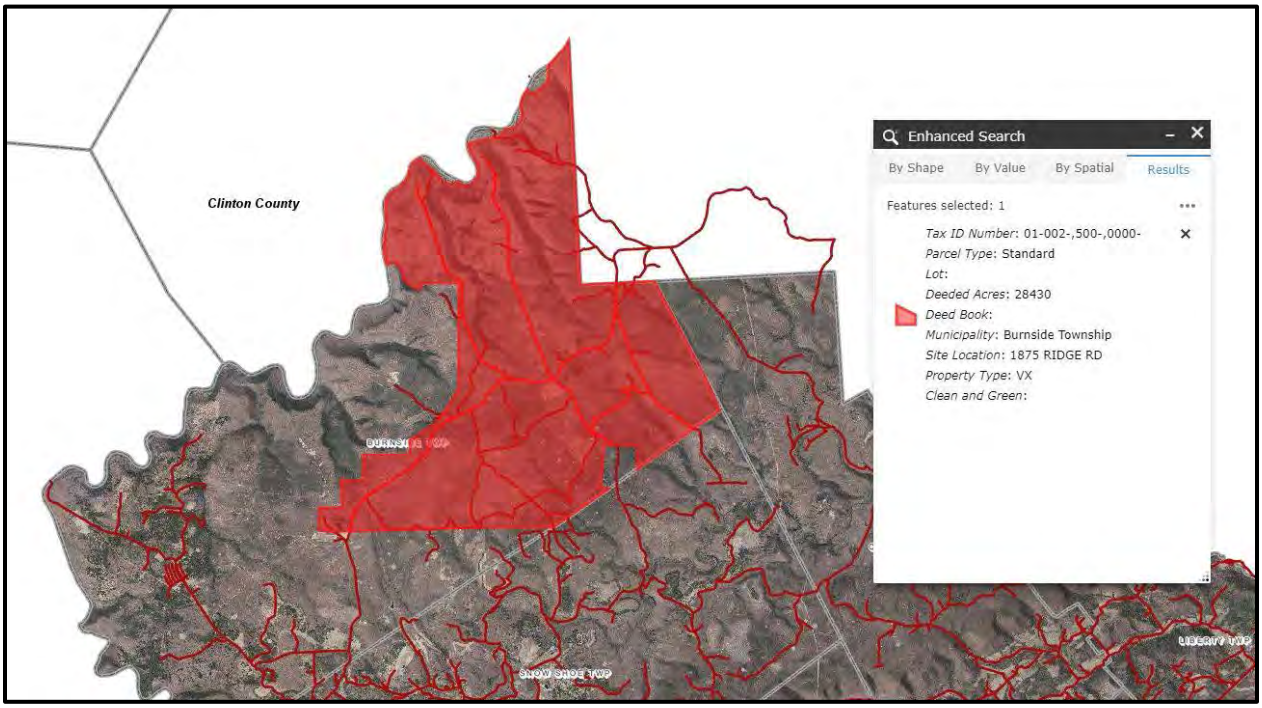
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer was not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #2 is a part of the following tax parcel.

Tax Assessment Identification:	01-002-,500-,0000-
Tax Assessment Ownership:	Commonwealth of Penna
Tax Assessment Acreage:	28,430
Market Value Tax Assessment:	$11,152,110
Act 319 Assessment:	Yes ($1,837,230)
Common Level Ratio:	3.62
Indicated Market Value:	$40,370,638
Millage Rate:	65.82
Annual Market Value Taxes:	$2,657,195
Annual Act 319 Taxes:	$437,754



Tax Parcel Map - Centre County GIS

Acreage

The site acreage is assumed to be 8.07 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

No well was drilled and the site is in the process of being reclaimed.

Photo Key Map

©Google Earth 2018

#1 Road Access looking east

Conversion Site #2 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2118

#2 Surrounding Woodland looking northwest

Conversion Site #2 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2118

#3 Reclaimed Pad Site looking northeast

Conversion Site #2 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2118

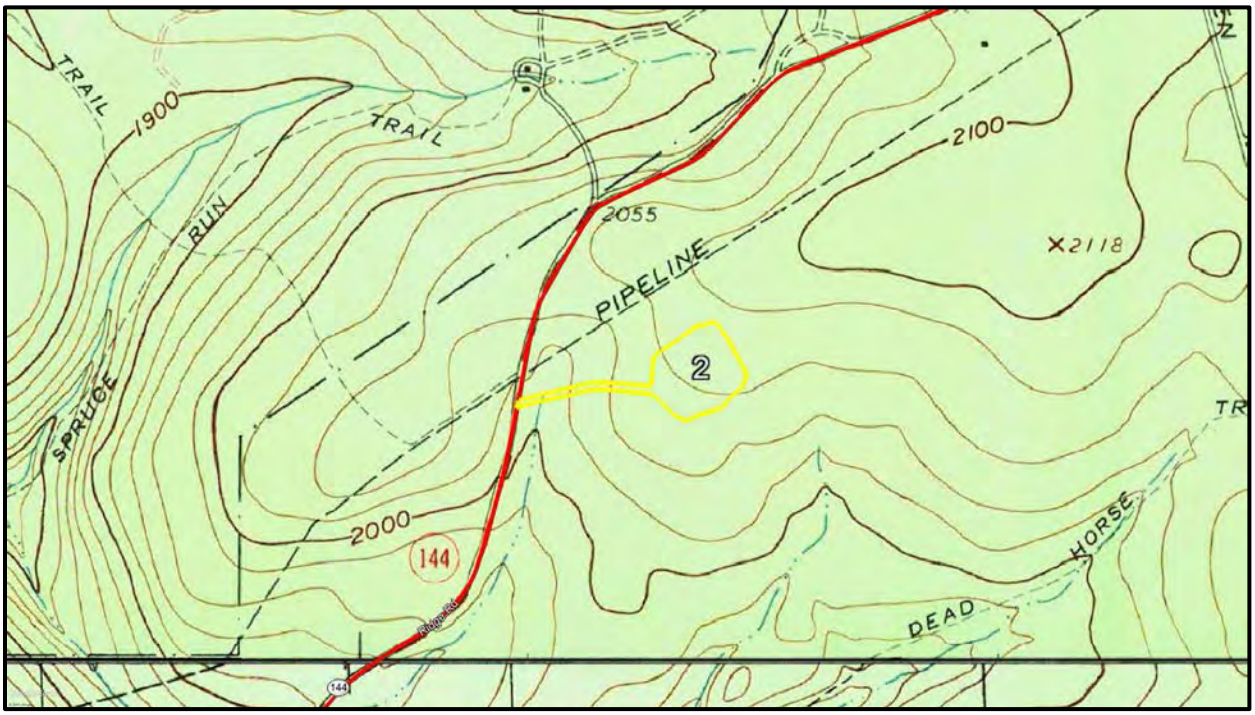
#4 Reclaimed Pad Site looking southeast

Conversion Site #2 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2118

#5 Reclaimed Pad Site looking northwest

Conversion Site #2 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2118

Overall Surrounding Topography: Gentle slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

None – The property is being reclaimed as an herbaceous wildlife opening.

Location

Conversion Site #2 is located in Burnside Township, Centre County, on Ridge Road approximately 0.7 miles southwest of Sand Road. The Post Office is Clarence, PA 16829.

Rental History

No rental – managed by the Bureau of Forestry.

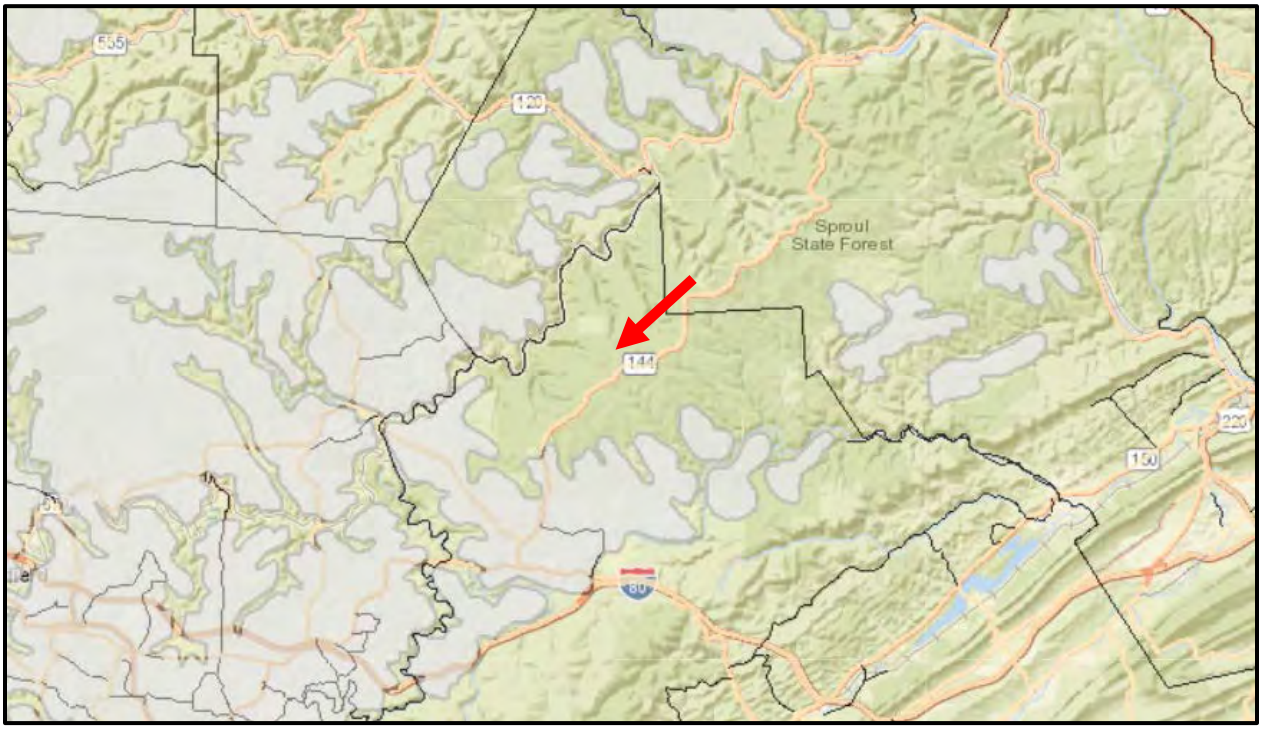
Flood Map Information

The subject is located on FEMA map 42027C0065F (map date 5/4/2009). 100% is located in Flood Zone X.

©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

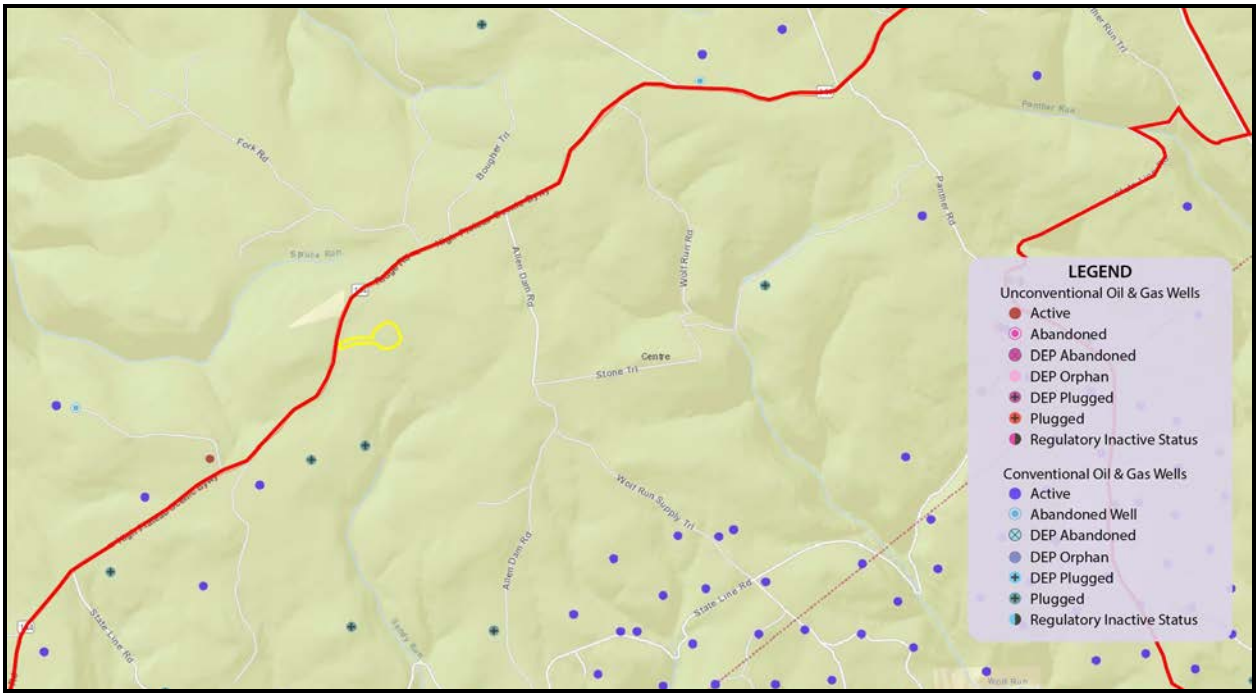
Coal: The PA Mine Map indicates there are no known coal fields in this area



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to EXCO Resources, Inc. (Texaco, Inc. is original lessee – Contract #M-110706-10 which covers 2,760 acres of Sproul State Forest).

Oil & Gas Development: The conversion site has been excavated to prepare for drilling of an unconventional well site. The site was not further developed and has been reclaimed as an herbaceous wildlife opening. The site was converted in June 2010.



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning

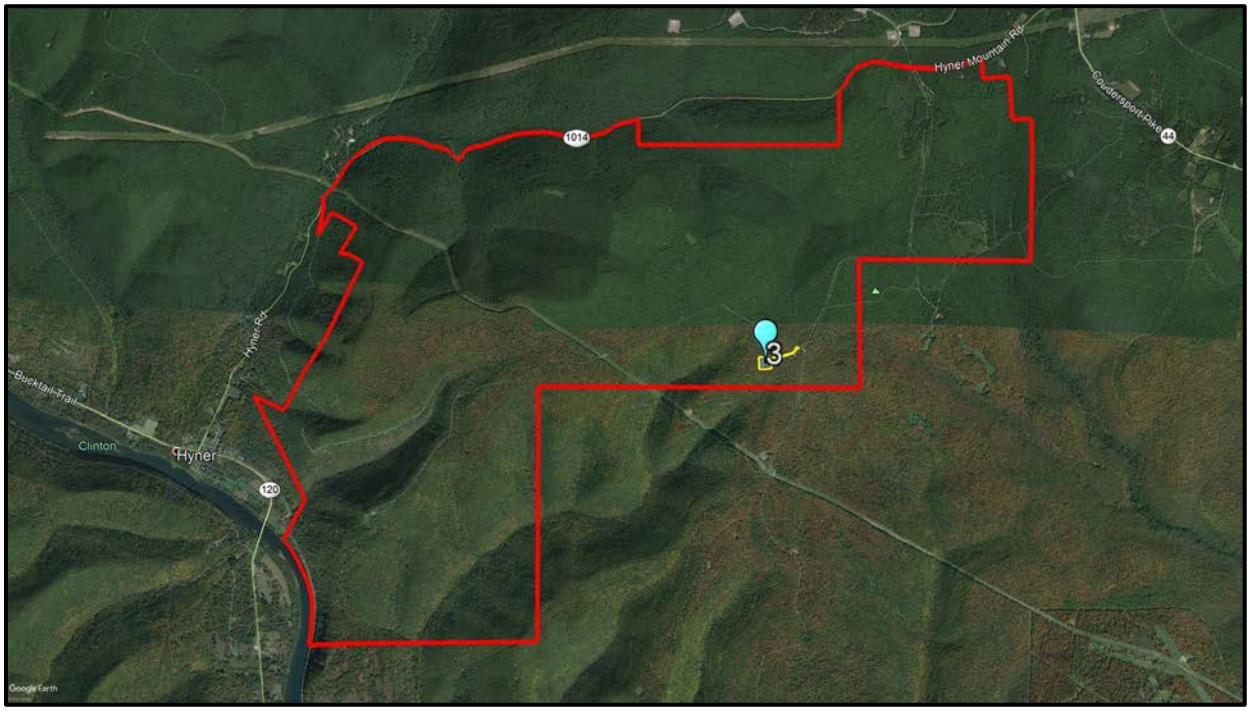
Burnside Township has no zoning. Subject complies with Centre County Subdivision and Land Development Ordinance.

Easements

Unrecorded highway ROW's.

LWCF Area #2 Property Data

The location and size of the LWCF areas are based on GIS information provided by the PA DCNR. Location for conversion area #3 is identified by the blue tag.



©Google Earth 2018

LWCF Area #2 Map

Sproul State Forest Map

LWCF Area Acreage

LWCF Area #2 is located within the 305,450 acre District 10 - Sproul State Forest. The LWCF Area #2 is 5,416.91 Acres.

Use History

The property has been owned by the Commonwealth of PA for many decades. The Bureau of Forestry is charged with managing the State Forests for two primary reasons.

The first is forest recreation. Forest recreation is one of the most common ways that people connect with and enjoy the state forest. The state forest system provides opportunities for citizens to recreate and enjoy the forest.

The second use, Management of state forests, is guided by Penn's Woods, the bureau's strategic plan, and the State Forest Resource Management Plan. The district staff promotes wild plant conservation and private forest land conservation and stewardship.

The area has had unconventional gas well drilling into the Marcellus Shale between 2013 and 2015. This use has caused a land use from forested recreation to well pads, impoundment areas, compressor stations and transmission pipelines.

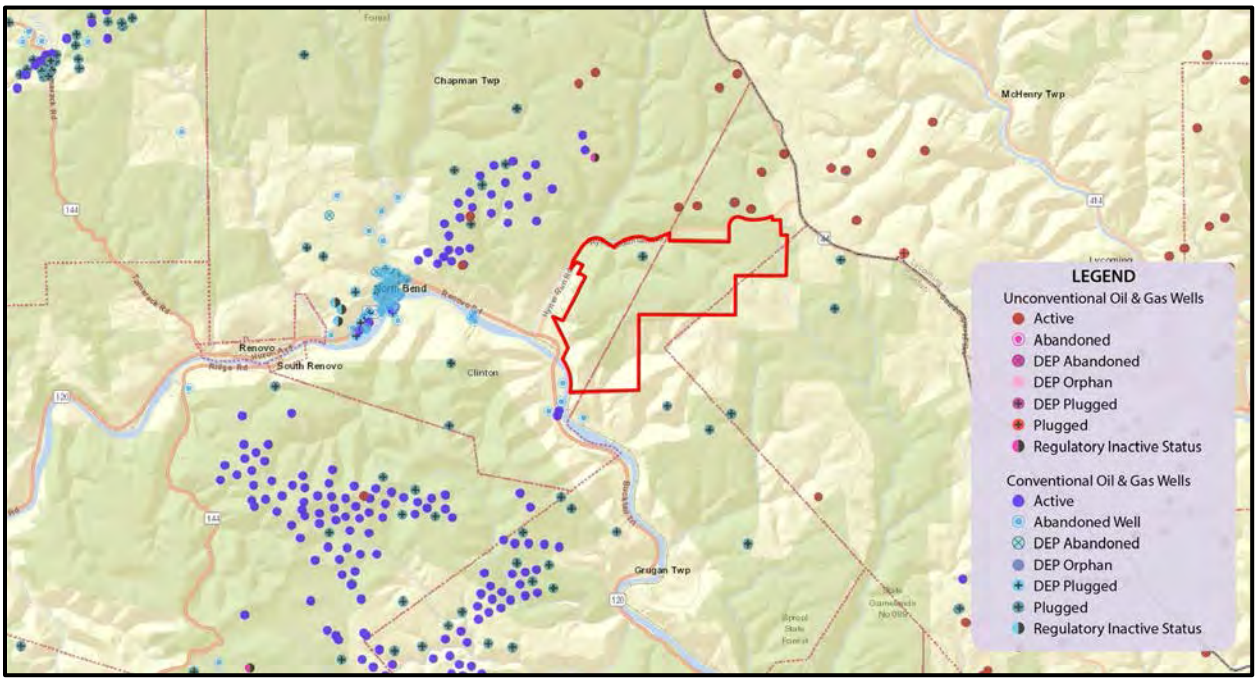
Location

LWCF Area #2 is located in the northern portion of Clinton County, in Chapman, Gallagher and Grugan Townships. The area is approximately 16 miles north of Lock Haven (Clinton County Seat).

Environmental

The scope of this appraisal does not include any environmental audits or testing for hazardous materials. No apparent environmental concerns were noted. However, as in the case of all real estate, the owners of the subject property are advised to have a complete understanding of the environmental issues surrounding the subject site. As such, a Phase I environmental audit is recommended.

Gas Wells in Proximity to LWCF Area



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Conversion Site #3 – 284 Pad A

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Martha M. Brown et al
Deed Reference #:	108-687 (Addendum A)
Date of Recording and Purchase:	October 19, 1928
Purchase Price:	$55,901.07
Deeded Acreage:	31 tracts

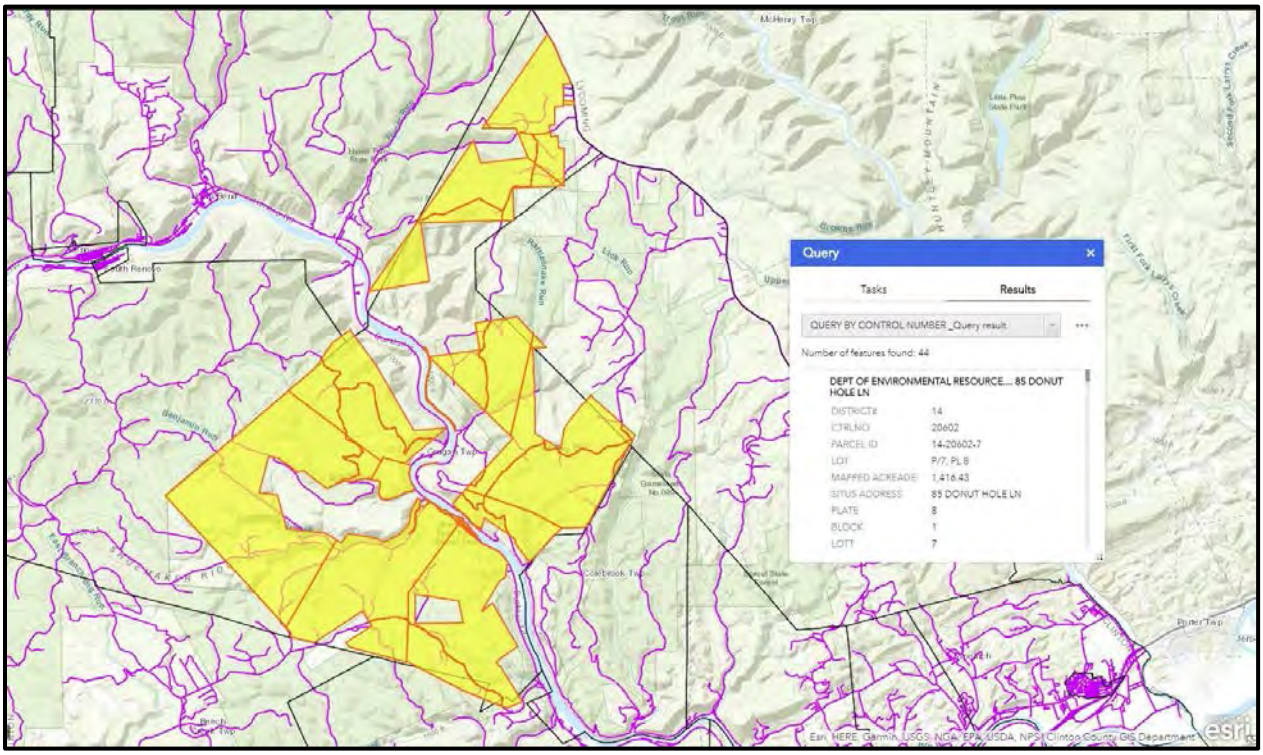
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #3 is a part of the following tax parcel.

Tax Assessment Identification:	14-20602-4
Tax Assessment Ownership:	Department of Environmental Resources
Tax Assessment Acreage:	24,111
Market Value Tax Assessment:	$19,288,800
Act 319 Assessment:	No
Common Level Ratio:	1.13
Indicated Market Value:	$21,796,344
Millage Rate:	.01966
Annual Market Value Taxes:	$428,516
Annual Act 319 Taxes:	None



Tax Parcel Map - Clinton County GIS

Acreage

The acreage amount of this site is assumed to be 4.44 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

No well was drilled.

Photo Key Map

©Google Earth 2018

#1 Access looking southwest

Conversion Site #3 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

#2 Access looking northeast

Conversion Site #3 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

#3 Pad Site looking northeast

Conversion Site #3 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

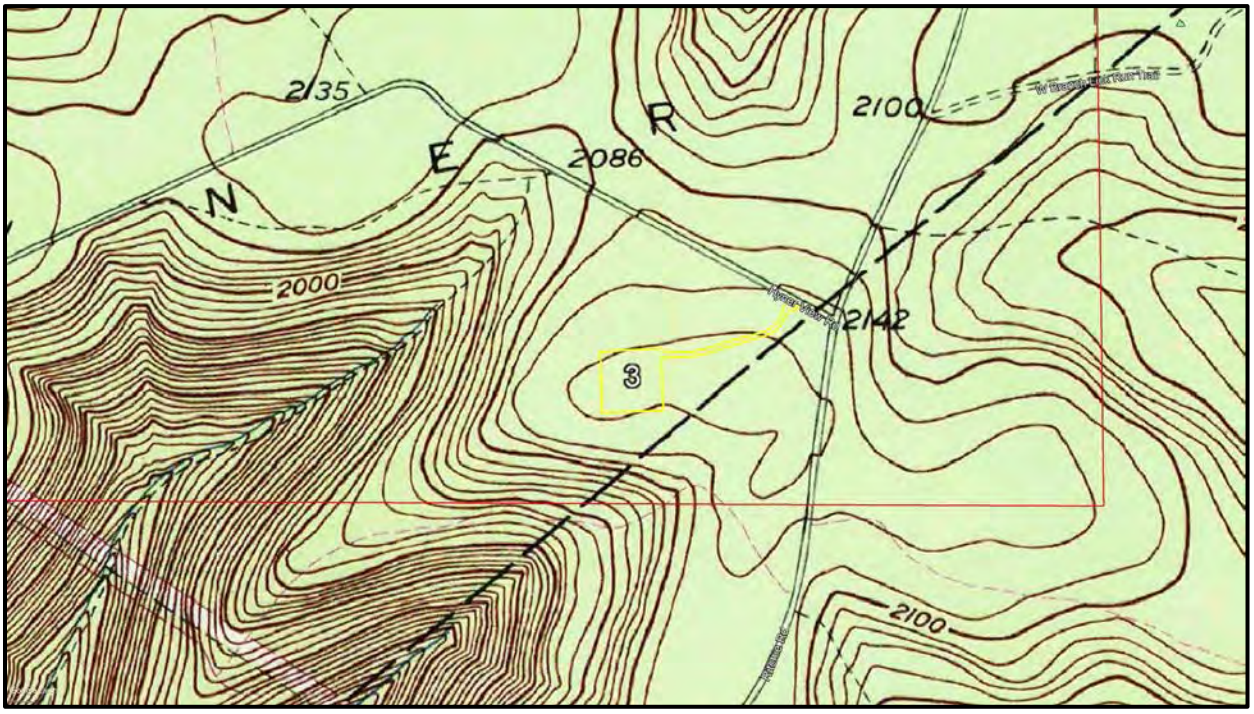
#4 Pad Site looking southwest

Conversion Site #3 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

#5 Surrounding Woodland looking southwest

Conversion Site #3 – Sproul State Forest, PA
Photo by Gregory L. Snyder 8/22/2018

Overall Surrounding Topography: Gentle slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

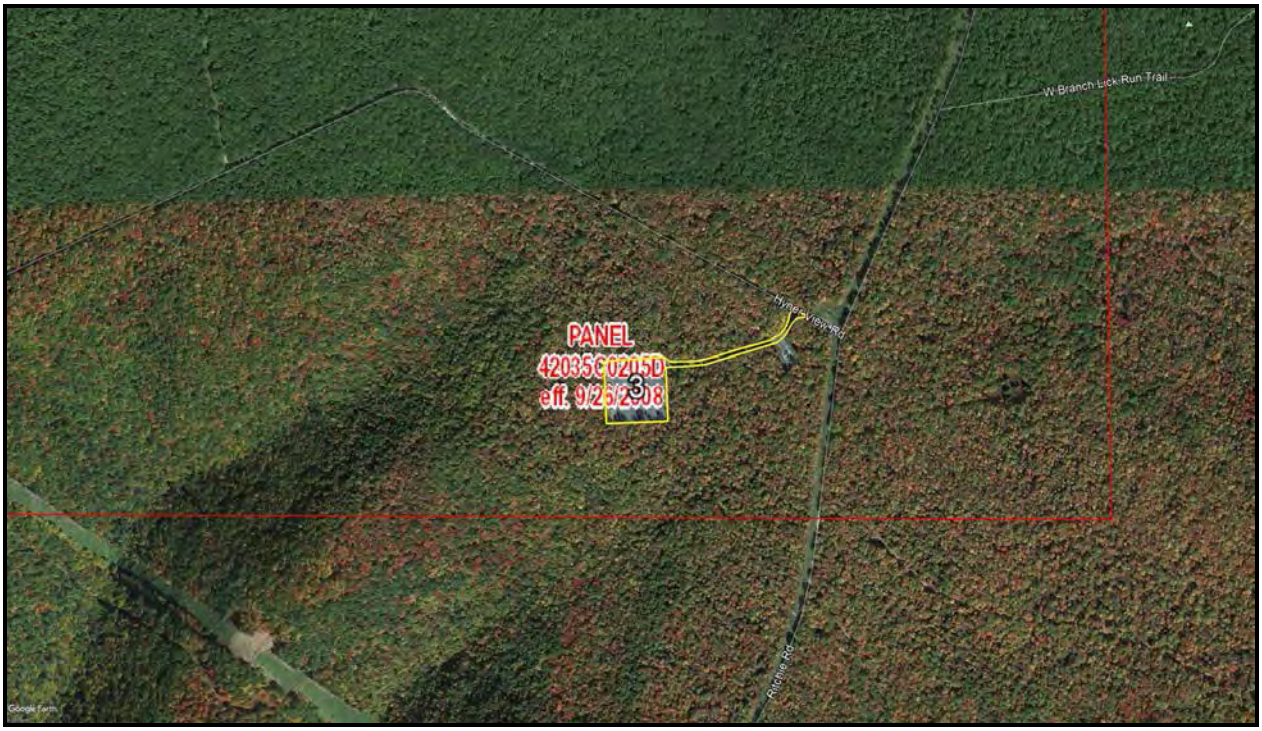
Conversion Site #3 is located in Girard Township, Clinton County, on Hyner View Road, west of Ritchie Road. It is approximately 3.5 miles east of SR 120. Post Office is Lock Haven, PA 17745.

Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

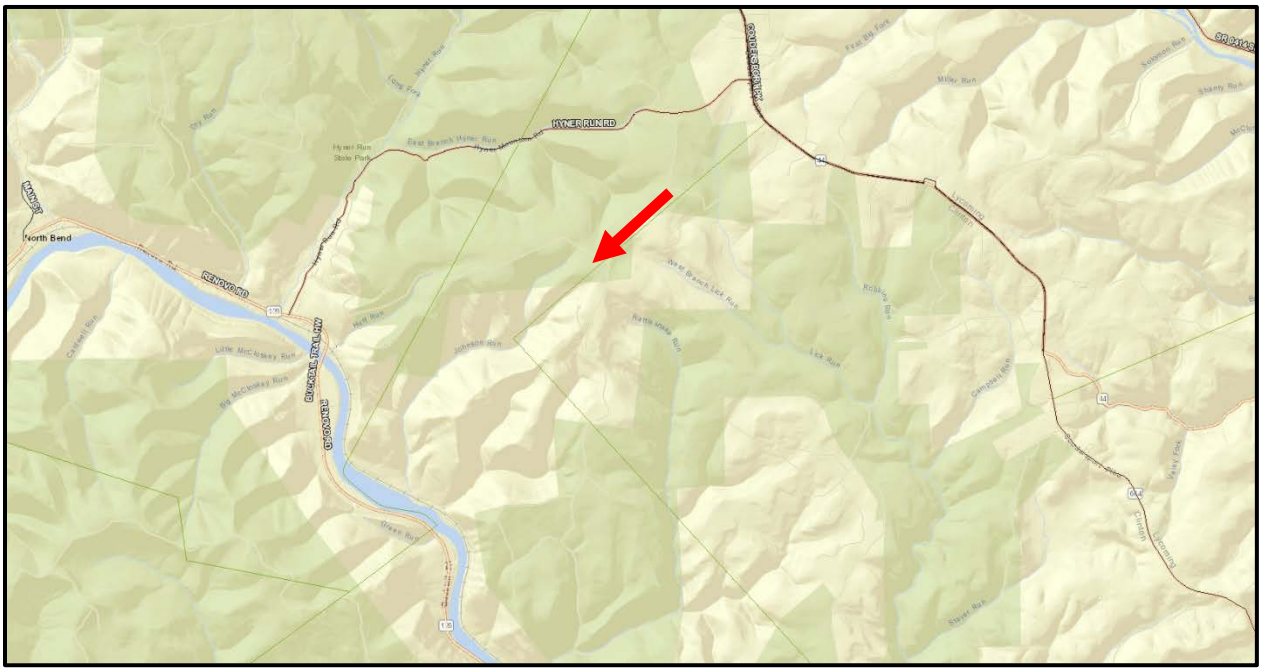
The subject is located on FEMA map 42035C0205D (map date 9/26/2008). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

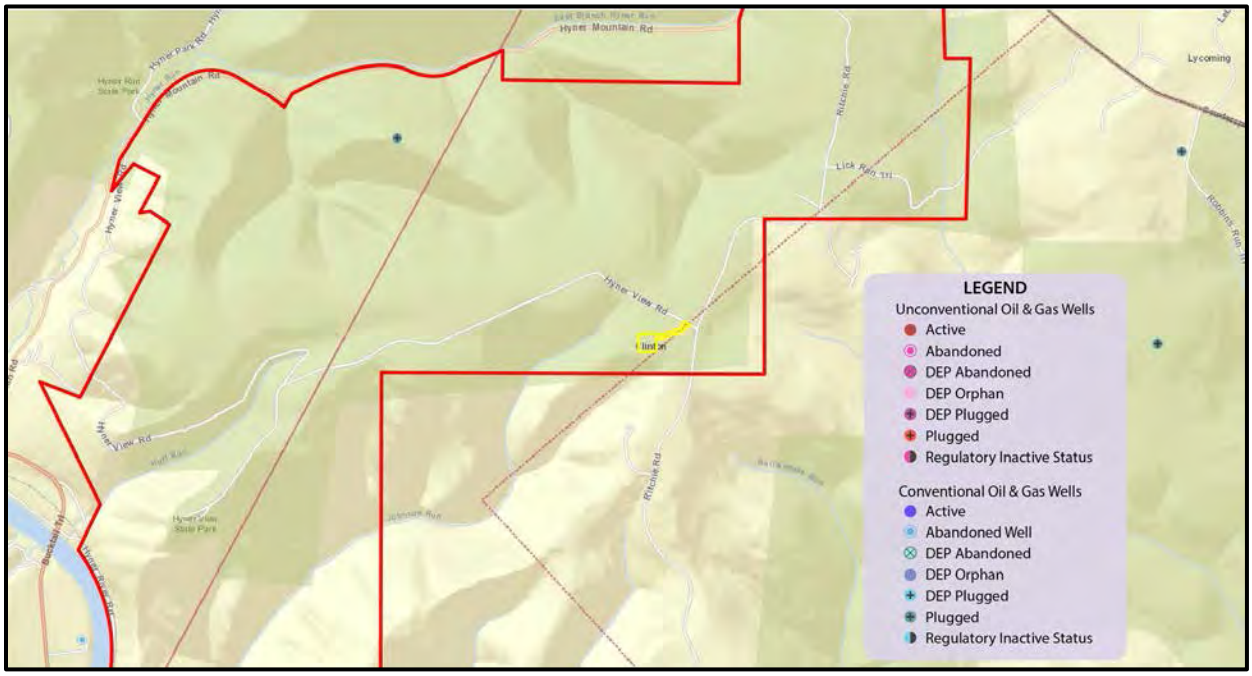
Coal: According to PA Mine Maps, no coal fields are known to exist in this area



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to AEP Energy. (Texaco, Inc. is original lessee – Contract #M-110284-10 which covers 2,059 acres of Sproul State Forest).

Oil & Gas Development: The conversion site has been excavated to prepare for drilling of an unconventional well site. The site was converted in November 2014.



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: Rural Forest District in accordance with the Clinton County Zoning Ordinance as adopted by Grugan Township. Natural gas development is permitteded. Subject complies with Clinton County Subdivision and Land Development Ordinance.

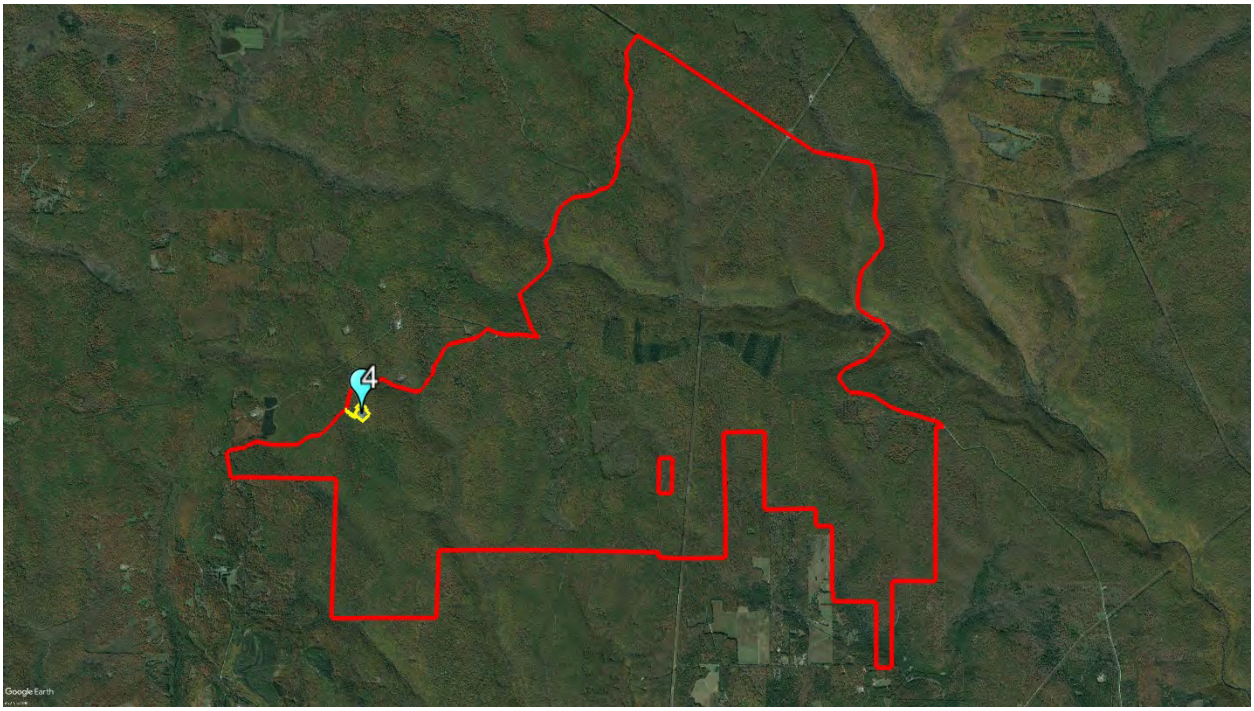
A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

LWCF Area #3 Property Data

The location and size of the LWCF areas are based on GIS information provided by the PA DCNR. Location for Conversion Area #4 is identified by the blue tag.



©Google Earth 2018

LWCF Area #3 Map

Moshannon State Forest Map

LWCF Area Acreage

LWCF Area #3 is located within the 190,031 acre District 9 - Moshannon State Forest. The LWCF Area #3 is 7,366.14 Acres.

Use History

The property has been owned by the Commonwealth of PA for many decades. The Bureau of Forestry is charged with managing the State Forests for two primary reasons.

The first is forest recreation. Forest recreation is one of the most common ways that people connect with and enjoy the state forest. The state forest system provides bountiful opportunities for citizens to recreate and enjoy the forest.

The second use, Management of state forests, is guided by Penn's Woods, the bureau's strategic plan, and the State Forest Resource Management Plan. The district staff promotes wild plant conservation and private forest land conservation and stewardship.

The area has had unconventional gas well drilling into the Marcellus Shale within the last decade. This use has caused a land use from forested recreation to well pads, impoundment areas, compressor stations and transmission pipelines.

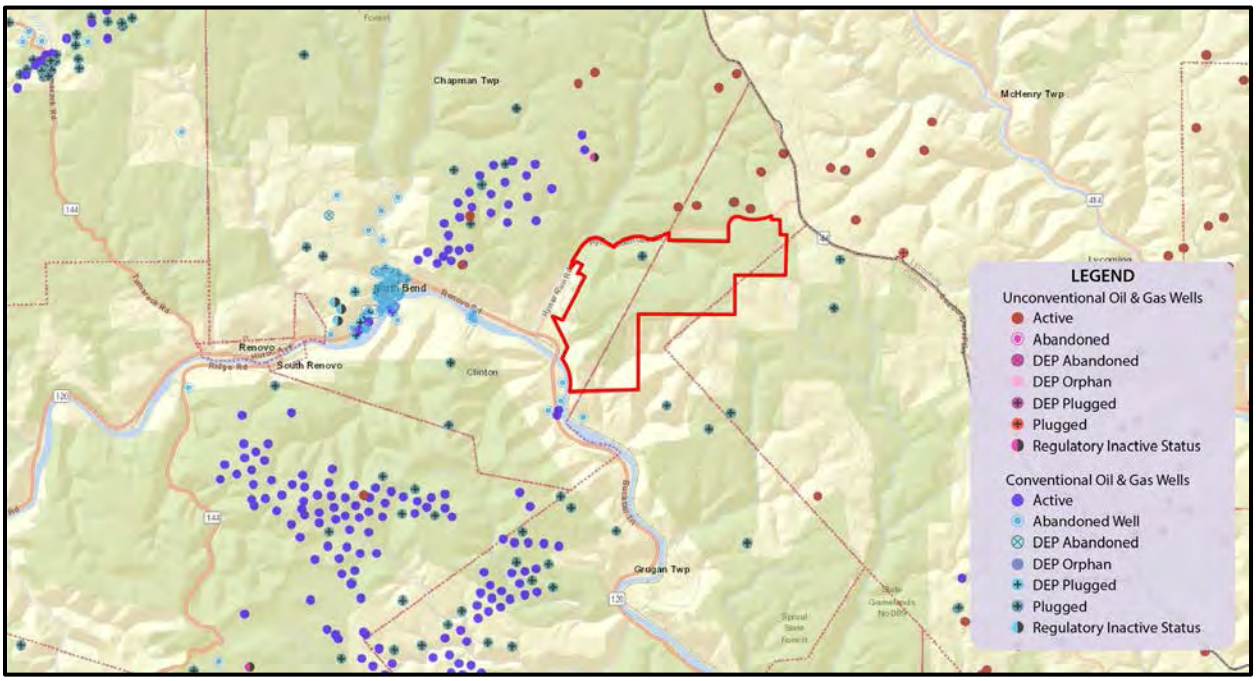
Location

LWCF Area #3 is located in the northern portion of Clearfield County, in Covington and Girard Townships. The area is approximately 11 miles north east of Clearfield (Clearfield County Seat).

Environmental

The scope of this appraisal does not include any environmental audits or testing for hazardous materials. No apparent environmental concerns were noted. However, as in the case of all real estate, the owners of the subject property are advised to have a complete understanding of the environmental issues surrounding the subject site. As such, a Phase I environmental audit is recommended.

Gas Wells in Proximity to LWCF Area



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of LCWF Area #3

Conversion Site #4 – COP 324 A

Legal Description & Sales History

Property is deeded to:	The Commonwealth of Pennsylvania
Previous Owner:	Dents Run Coal Company
Deed Reference #:	171-569 (Addendum A)
Date of Recording and Purchase:	January 7, 1909
Purchase Price:	$9,171
Deeded Acreage:	4,076 Acres

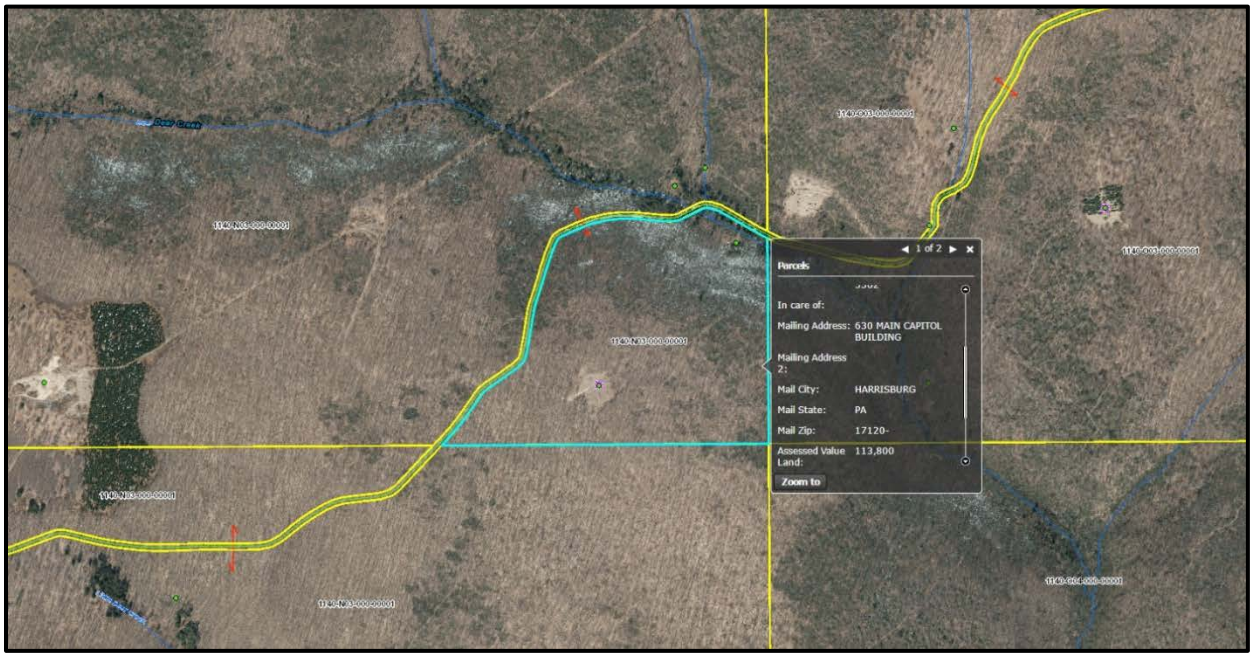
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #4 is a part of the following tax parcel.

Tax Assessment Identification:	1140N0300000001
Tax Assessment Ownership:	Pennsylvania State Forest
Tax Assessment Acreage:	2172.05
Market Value Tax Assessment:	$455,200
Act 319 Assessment:	No
Common Level Ratio:	6.90
Indicated Market Value:	$3,140,880
Millage Rate:	147.64
Annual Market Value Taxes:	$463,720
Annual Act 319 Taxes:	None



Tax Parcel Map - Clearfield County GIS

Acreage

The acreage amount of this site is assumed to be 6.25 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

Photo Key Map

©Google Earth 2018

#1 Access looking southwest

Conversion Site #4 – Moshannon State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

#2 Well Pad looking southwest

Conversion Site #4 – Moshannon State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

#3 Well Pad looking east

Conversion Site #4 – Moshannon State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

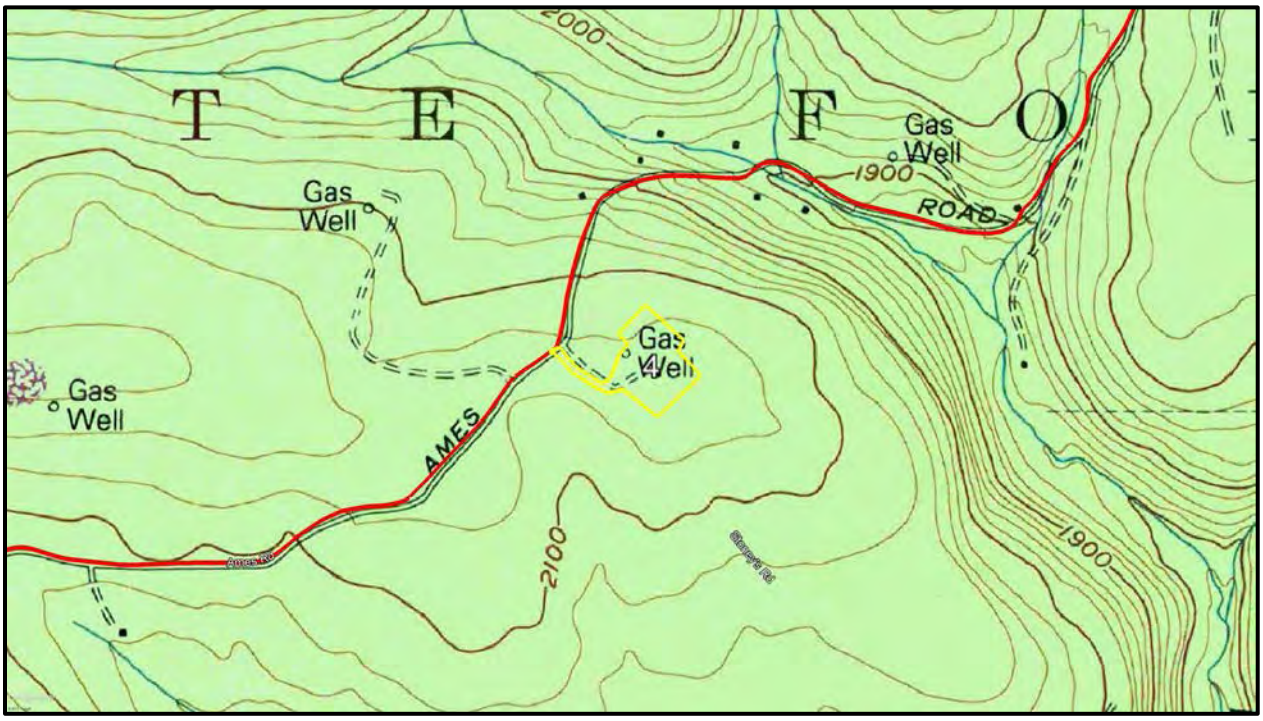
#4 Well Head looking east

Conversion Site #4 – Moshannon State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

#5 Well Pad looking west

Conversion Site #4 – Moshannon State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

Overall Surrounding Topography: Gentle slopes



©Google Earth 2018 & USGS National Map

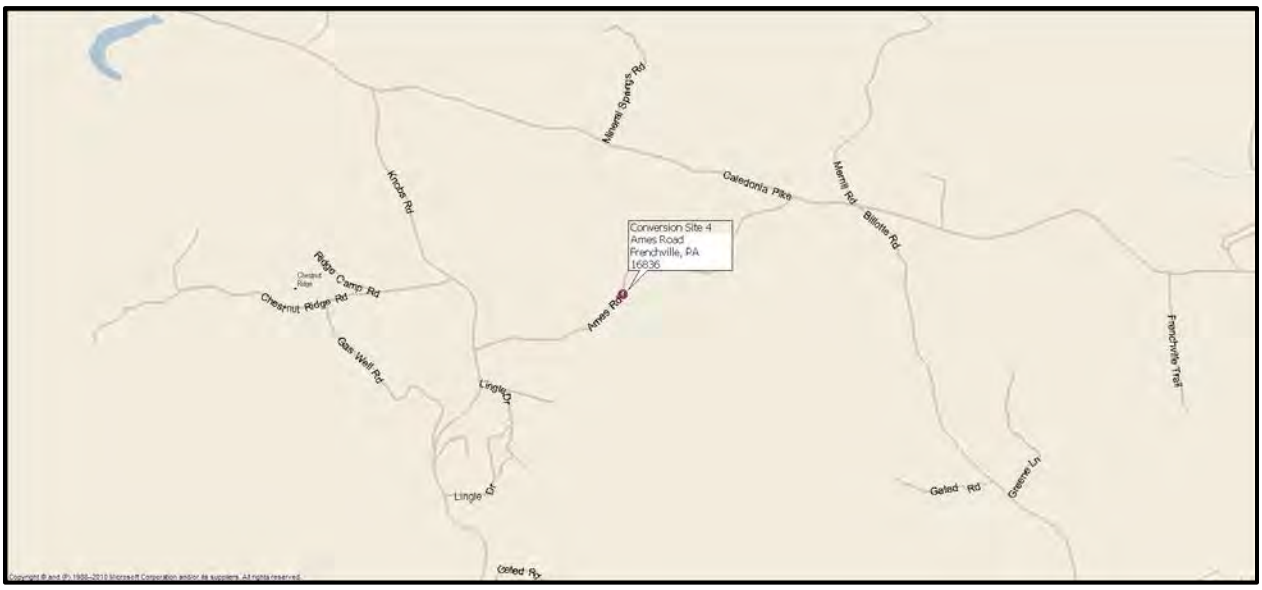
Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

Conversion Site #4 is located in Girard Township, Clearfield County, on Ames Road between Caledonia Pike and Knobs Road. It is approximately 6 miles south SR 879 (Shawville Croft Hwy). Post office is Frenchville, PA 16836.

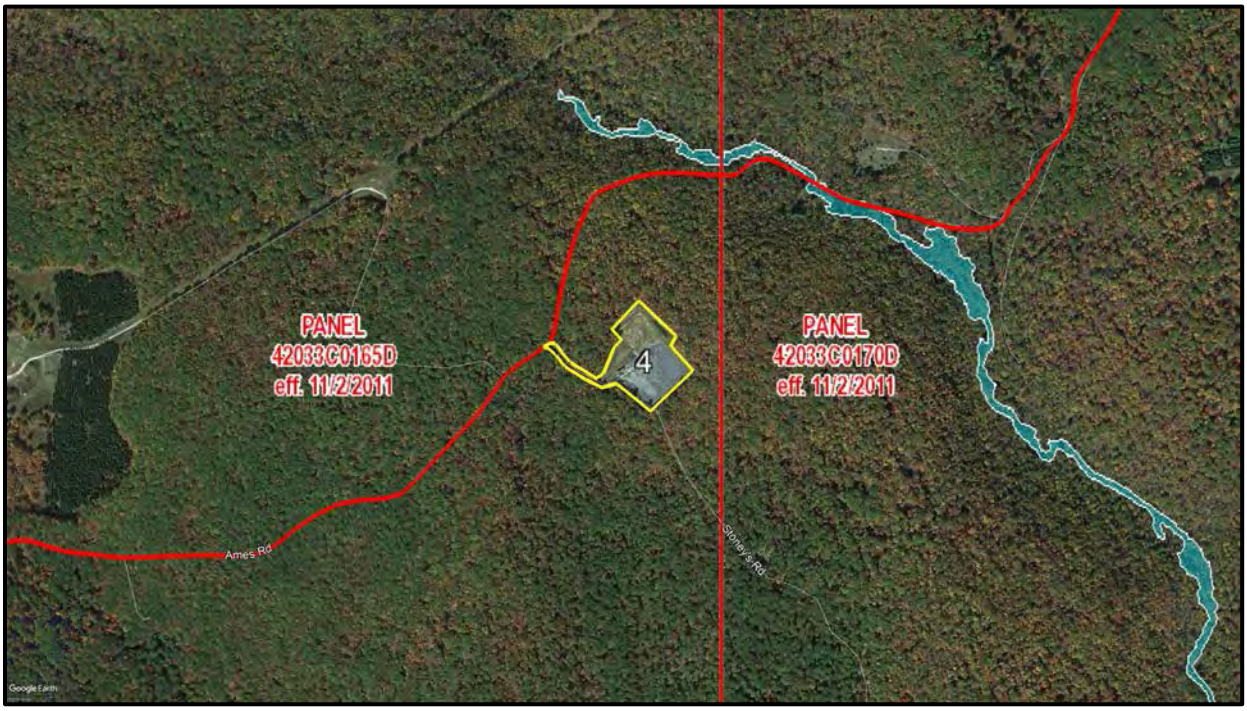


Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

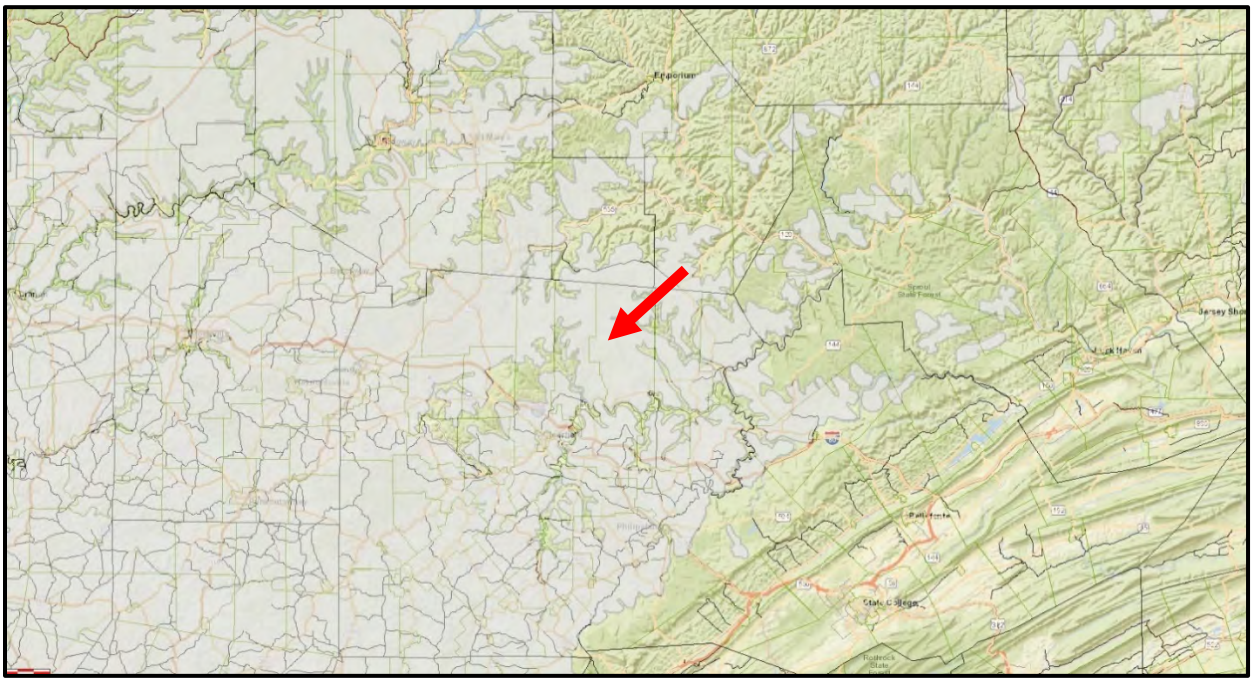
The subject is located on FEMA map 42033C0165D (map date 11/2/2011). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

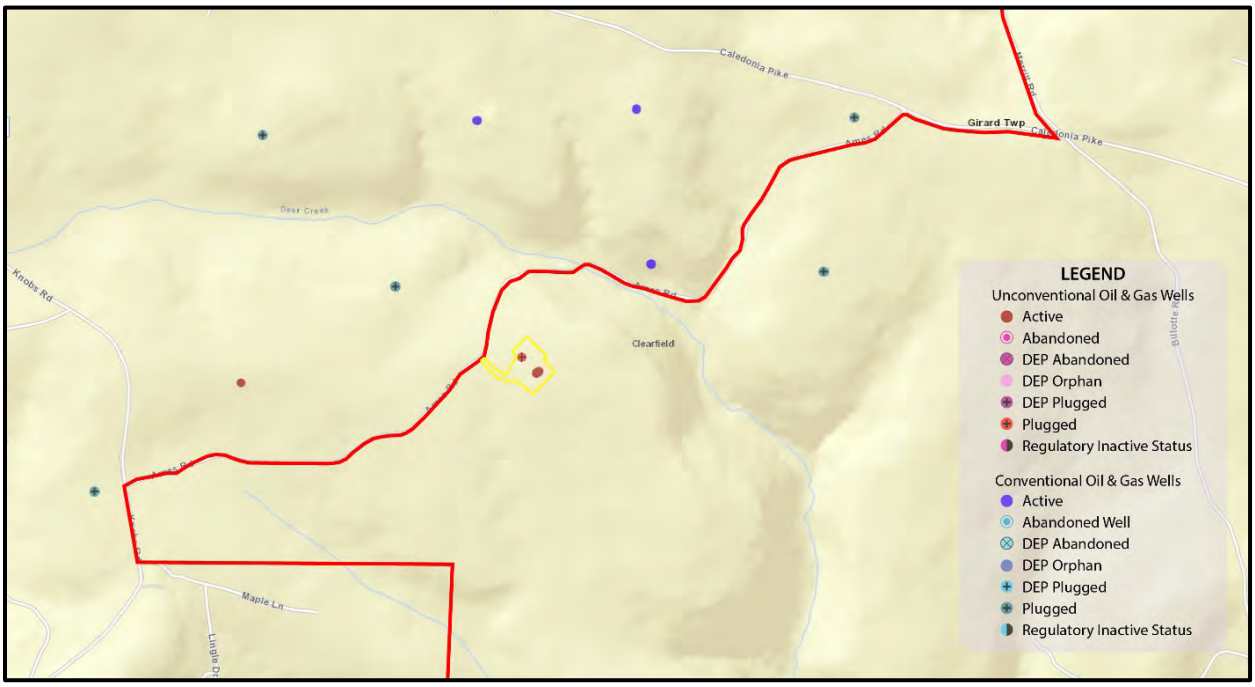
Coal: Owned by Landowner (*Coal Map indicates there is coal in the area*)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Energy Corp of America. (Adobe Oil and Gas Corporation is original lessee – Contract #M-110324-9 which covers 4,565 acres of Moshannon State Forest).

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 2 active wells. The site also has the well heads, conveyance piping, gas processing units, and condensate and brine storage tanks. The site was converted in July 2012.



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

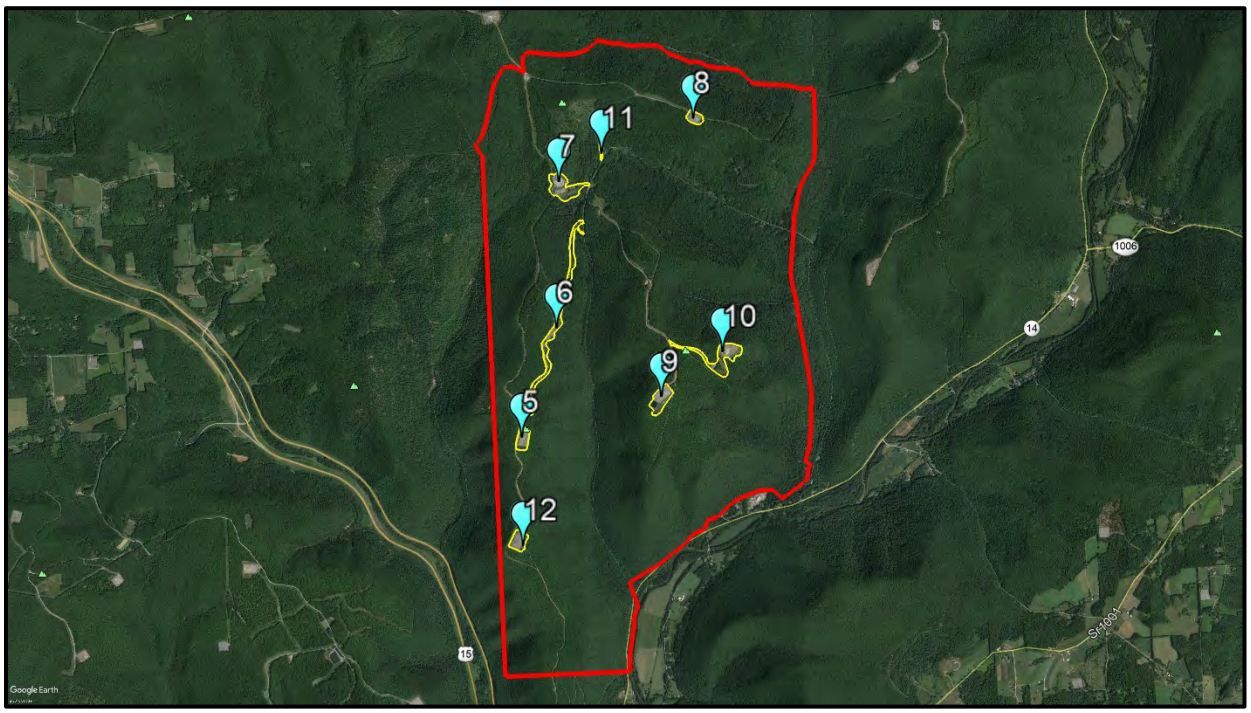
Girard Township has no zoning. The present use complies with Clearfield County's Subdivision and Land Development Ordinance.

Easements

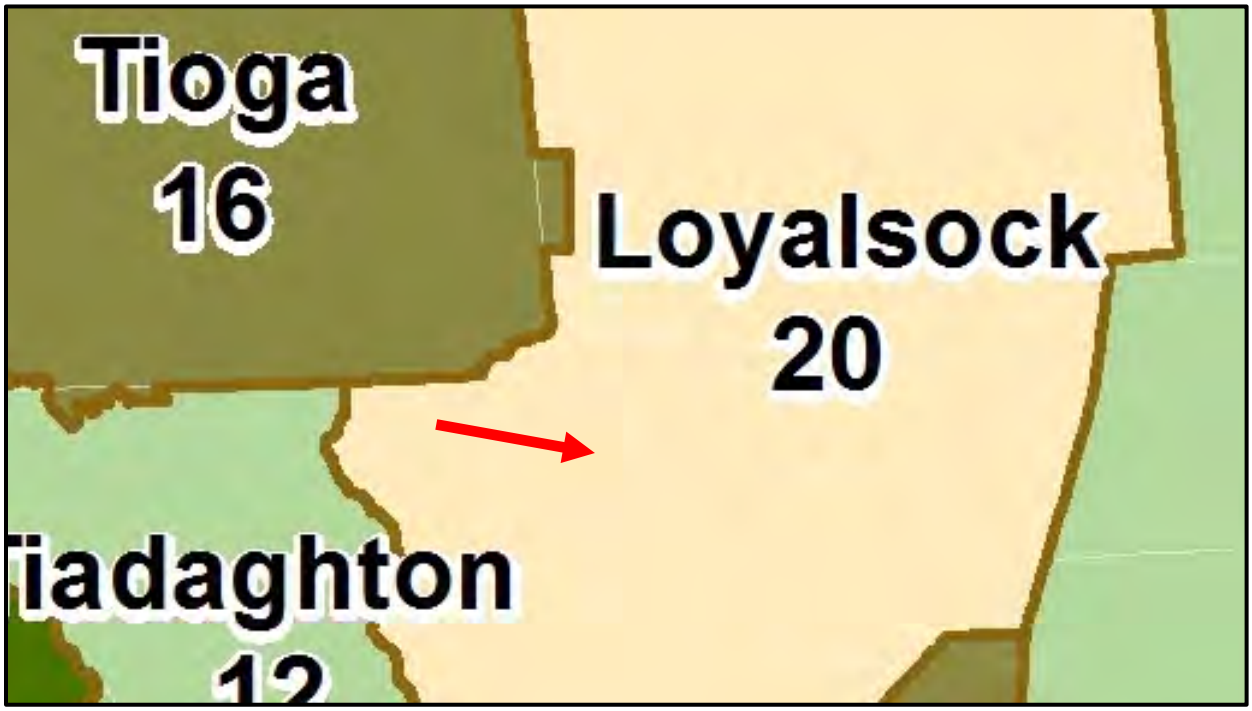
Unrecorded highway ROW's.

LWCF Area #4 Property Data

The location and size of the LWCF areas are based on GIS information provided by the PA DCNR. Locations for conversion areas #5 thru #12 are identified by the blue tags.



LWCF Area #4 Map



Loyalsock State Forest Map

LWCF Area Acreage

LWCF Area #4 is located within the 114,552 acre District 20 - Loyalsock State Forest. The LWCF Area #4 is 5,228.56 Acres.

Use History

The property has been owned by the Commonwealth of PA for many decades. The Bureau of Forestry is charged with managing the State Forests for two primary reasons.

The first is forest recreation. Forest recreation is one of the most common ways that people connect with and enjoy the state forest. The state forest system provides bountiful opportunities for citizens to recreate and enjoy the forest.

The second use, Management of state forests, is guided by Penn's Woods, the bureau's strategic plan, and the State Forest Resource Management Plan. The district staff promotes wild plant conservation and private forest land conservation and stewardship.

The area has had unconventional gas well drilling into the Marcellus Shale within the last decade. This use has caused a land use from forested recreation to well pads, impoundment areas, compressor stations and transmission pipelines.

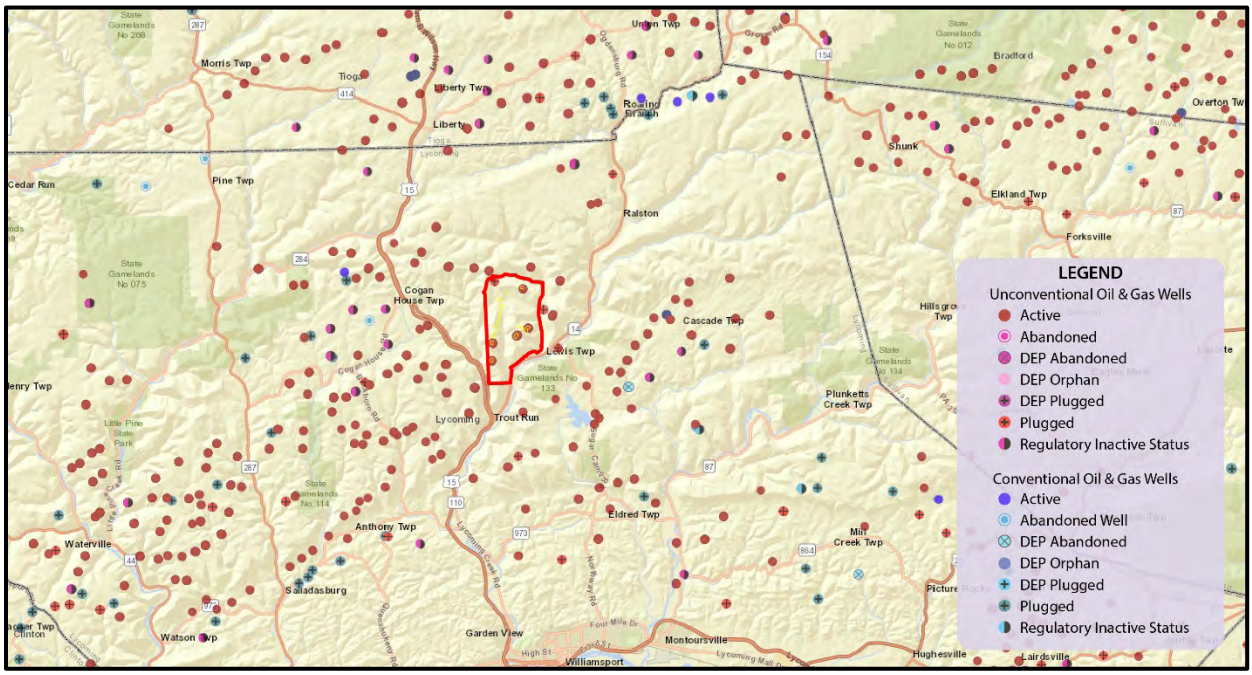
Location

LWCF Area #4 is located in the northern portion of Lycoming County, in Lewis and MacIntyre Townships. The area is approximately 4 miles north of Trout Run and 14 miles north of Williamsport (Lycoming County Seat).

Environmental

The scope of this appraisal does not include any environmental audits or testing for hazardous materials. No apparent environmental concerns were noted. However, as in the case of all real estate, the owners of the subject property are advised to have a complete understanding of the environmental issues surrounding the subject site. As such, a Phase I environmental audit is recommended.

Gas Wells in Proximity to LWCF Area



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of LWCF Area #4

Conversion Site #5 – Pad N

Legal Description & Sales History

Property is deeded to:	The Commonwealth of Pennsylvania
Previous Owner:	George W. & Elizabeth Ann Hoover, Charles & Mary Esther Bartles and Asher D. & Carrie B. Updegraff
Deed Reference #:	204-85 (Addendum A)
Date of Recording and Purchase:	November 6, 1908
Purchase Price:	$6,433.99
Deeded Acreage:	2,339.63 Acres

Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #5 is a part of the following tax parcel.

Tax Assessment Identification:	24+,500.0-0001.00-000+
Tax Assessment Ownership:	State Forest & Game Lands
Tax Assessment Acreage:	5,907
Market Value Tax Assessment:	$2,076,290
Act 319 Assessment:	No
Common Level Ratio:	1.36
Indicated Market Value:	$2,823,754
Millage Rate:	24.052
Annual Market Value Taxes:	$67,917
Annual Act 319 Taxes:	None

Tax Parcel Map - Lycoming County GIS

Acreage

The acreage amount of this site is assumed to be 7.54 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

Photo Key Map

©Google Earth 2018

#1 Pad Site looking northeast

Conversion Site #5 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#2 Pad Site looking south

Conversion Site #5 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#3 Well Heads looking northwest

Conversion Site #5 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#4 Gas Processing Equipment looking north

Conversion Site #5 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

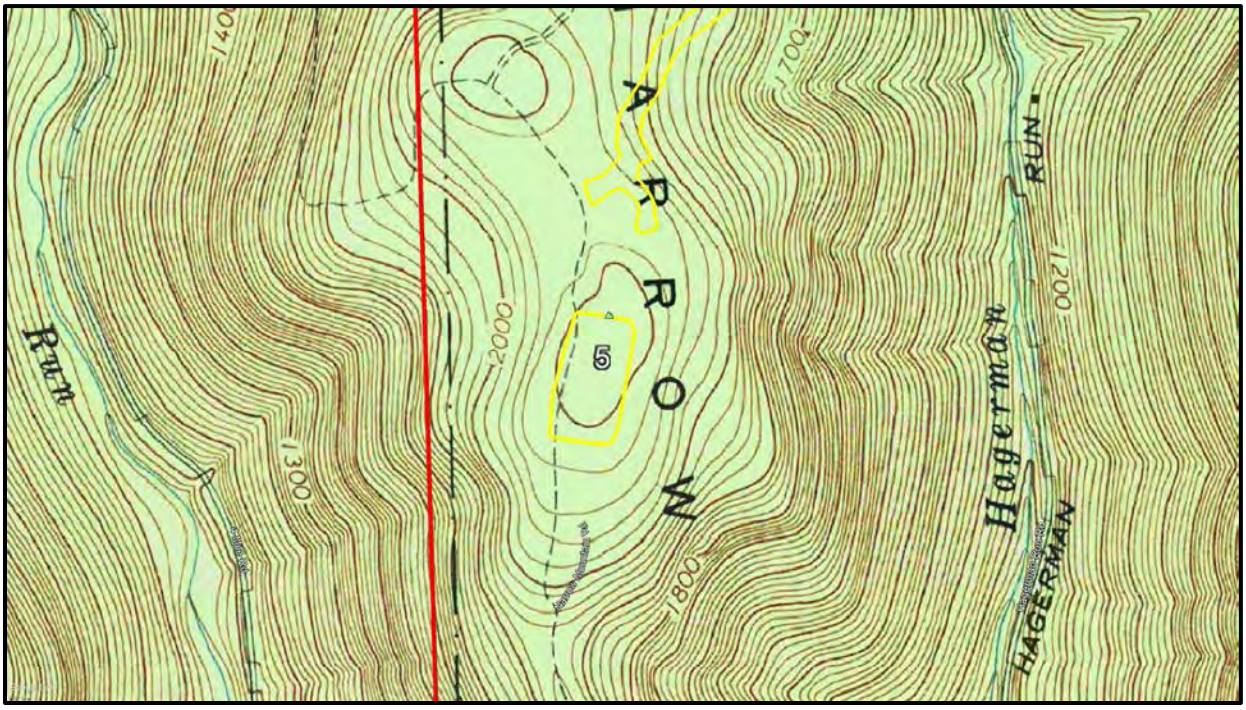
#5 Surrounding woodland looking southeast

Conversion Site #5 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#6 Waste Water Tanks looking northwest

Conversion Site #5 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

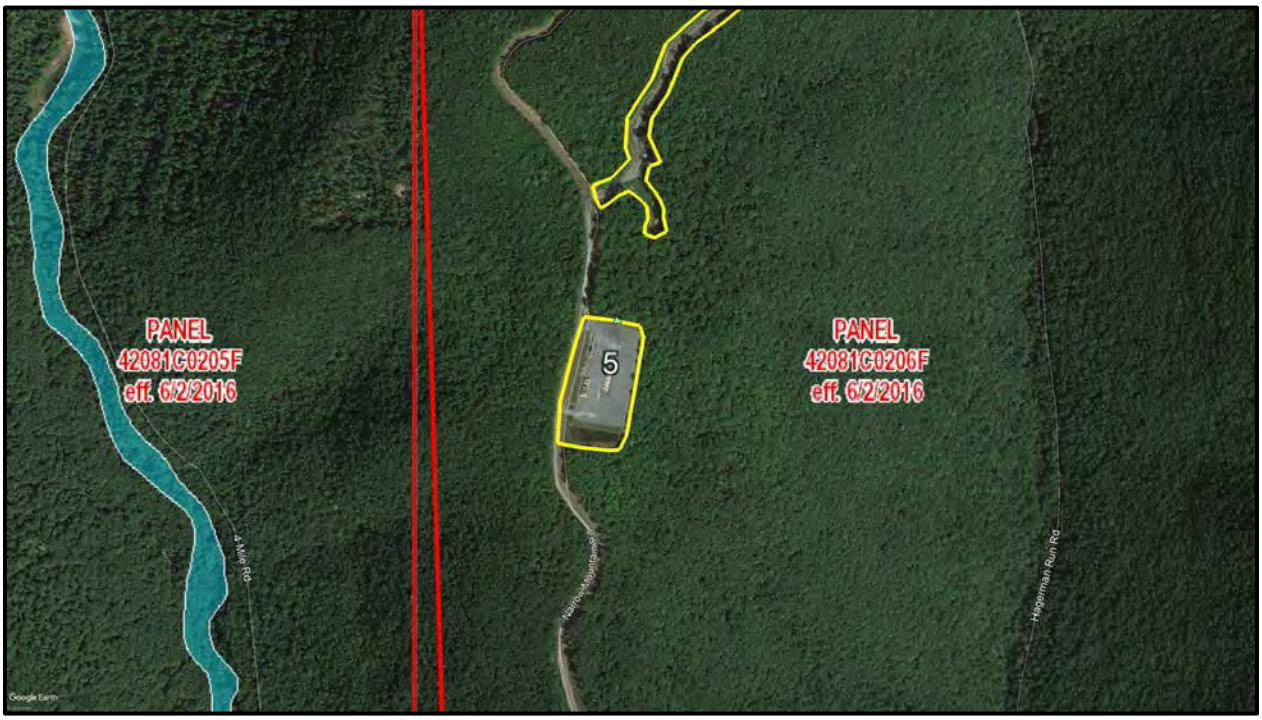
Conversion Site #5 is located in Lewis Township, Lycoming County, on the east side of Narrow Mountain Road, west of Hageman Run Road, approximately 3 miles north of Trout Run, and 13 miles north of Williamsport. Post Office is Trout Run, PA 17771.

Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

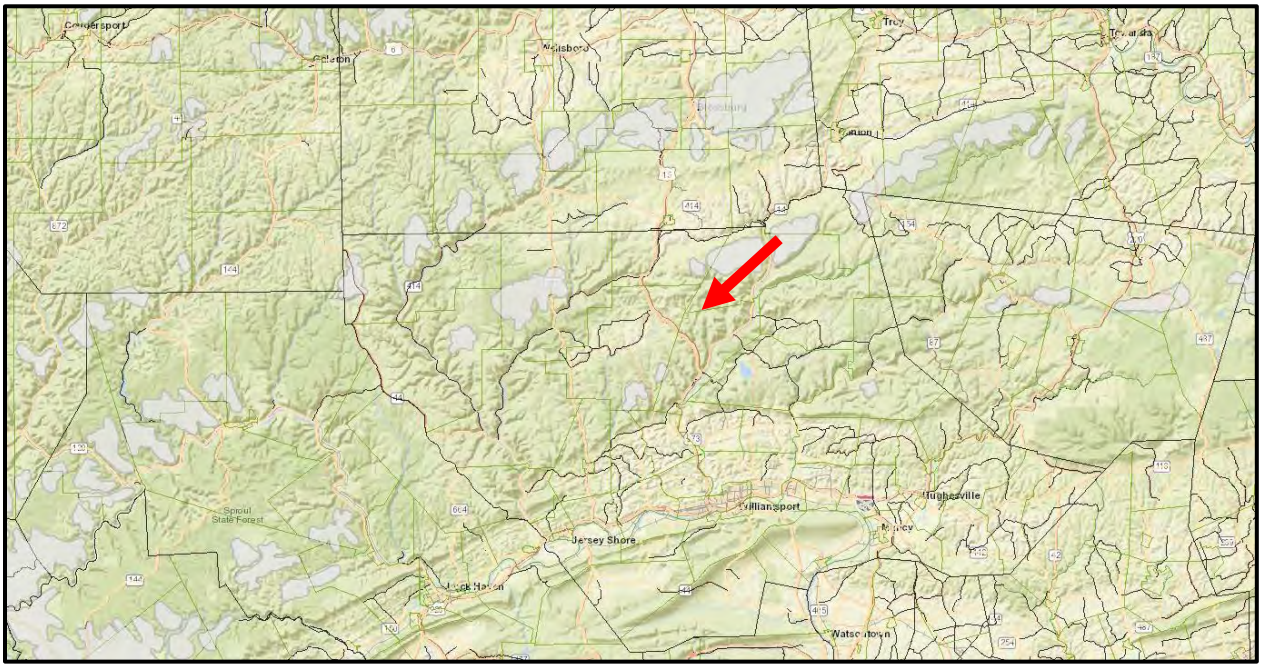
The subject is located on FEMA map 42081C0206F (map date 6/2/2016). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

Coal: None (No coal known to exist in this area)



PA Mine Map – Pennsylvania DEP

PA Mine Map

Oil & Gas: Owned by Landowner, leased to Seneca Resources Corporation (Contract #M-110100-20 which covers 8,891 acres of Loyalsock State Forest).

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 6 active wells. The site also has the well heads, conveyance piping, gas processing units, and condensate and brine storage tanks. The site was converted in October 2012.

PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: The subject is located in Lycoming County's Resource Protection District as adopted by Lewis Township. The present use complies with the zoning ordinance and the Lycoming County's Subdivision and Land Development Ordinance.

A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

Conversion Site #6 – Road to Pad N

Legal Description & Sales History

Property is deeded to:	The Commonwealth of Pennsylvania
Previous Owner:	George W. & Elizabeth Ann Hoover, Charles & Mary Esther Bartles and Asher D. & Carrie B. Updegraff
Deed Reference #:	204-85 (Addendum A)
Date of Recording and Purchase:	November 6, 1908
Purchase Price:	$6,433.99
Deeded Acreage:	2,339.63 Acres

Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #6 is a part of the following tax parcel.

Tax Assessment Identification:	24+,500.0-0001.00-000+,
Tax Assessment Ownership:	State Forest & Game Lands
Tax Assessment Acreage:	5,907
Market Value Tax Assessment:	$2,076,290
Act 319 Assessment:	No
Common Level Ratio:	1.36
Indicated Market Value:	$2,826,754
Millage Rate:	24.052
Annual Market Value Taxes:	$67,917
Annual Act 319 Taxes:	None

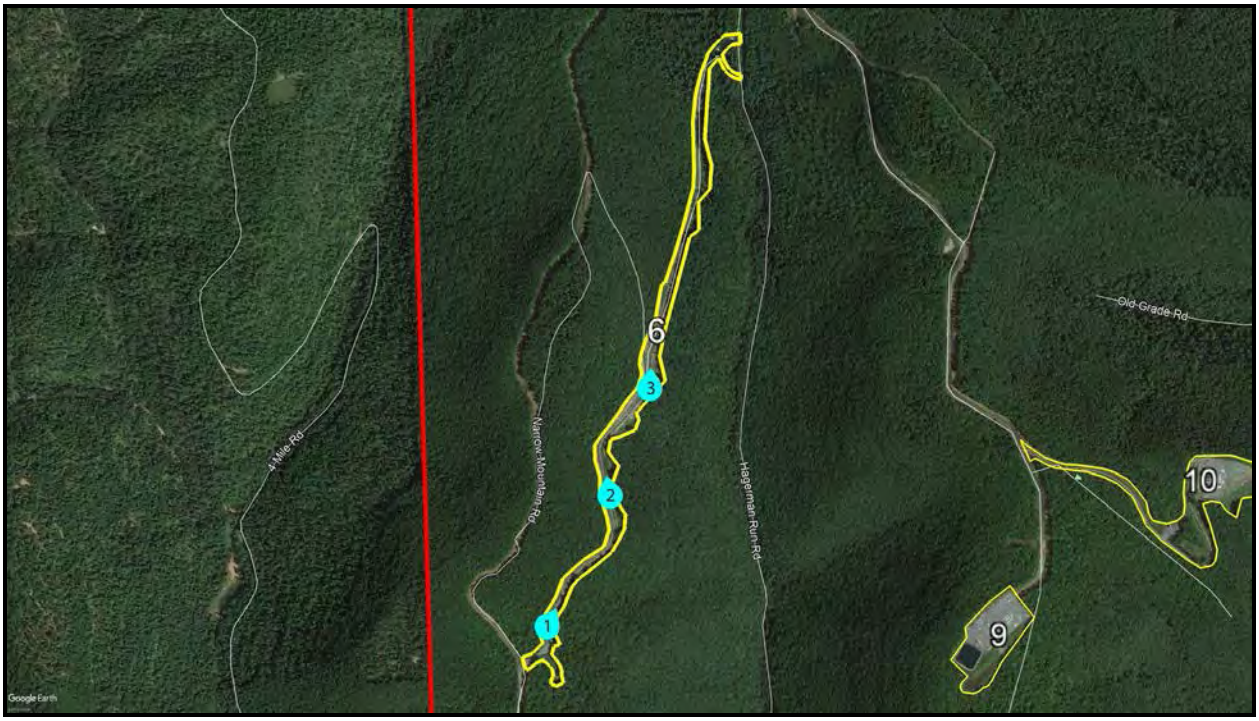
Tax Parcel Map - Lycoming County GIS

Acreage

The acreage amount of this site is assumed to be 28.66 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes and access road between well sites.

Photo Key Map



©Google Earth 2018

#1 Road to Pad N looking north

Conversion Site #6 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

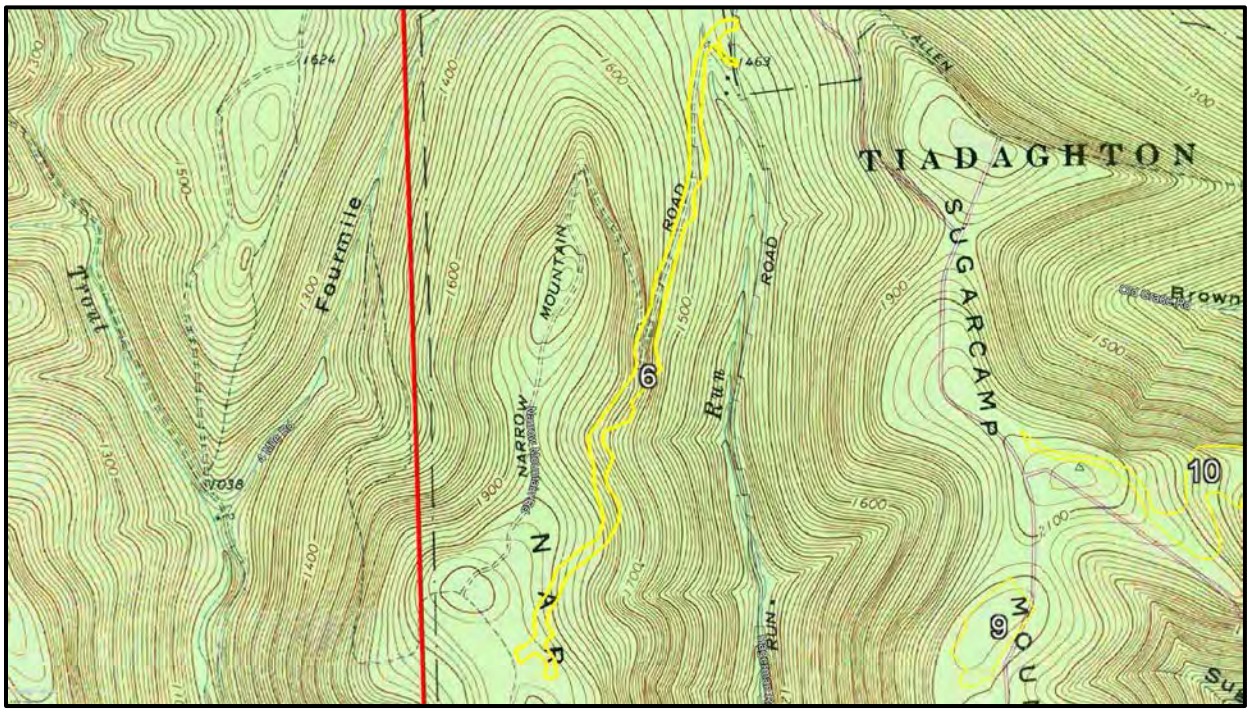
#2 Road to Pad N looking north

Conversion Site #6 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#3 Road to Pad N looking north

Conversion Site #6 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

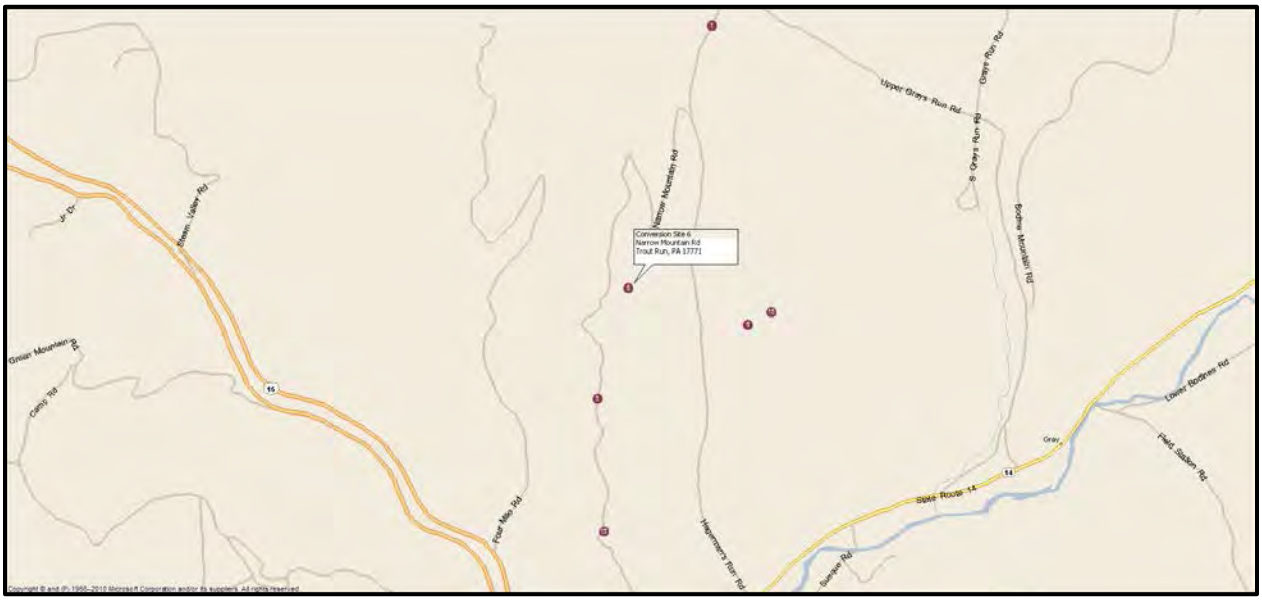
Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of unconventional wells. The leasehold improvements include creating a road with which its surface is covered with crushed limestone.

Location

Conversion Site #6 is located in Lewis Township, Lycoming County, on Narrow Mountain Road, west of Hageman Run Road, approximately 4 miles north of Trout Run, and 14 miles north of Williamsport. Post Office is Trout Run, PA 17771.

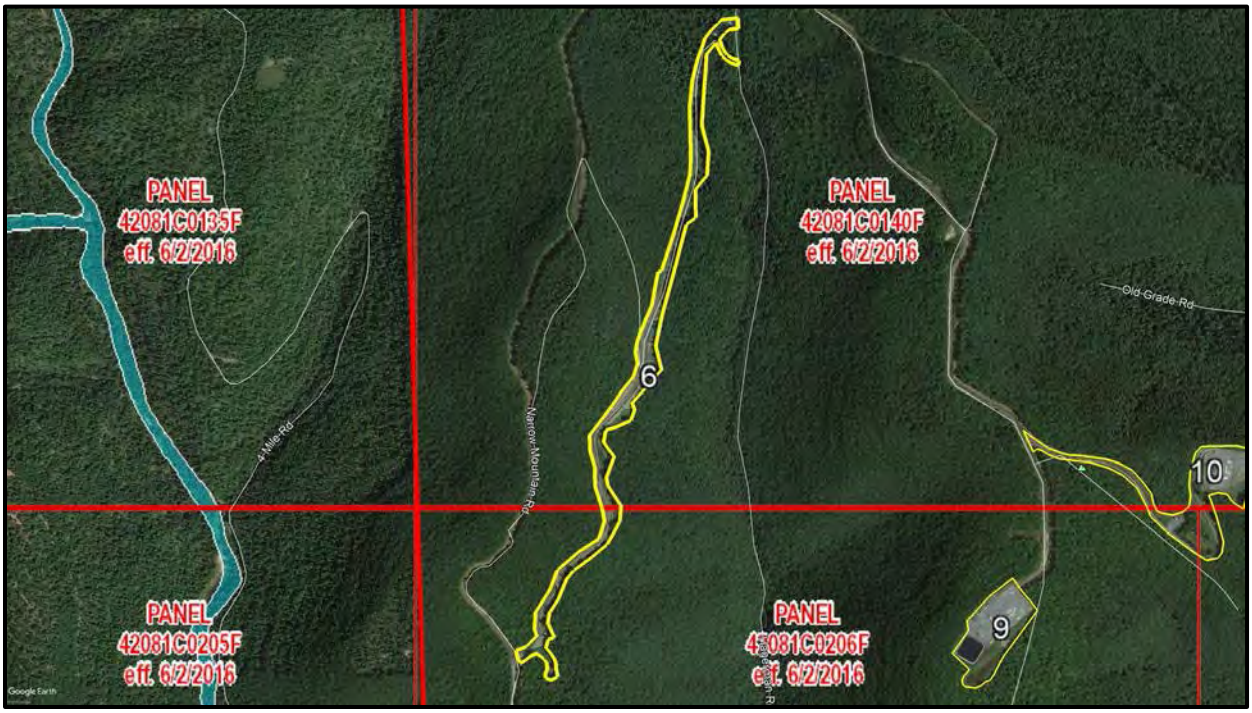


Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

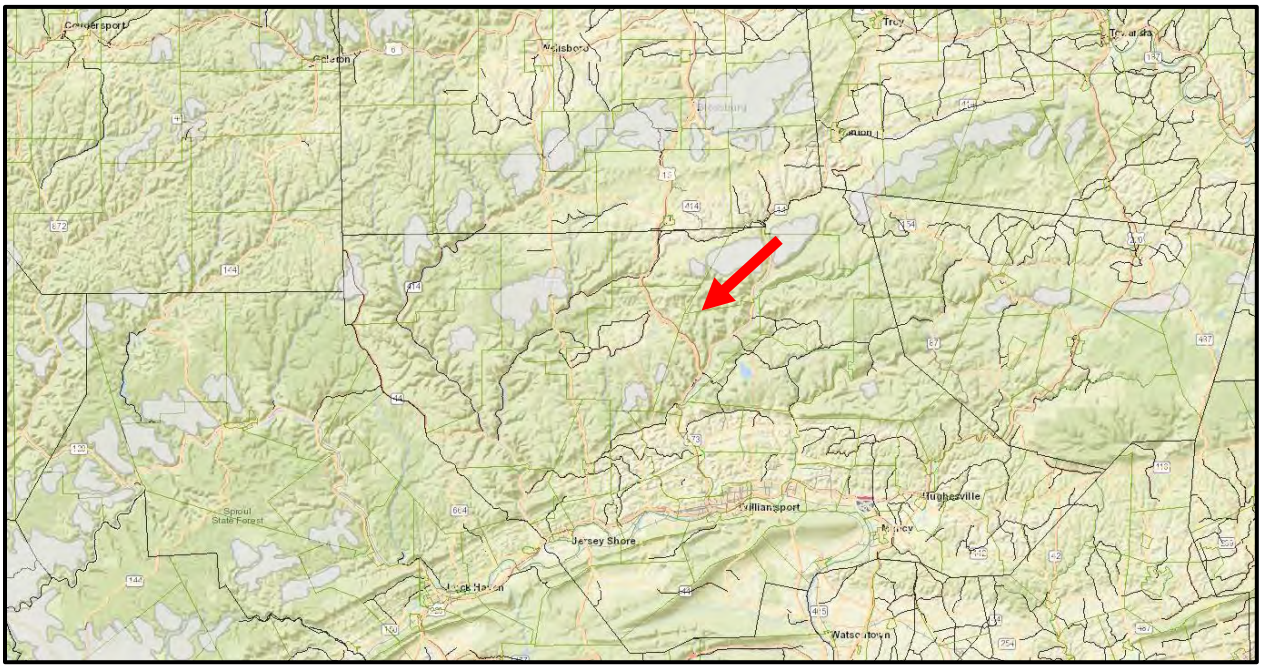
The subject is located on FEMA maps 42081C0140F & 42081C0206F (map date 6/2/16). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Seneca Resources Corporation (Contract #M-110100-20 which covers 8,891 acres of Loyalsock State Forest).

Oil & Gas Development: The surrounding area have been developed into unconventional well sites. The site was converted in December, 2011.

PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: The subject is located in Lycoming County's Resource Protection District as adopted by Lewis Township. The present use complies with the zoning ordinance and the Lycoming County's Subdivision and Land Development Ordinance.

A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

Conversion Site #7 – Hagerman Compressor Station & Holding Pond

(AKA – Neuman Compressor Station)

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	John G. Newman
Deed Reference #:	555-719 (Addendum A)
Date of Recording and Purchase:	April 17, 1970
Purchase Price:	$22,000
Deeded Acreage:	443.84 Acres

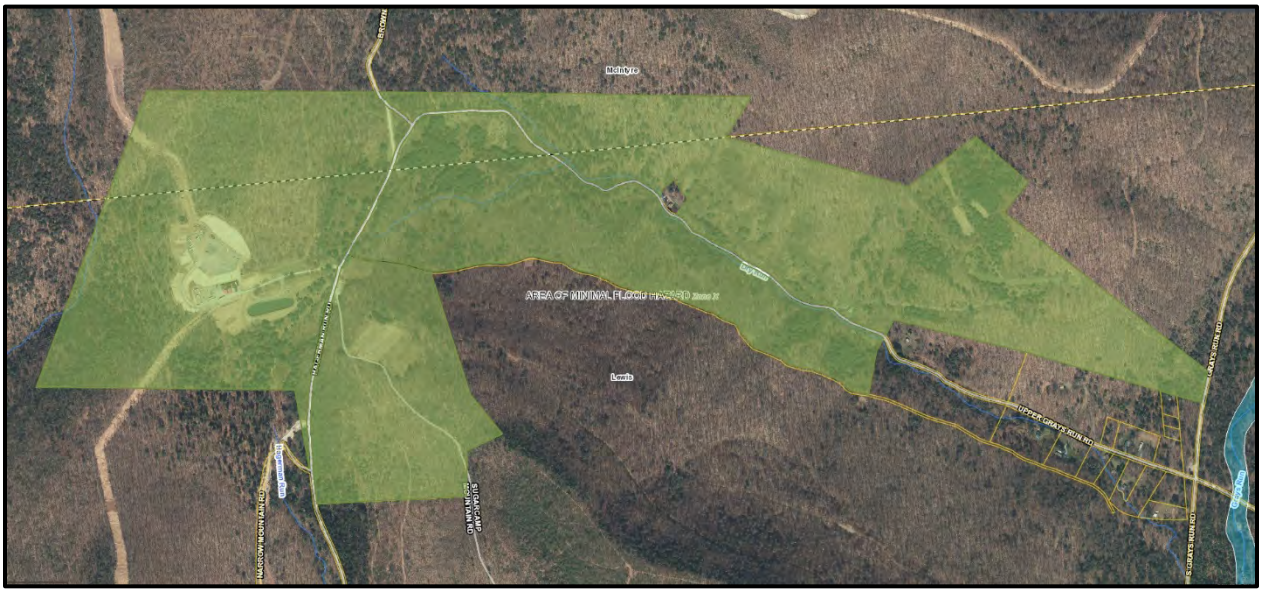
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #7 is a part of the following tax parcel.

Tax Assessment Identification:	24+,209.0-0122.00-000+
Tax Assessment Ownership:	Commonwealth of PA
Tax Assessment Acreage:	443.84
Market Value Tax Assessment:	$193,120
Act 319 Assessment:	No
Common Level Ratio:	1.36
Indicated Market Value:	$262,643
Millage Rate:	24.052
Annual Market Value Taxes:	$6,317
Annual Act 319 Taxes:	None



Tax Parcel Map - Lycoming County GIS

Acreage

The acreage amount of this site is assumed to be 18.20 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the compressor station site and the access road to the well site. The access road and compressor station site have been improved with crushed stone. There is a water holding impoundment that has been lined with a rubber covering.

Photo Key Map

©Google Earth 2018

#1 Compressor Station looking northeast

Conversion Site #7 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#2 Compressor Station looking west

Conversion Site #7 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#3 Compressor Station looking east

Conversion Site #7 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

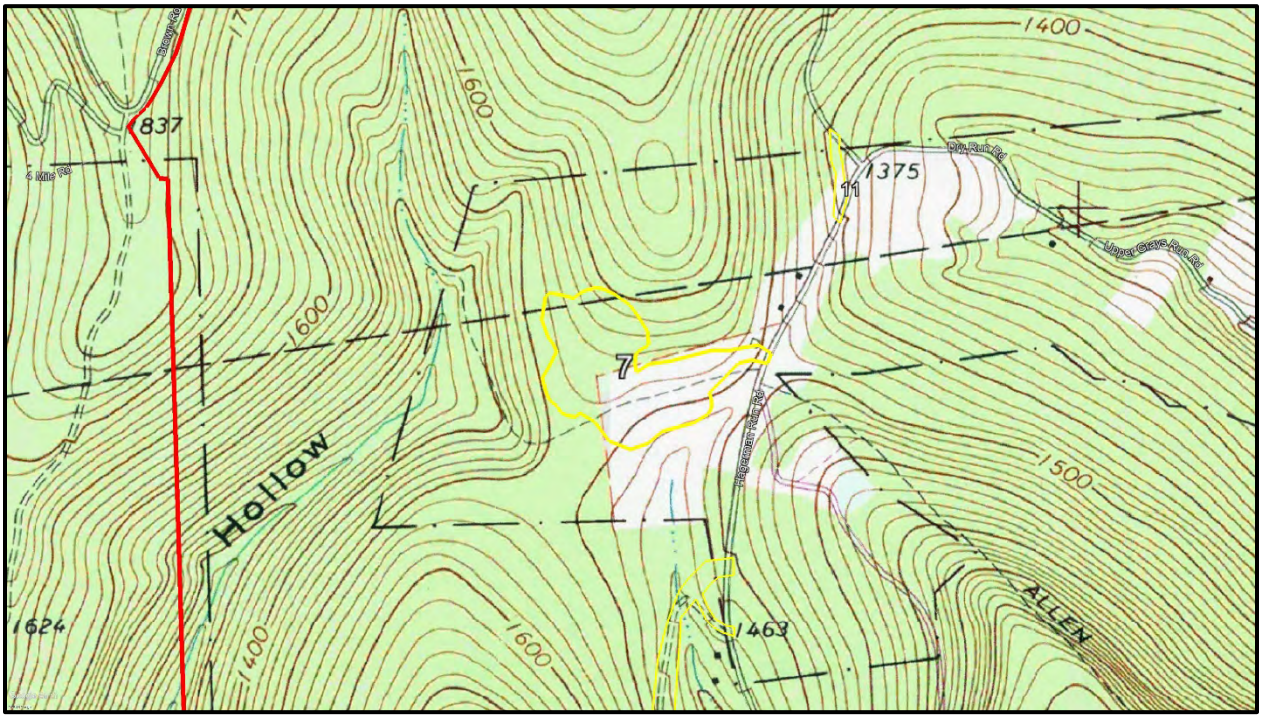
#4 Water Holding Pond looking southeast

Conversion Site #7 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#5 Surrounding Woodland looking southwest

Conversion Site #7 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of a compressor station. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

Conversion Site #7 is located in Lewis Township, Lycoming County, on the west side of Hageman Run Road, south of Upper Grays Run, approximately 5 miles north of Trout Run, and 15 miles north of Williamsport. Post Office is Trout Run, PA 17771.

Rental History

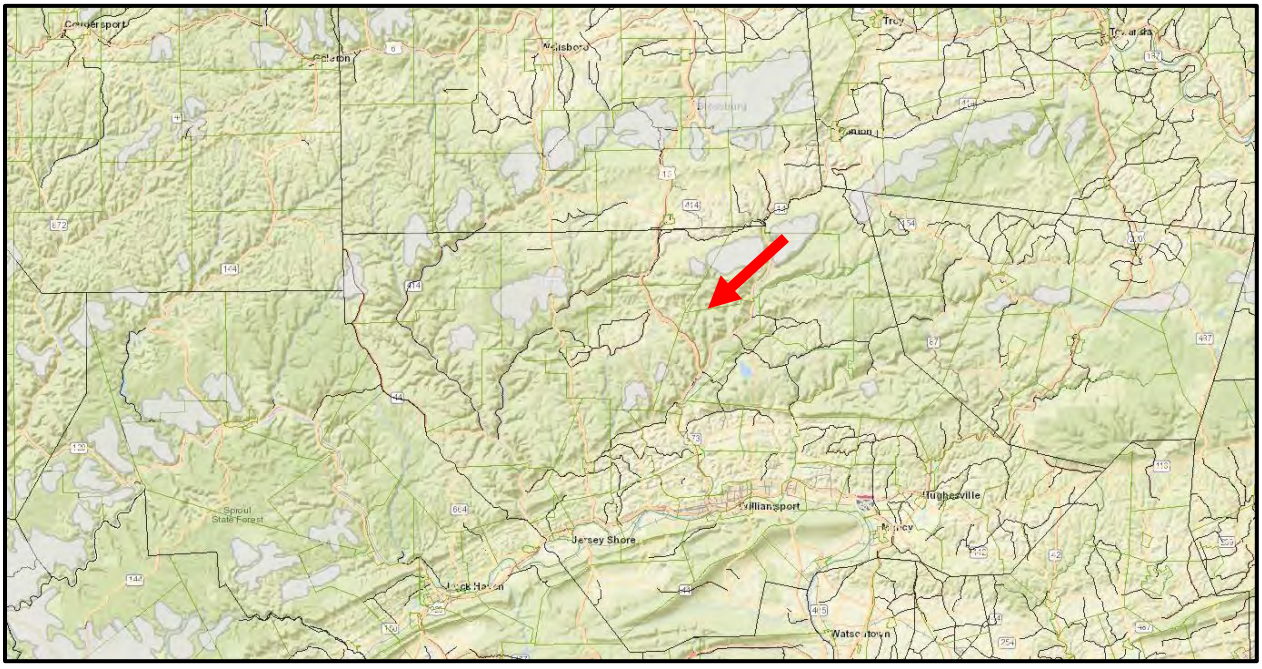
No rental – managed by the Bureau of Forestry.

Flood Map Information

The subject is located on FEMA map 42081C0140F (map date 6/242016). 100% is located in Flood Zone X.

Subsurface Rights Subsurface Rights

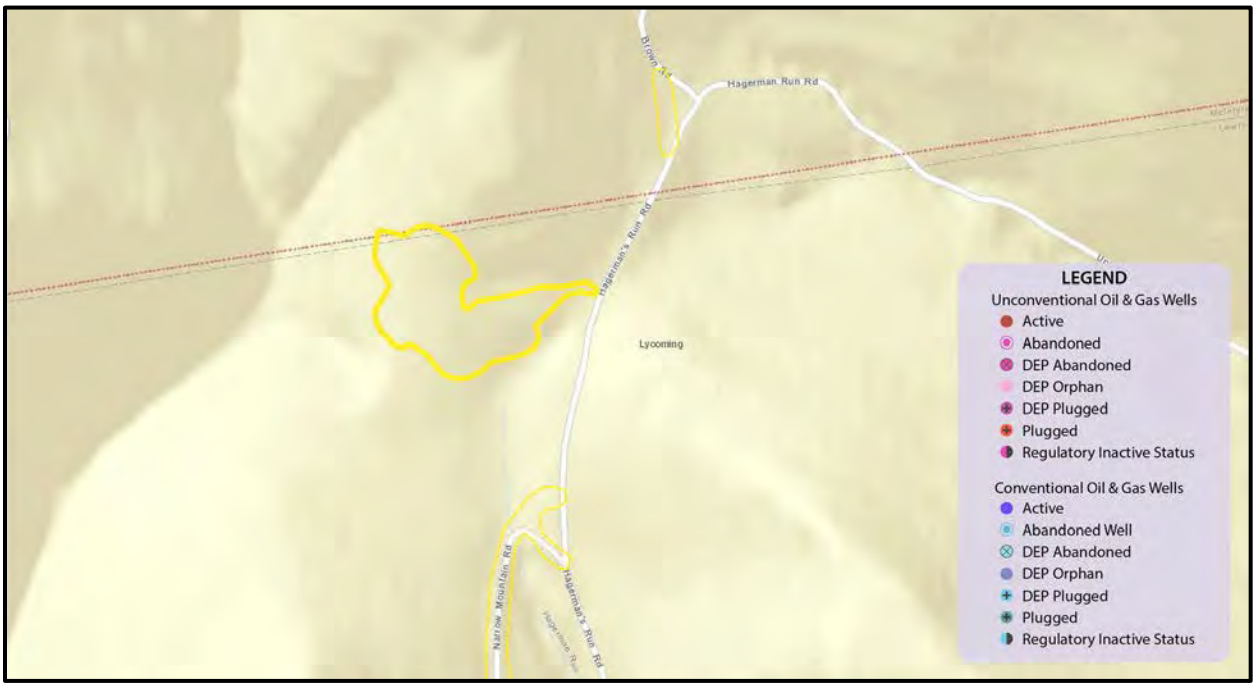
Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Seneca Resources Corporation (Contract #M-110100-20 which covers 8,891 acres of Loyalsock State Forest).

Oil & Gas Development: The conversion site has been developed into a compressor station. Additionally, there is a rubber lined holding pond located in the southeast portion of the property. The site was converted in September, 2011.



Map from PA DEP, PA Oil and Gas Mapping website

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: The subject is located in Lycoming County's Resource Protection District as adopted by Lewis Township. The present use complies with the zoning ordinance and the Lycoming County's Subdivision and Land Development Ordinance.

A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

Conversion Site #8 – T 100 Pad G

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Commonwealth of Pennsylvania
Deed Reference #:	356-168 (Addendum A)
Date of Recording and Purchase:	May 5, 1948
Purchase Price:	Land Swap
Deeded Acreage:	741.60 Acres

The property was a land swap. Due to the age of the swap and without information about the swapped parcel, an analysis to determine if the swap was of equal market values at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #8 is a part of the following tax parcel.

Tax Assessment Identification:	29+,500.0-0001.00-000+
Tax Assessment Ownership:	DCNR Bureau of Forestry
Tax Assessment Acreage:	15,330
Market Value Tax Assessment:	$3,622,330
Act 319 Assessment:	No
Common Level Ratio:	1.36
Indicated Market Value:	$4,926,369
Millage Rate:	22.0758
Annual Market Value Taxes:	$108,754
Annual Act 319 Taxes:	None

Tax Parcel Map - Lycoming County GIS

Acreage

The acreage amount of this site is assumed to be 5.22 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

Photo Key Map

©Google Earth 2018

#1 Well Pad looking southeast

Conversion Site #8 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#2 Well Pad looking northwest

Conversion Site #8 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#3 Well Head looking east

Conversion Site #8 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#4 Gas Processing Equipment looking northwest

Conversion Site #8 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

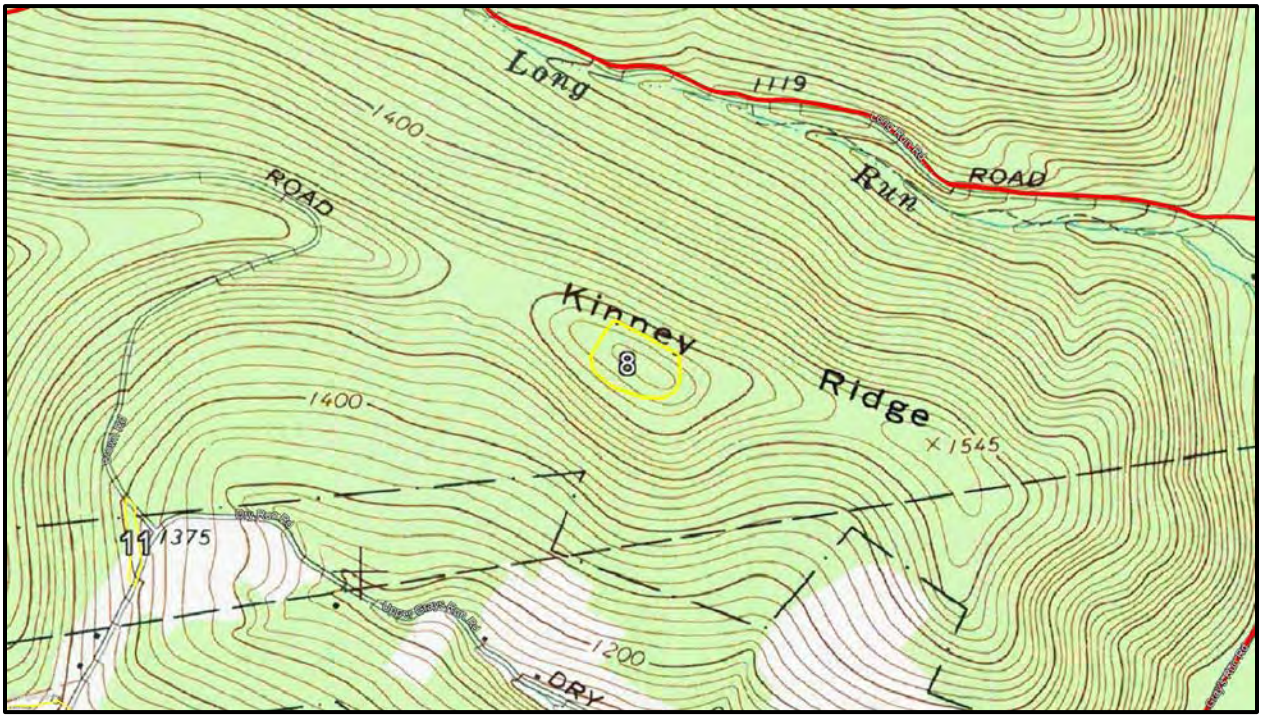
#5 Waste Water Tanks looking northwest

Conversion Site #8 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#6 Surrounding Woodland looking southeast

Conversion Site #8 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

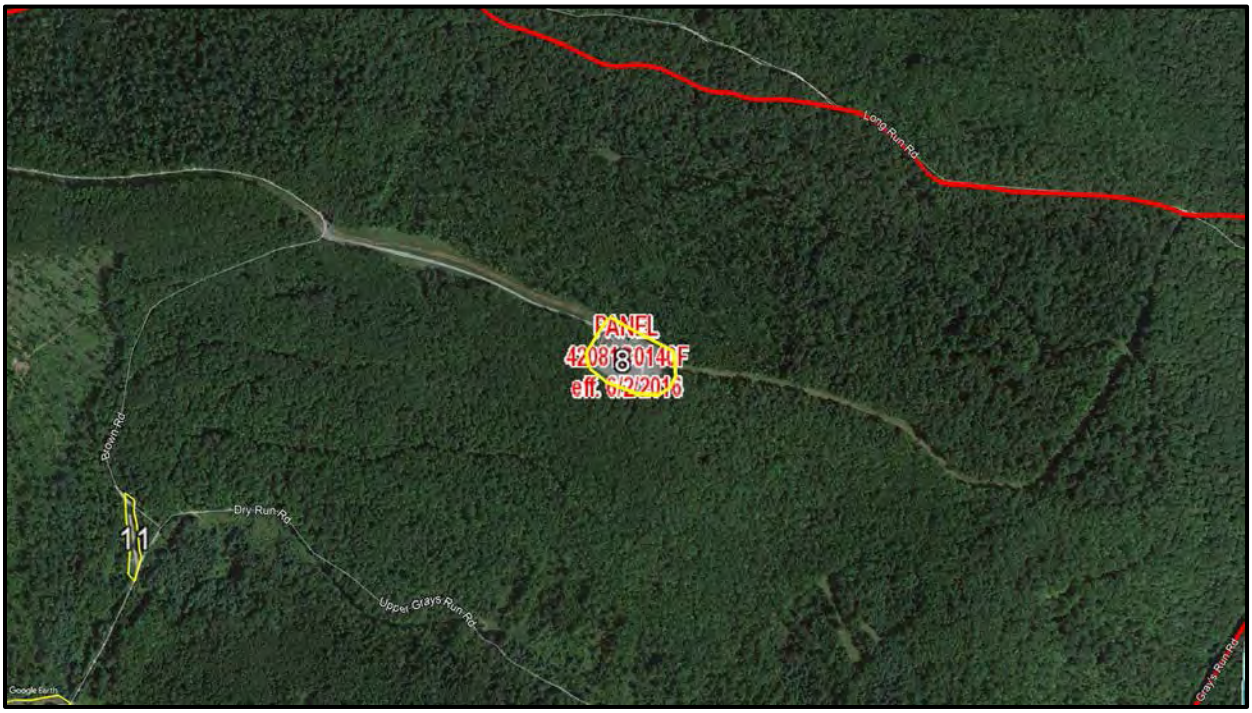
Conversion Site #8 is located in Lewis Township, Lycoming County, east side of Brown Road, north of the intersection with Hageman Run Road, approximately 6 miles north of Trout Run, and 16 miles north of Williamsport. Post Office is Trout Run, PA 17771.

Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

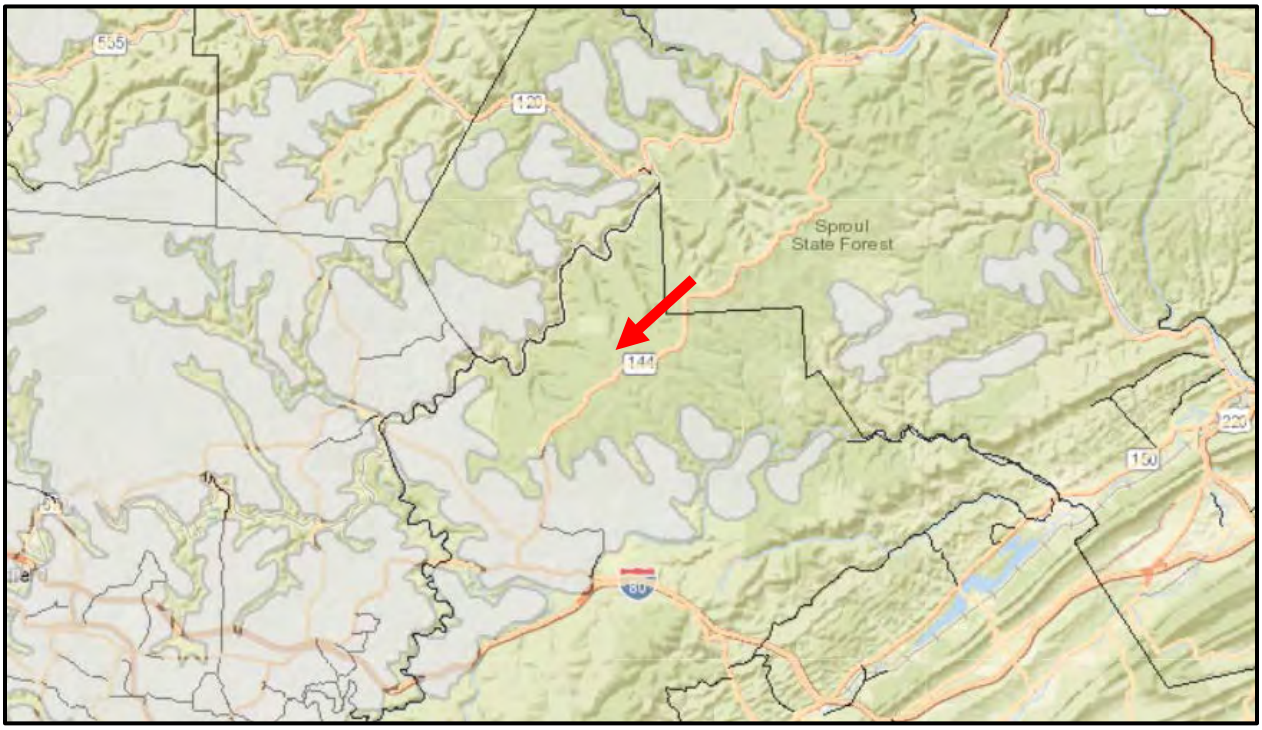
The subject is located on FEMA map 42081C0140F (map date 6/2/2016). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

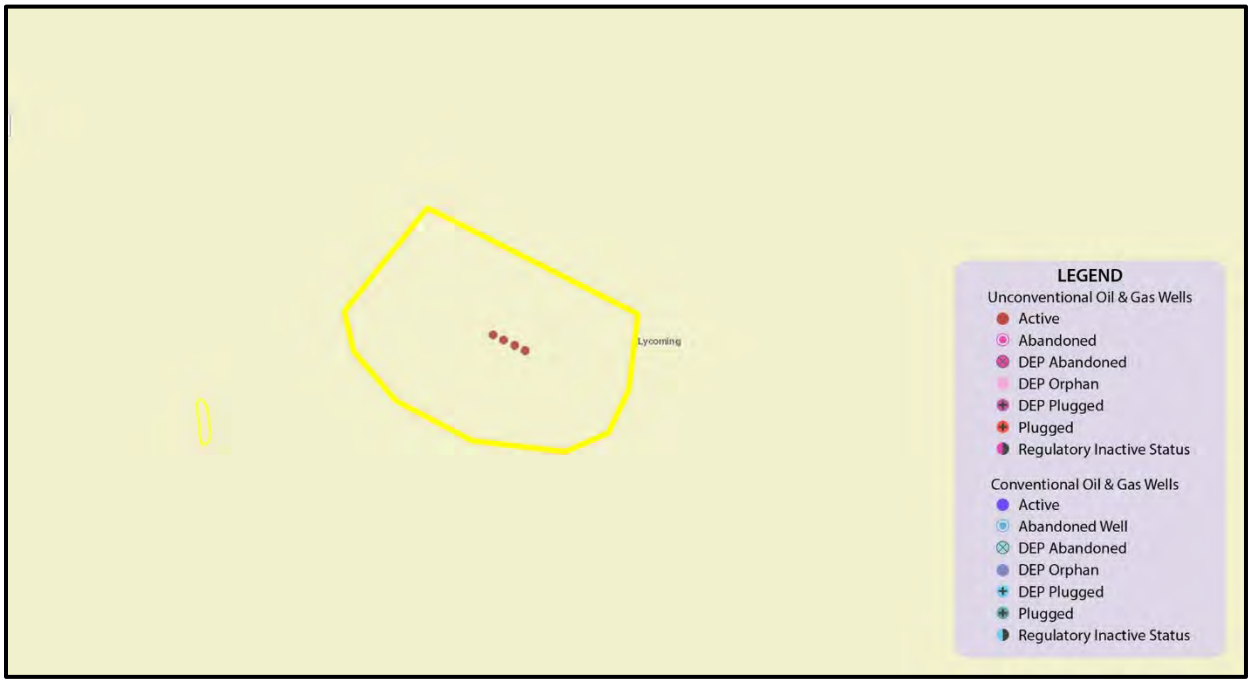
Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Seneca Resources Corporation (Contract #M-110100-20 which covers 8,891 acres of Loyalsock State Forest).

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 4 active wells. The site also has all well heads, conveyance piping, gas processing units, and condensate and brine storage tanks. The site was converted in September, 2011.



Map from PA DEP, PA Oil and Gas Mapping website

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: The subject is located in Lycoming County's Resource Protection District as adopted by MacIntyre Township. The present use complies with the zoning ordinance and the Lycoming County's Subdivision and Land Development Ordinance.

A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

Conversion Site #9 – Pad P & Impoundment

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Thomas B. & Mary A. Albert
Deed Reference #:	254-418 (Addendum A)
Date of Recording and Purchase:	September 24, 1924
Purchase Price:	730.01
Deeded Acreage:	243.34 Acres

Property is deeded to:	The Commonwealth of Pennsylvania
Previous Owner:	George W. & Elizabeth Ann Hoover, Charles & Mary Esther Bartles and Asher D. & Carrie B. Updegraff
Deed Reference #:	204-85 (Addendum A)
Date of Recording and Purchase:	November 6, 1908
Purchase Price:	$6,433.99
Deeded Acreage:	2,339.63 Acres

Property is deeded to:	The Commonwealth of Pennsylvania
Previous Owner:	Asher D. & Carrie B. Updegraff
Deed Reference #:	223-475 (Addendum A)
Date of Recording and Purchase:	November 21, 1916
Purchase Price:	$146.90
Deeded Acreage:	320.52 Acres

Due to the age of the sale, an analysis was to determine if the sale was market value at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #9 is a part of the following tax parcel.

Tax Assessment Identification:	24+,500.0-0001.00-000+,
Tax Assessment Ownership:	State Forest & Game Lands
Tax Assessment Acreage:	5,907
Market Value Tax Assessment:	$2,076,290
Act 319 Assessment:	No
Common Level Ratio:	1.36
Indicated Market Value:	$2,826,754
Millage Rate:	24.052

Annual Market Value Taxes: $67,917
Annual Act 319 Taxes: None

Tax Parcel Map - Lycoming County GIS

Acreage

The acreage amount of this site is assumed to be 12.39 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

Photo Key Map

©Google Earth 2018

#1 Well Pad looking southwest

Conversion Site #9 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#2 Well Pad looking north

Conversion Site #9 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#3 Well Heads looking southwest

Conversion Site #9 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#4 Well Heads looking southwest

Conversion Site #9 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#5 Gas Processing Equipment looking west

Conversion Site #9 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#6 Waste Water Tanks looking southwest

Conversion Site #9 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

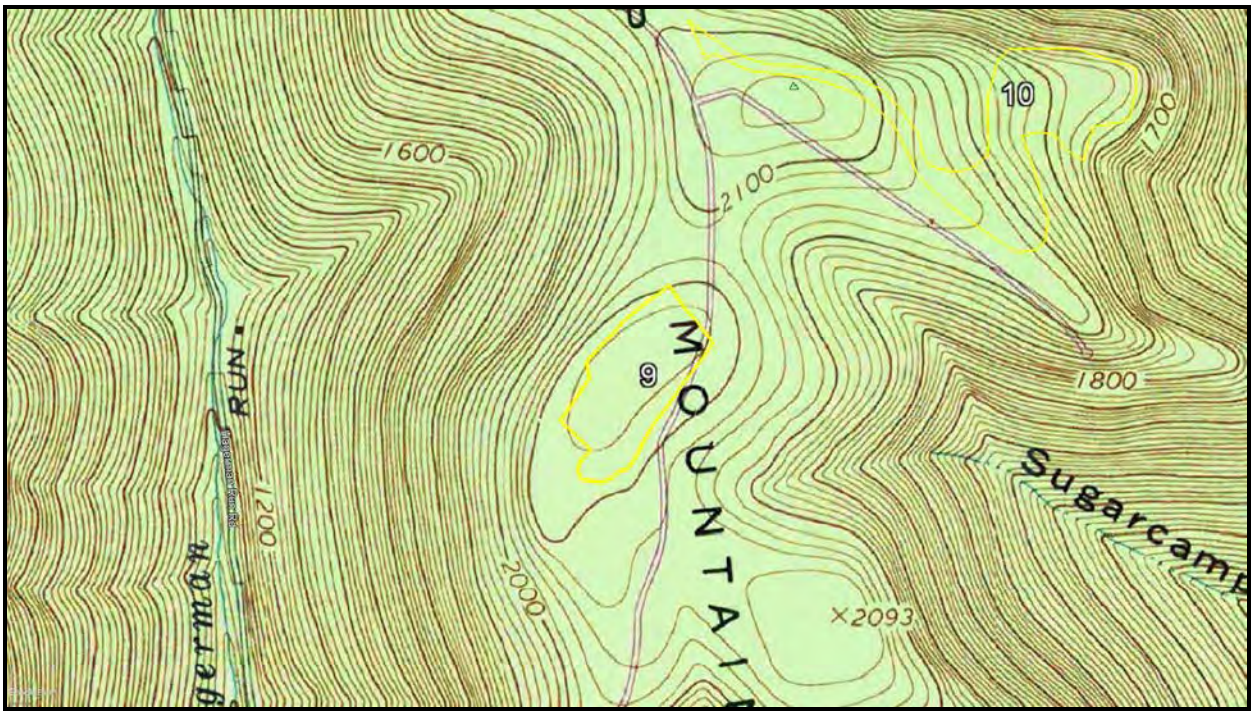
#7 Water Impoundment – Reclaimed
Looking west

Conversion Site #9 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#8 Surrounding Woodland looking south

Conversion Site #9 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

Topographic Map

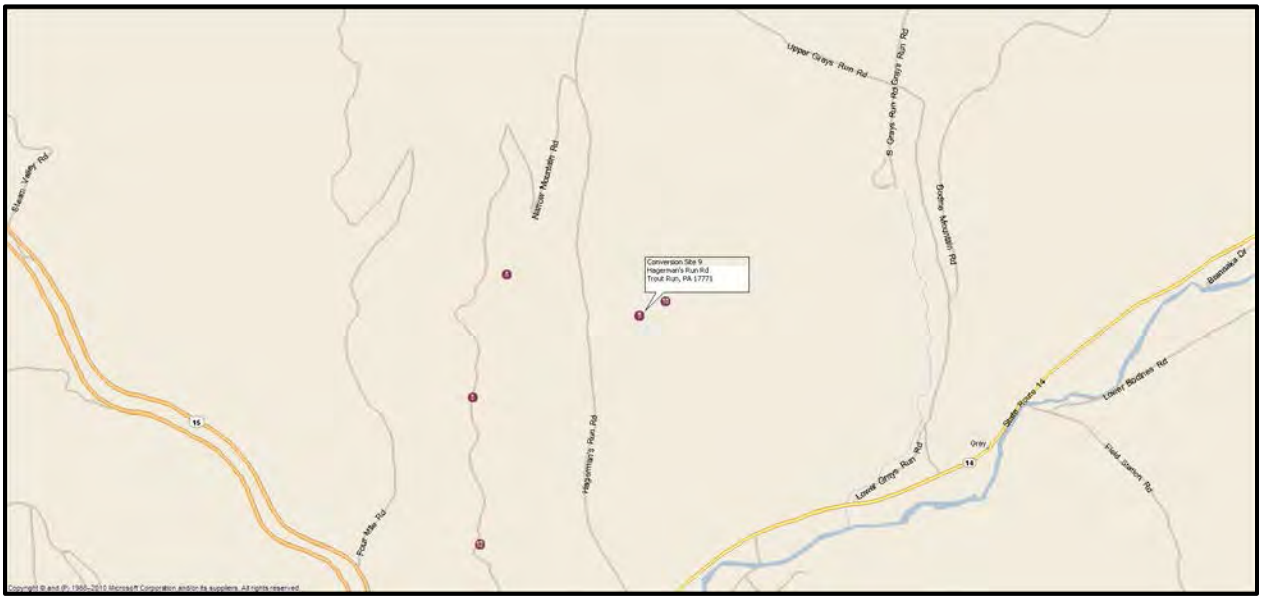
Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania. A water impoundment area has been reclaimed.

Location

Conversion Site #9 is located in Lewis Township, Lycoming County, on Sugarcamp Mountain Road, east of the intersection with Hageman Run Road, approximately 4 miles north of Trout Run, and 14 miles north of Williamsport. Post Office is Trout Run, PA 17771.

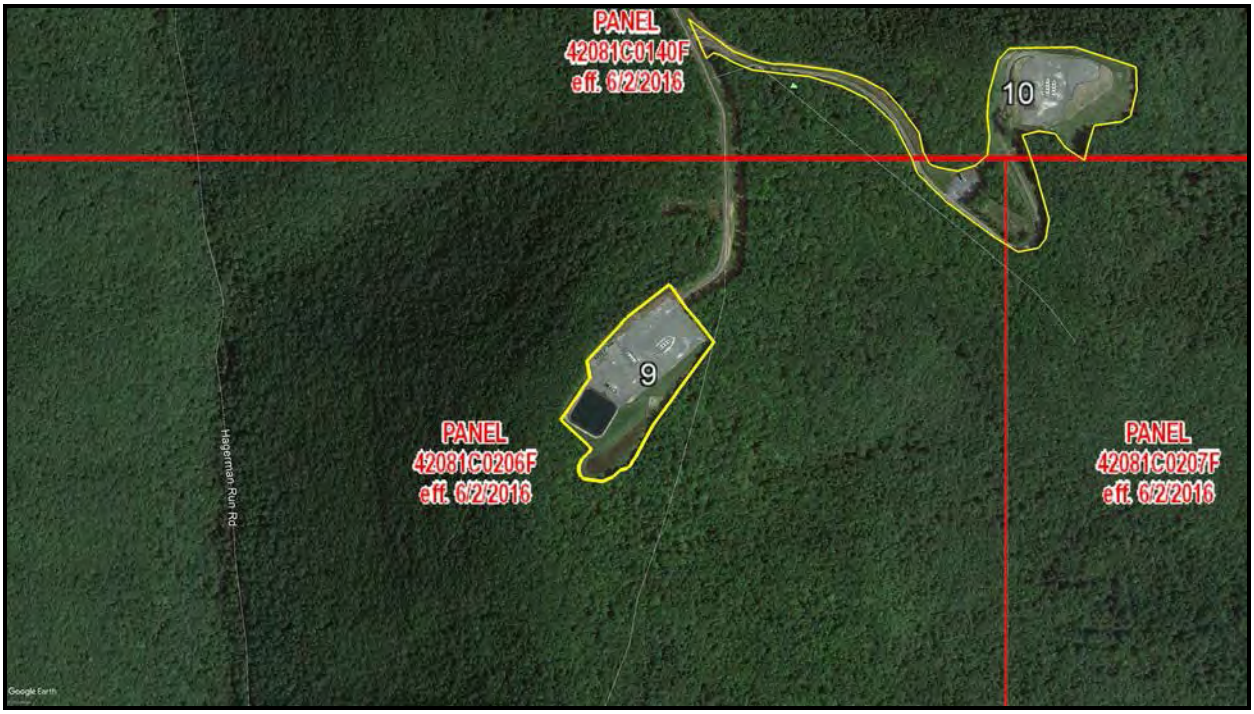


Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

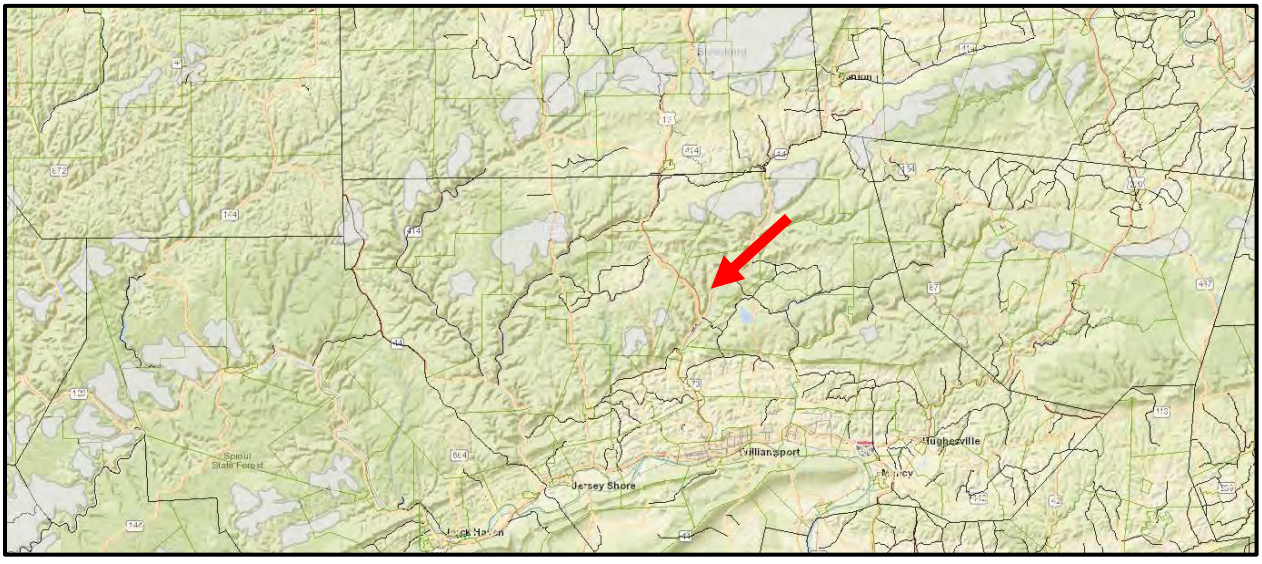
The subject is located on FEMA map 42081C0206F (map date 6/2/2016). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Seneca Resources Corporation (Contract #M-110100-20 which covers 8,891 acres of Loyalsock State Forest).

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 9 active wells. The site also has well heads, conveyance piping, gas processing units, and condensate and brine storage tanks. Additionally, there is one conventional well southeast of the Unconventional well pad. The site was converted in January, 2013.

PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: The subject is located in Lycoming County's Resource Protection District as adopted by Lewis Township. The present use complies with the zoning ordinance and the Lycoming County's Subdivision and Land Development Ordinance.

A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

Conversion Site #10 – Pad T

Legal Description & Sales History

Property is deeded to:	The Commonwealth of Penna.
Previous Owner:	John L. Hall
Deed Reference #:	204-71 (Addendum A)
Date of Recording and Purchase:	November 6, 1908
Purchase Price:	$7793.48
Deeded Acreage:	Not able to be determined

Property is deeded to:	The Commonwealth of Penna.
Previous Owner:	J. Henry Cochran et al.
Deed Reference #:	204-69 (Addendum A)
Date of Recording and Purchase:	November 6, 1908
Purchase Price:	$3,906.48
Deeded Acreage:	1420.54 Acres

Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer was not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #10 is a part of the following tax parcel.

Tax Assessment Identification:	24+,500.0-0001.00-000+,
Tax Assessment Ownership:	State Forest & Game Lands
Tax Assessment Acreage:	5,907
Market Value Tax Assessment:	$2,076,290
Act 319 Assessment:	No
Common Level Ratio:	1.36
Indicated Market Value:	$2,826,754
Millage Rate:	24.052
Annual Market Value Taxes:	$67,917
Annual Act 319 Taxes:	None

Tax Parcel Map - Lycoming County GIS

Acreage

The acreage amount of this site was assumed to be 20.13 acres. This assumption was based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

Photo Key Map

©Google Earth 2018

#1 Access Road looking northwest

Conversion Site #10 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#2 Well Pad looking southwest

Conversion Site #10 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#3 Well Pad looking northwest

Conversion Site #10 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#4 Well Heads looking west

Conversion Site #10 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#5 Gas Processing Equipment looking NW

Conversion Site #10 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

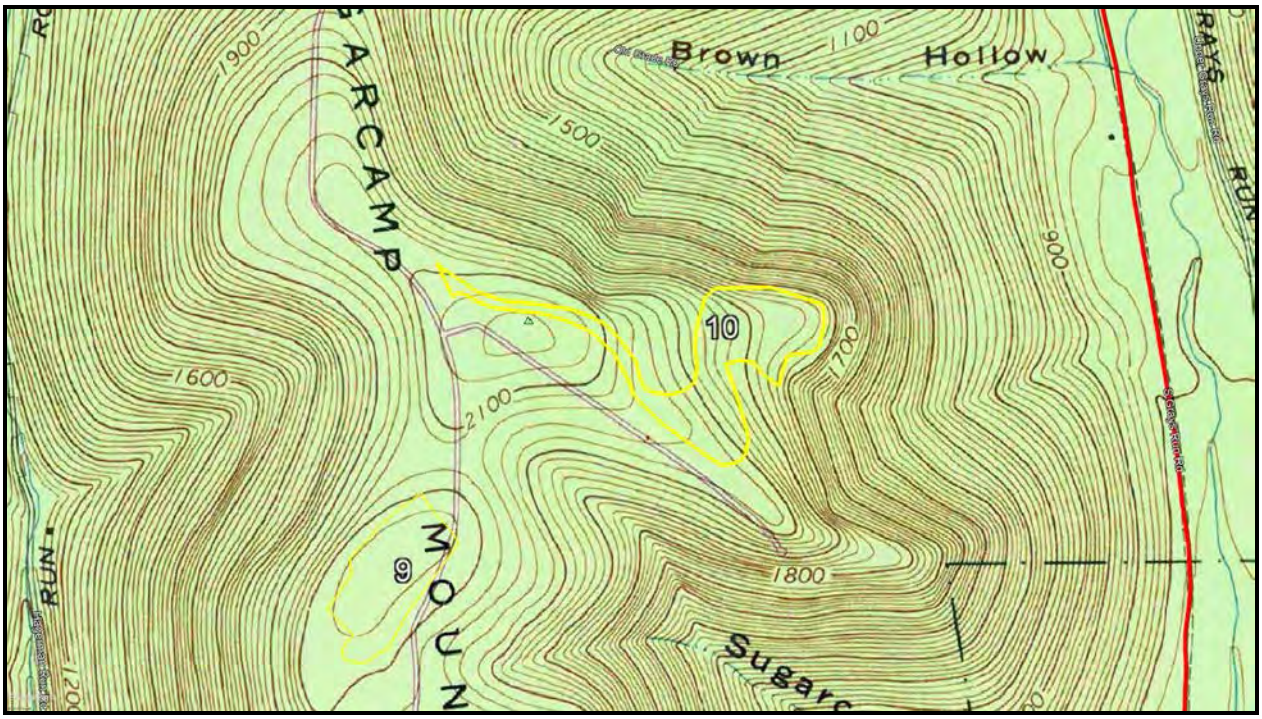
#6 Waste Water tanks looking east

Conversion Site #10 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#7 Surrounding Woodland looking NE

Conversion Site #10 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

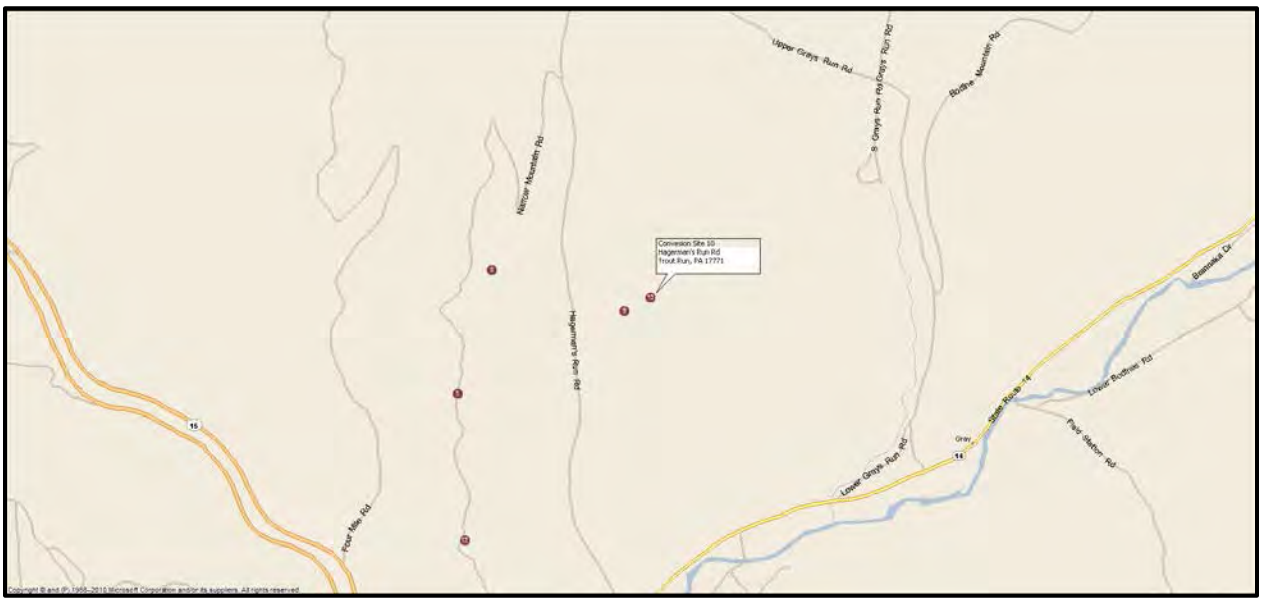
Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

Conversion Site #10 is located in Lewis Township, Lycoming County, on Sugarcamp Mountain Road, east of the intersection with Hageman Run Road, approximately 4 miles north of Trout Run, and 14 miles north of Williamsport. Post Office is Trout Run, PA 17771.

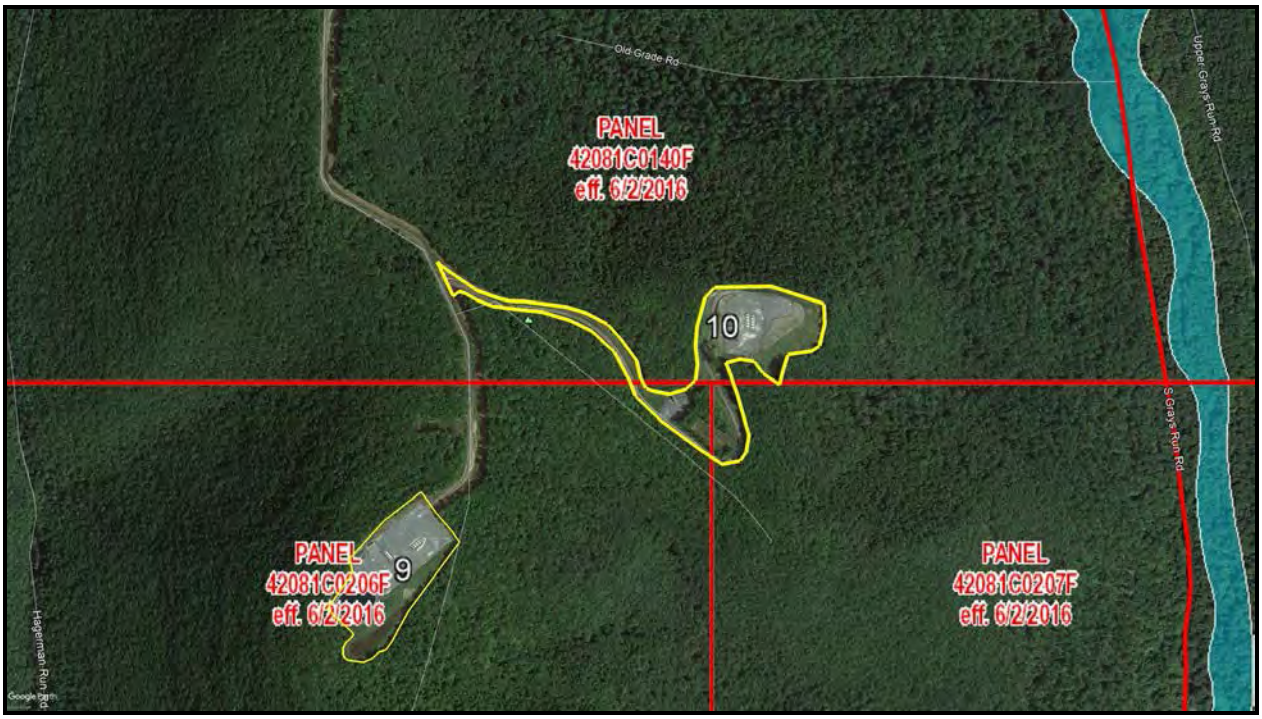


Rental History

No rental – managed by the Bureau of Forestry.

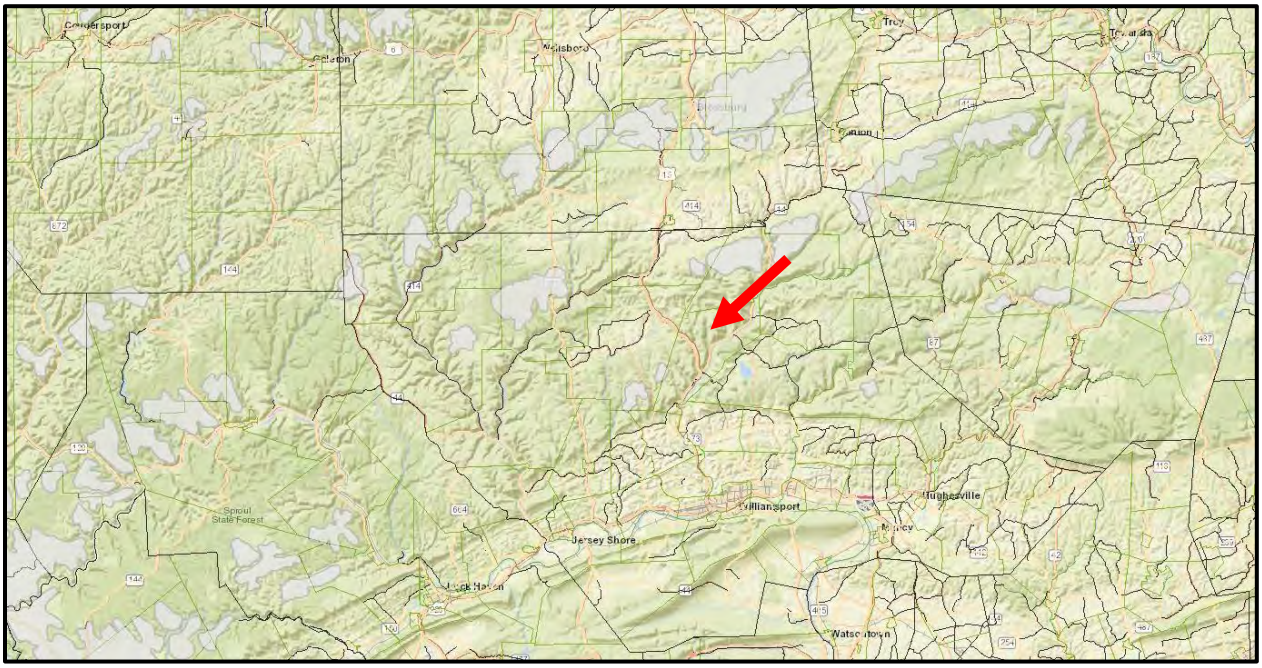
Flood Map Information

The subject is located on FEMA maps 42081C0140F, 42081C0206F, 42081C0207F (map date 6/2/2016). 100% is located in Flood Zone X.



Subsurface Rights

Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Seneca Resources Corporation (Contract #M-110100-20 which covers 8,891 acres of Loyalsock State Forest).

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 10 active wells. The site also has the well heads, conveyance piping, gas processing units, and condensate and brine storage tanks. Additionally, there is one conventional well southeast of the Unconventional well pad. The site was converted in January, 2013.

Map from PA DEP, PA Oil and Gas Mapping website

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: The subject is located in Lycoming County's Resource Protection District as adopted by Lewis Township. The present use complies with the zoning and Lycoming County's Subdivision and Land Development Ordinance.

A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

Conversion Site #11 – Brown Road Relocation

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	John G. Newman
Deed Reference #:	555-719 (Addendum A)
Date of Recording and Purchase:	April 17, 1970
Purchase Price:	$22,000
Deeded Acreage:	443.84 Acres

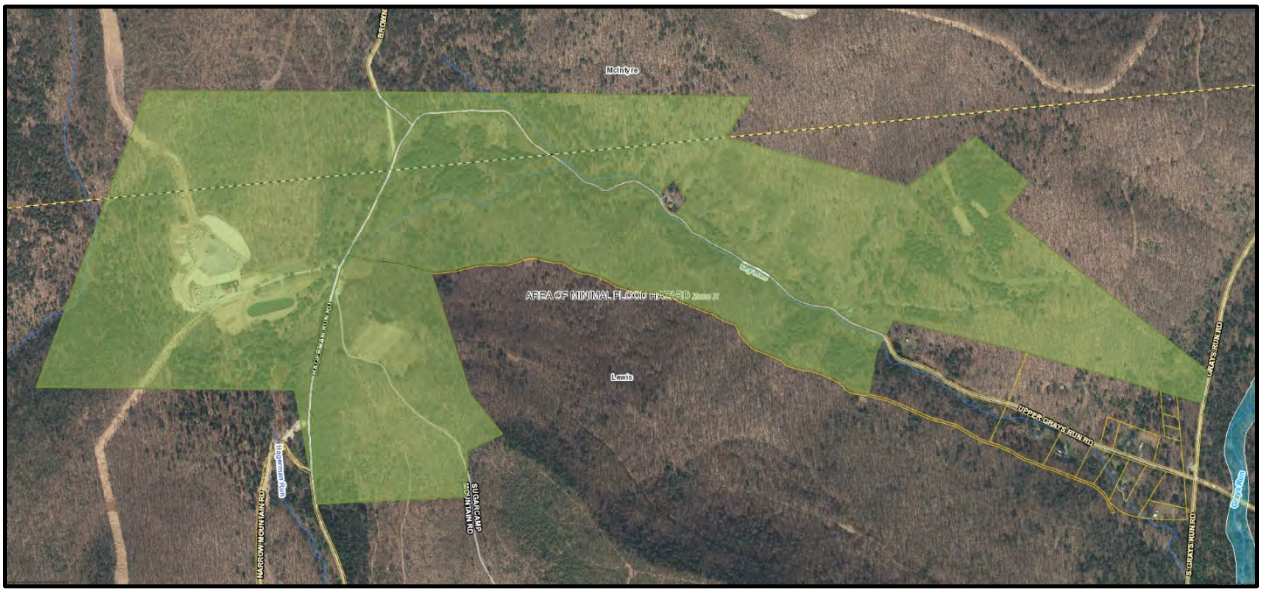
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer was not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #11 is a part of the following tax parcel.

Tax Assessment Identification:	24+,209.0-0122.00-000+
Tax Assessment Ownership:	Commonwealth of PA
Tax Assessment Acreage:	443.84
Market Value Tax Assessment:	$193,120
Act 319 Assessment:	No
Common Level Ratio:	1.36
Indicated Market Value:	$262,643
Millage Rate:	24.052
Annual Market Value Taxes:	$6,317
Annual Act 319 Taxes:	None



Tax Parcel Map - Lycoming County GIS

Acreage

The acreage amount of this site is assumed to be 0.85 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes a changing of an existing road to allow for easier movement of drilling equipment. The road has been improved with crushed stone.

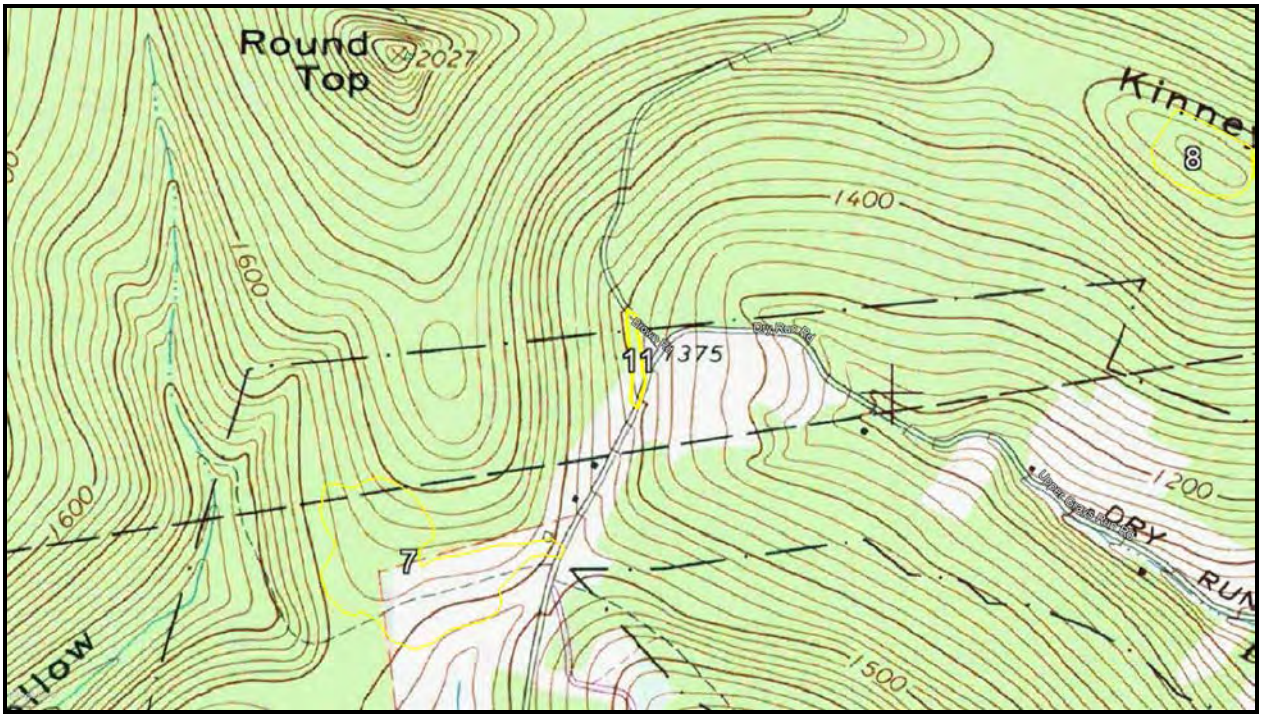
Photo Key Map

©Google Earth 2018

#1 Brown Road Relocation looking north

Conversion Site #11 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the relocation of Brown Road for easier movement of drilling equipment. The property has been improved with crushed limestone covering.

Location

Conversion Site #11 is located in Lewis Township, Lycoming County, on Brown Road, north of the intersection with Hageman Run Road, approximately 5 miles north of Trout Run, and 15 miles north of Williamsport. Post Office is Trout Run, PA 17771.

Rental History

No rental – managed by the Bureau of Forestry.

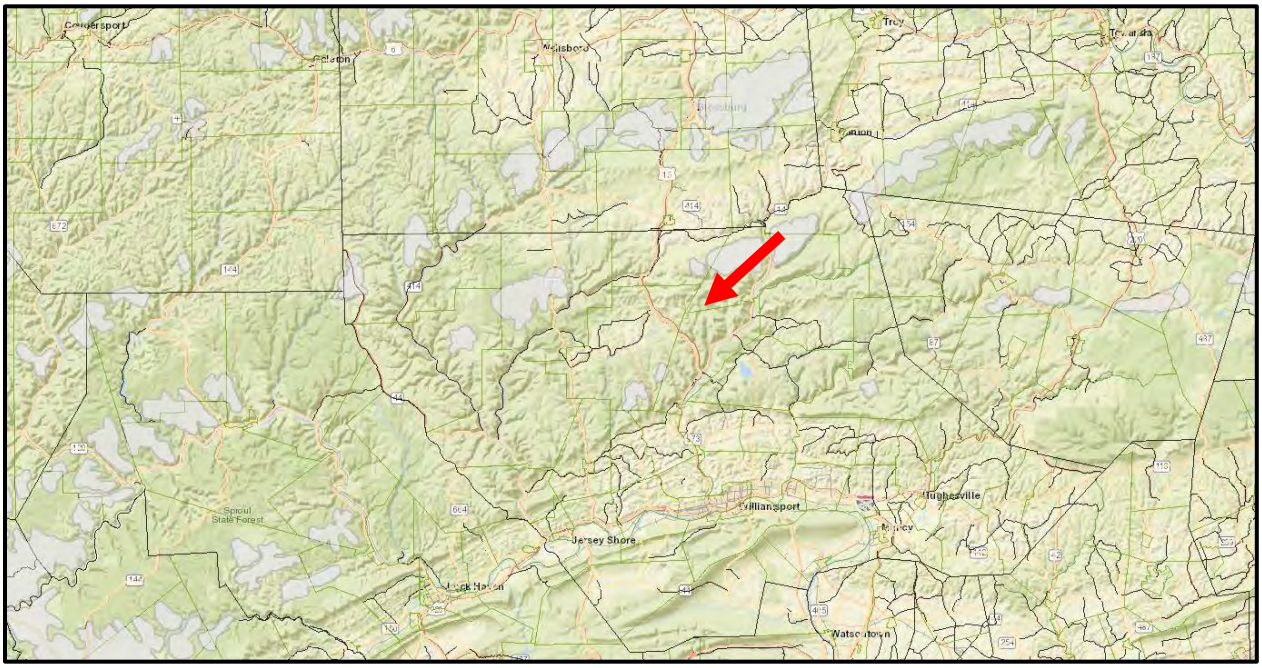
Flood Map Information

The subject is located on FEMA map 42081C0140F (map date 6/2/2016). 100% is located in Flood Zone X.

©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

Coal: Owned by landowner (PA Mine Map indicates there are no known coal fields in this area



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Seneca Resources Corporation (Contract #M-110100-20 which covers 8,891 acres of Loyalsock State Forest).

Oil & Gas Development: The surrounding area have been developed into unconventional well sites. The site was converted in May, 2011.

PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: The subject is located in Lycoming County's Resource Protection District as adopted by MacIntyre Township. The present use complies with zoning and Lycoming County's Subdivision and Land Development Ordinance.

A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

Conversion Site #12 – Pad R

Legal Description & Sales History

Property is deeded to:	The Commonwealth of Pennsylvania
Previous Owner:	George W. & Elizabeth Ann Hoover, Charles & Mary Esther Bartles and Asher D. & Carrie B. Updegraff
Deed Reference #:	204-85 (Addendum A)
Date of Recording and Purchase:	November 6, 1908
Purchase Price:	$6,433.99
Deeded Acreage:	2,339.63 Acres

Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer was not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #12 is a part of the following tax parcel.

Tax Assessment Identification:	24+,500.0-0001.00-000+,
Tax Assessment Ownership:	State Forest & Game Lands
Tax Assessment Acreage:	5,907
Market Value Tax Assessment:	$2,076,290
Act 319 Assessment:	No
Common Level Ratio:	1.36
Indicated Market Value:	$2,826,754
Millage Rate:	24.052
Annual Market Value Taxes:	$67,917
Annual Act 319 Taxes:	None

Tax Parcel Map - Lycoming County GIS

Acreage

The acreage amount of this site is assumed to be 8.65 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

Photo Key Map

©Google Earth 2018

#1 Well Pad & Well Heads looking southwest

Conversion Site #12 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#2 Well Pad looking north

Conversion Site #12 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#3 Gas Processing Equipment looking northeast

Conversion Site #12 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

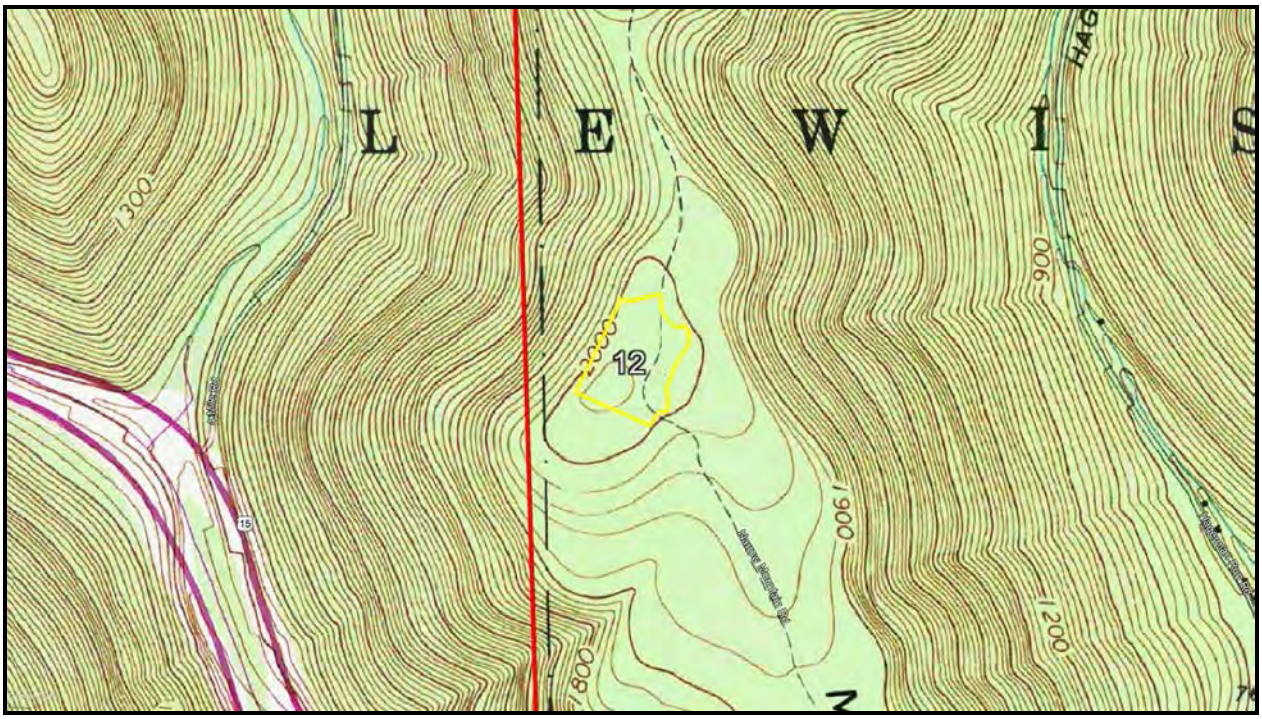
#4 Access looking northwest

Conversion Site #12 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#5 Waste Water Tanks & Surrounding Woodland looking northeast

Conversion Site #12 – Loyalsock State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

Conversion Site #12 is located in Lewis Township, Lycoming County, on Narrow Mountain Road, west of Hageman Run Road, approximately 3 miles north of Trout Run, and 13 miles north of Williamsport. Post Office is Trout Run, PA 17771.

Rental History

No rental – managed by the Bureau of Forestry.

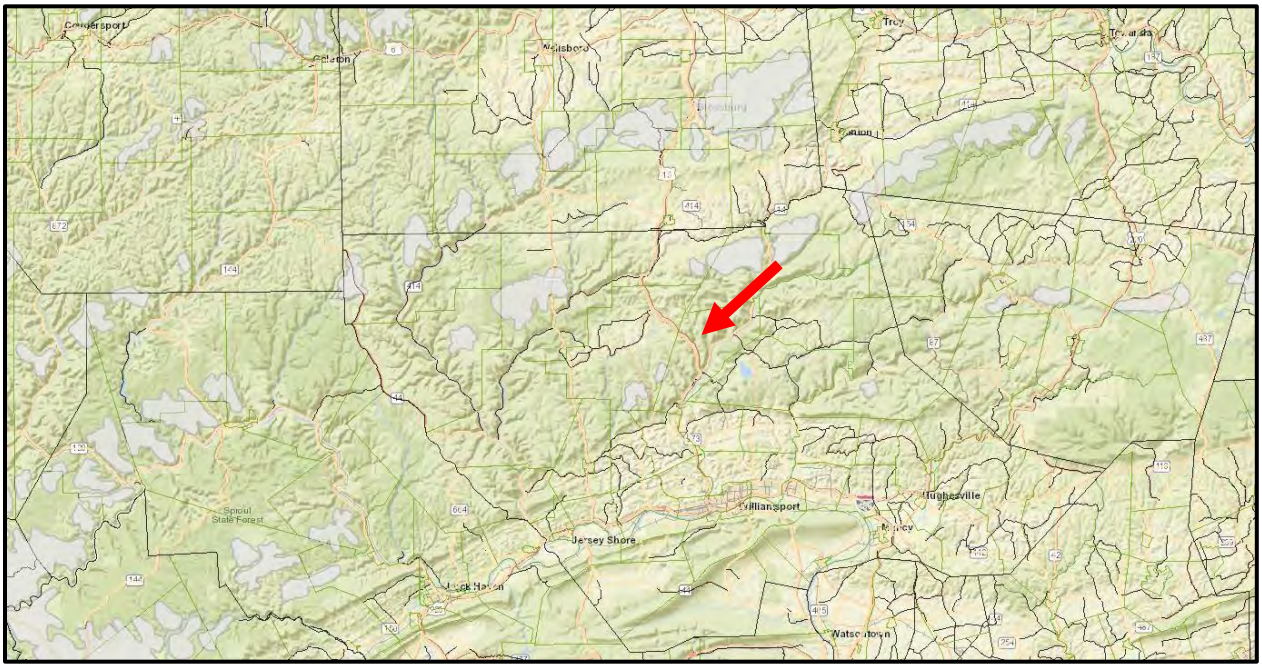
Flood Map Information

The subject is located on FEMA map 42081C0140F (map date 6/2/2016). 100% is located in Flood Zone X.

©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Seneca Resources Corporation (Contract #M-110100-20 which covers 8,891 acres of Loyalsock State Forest).

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 7 active wells. The site also has the well heads, conveyance piping, gas processing units, and condensate and brine storage tanks. Additionally, there is one conventional well southeast of the unconventional well pad. The site was converted in April, 2013.

PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Zoning: The subject is located in Lycoming County's Resource Protection District as adopted by Lewis Township. The present use complies zoning and with Lycoming County's Subdivision and Land Development Ordinance.

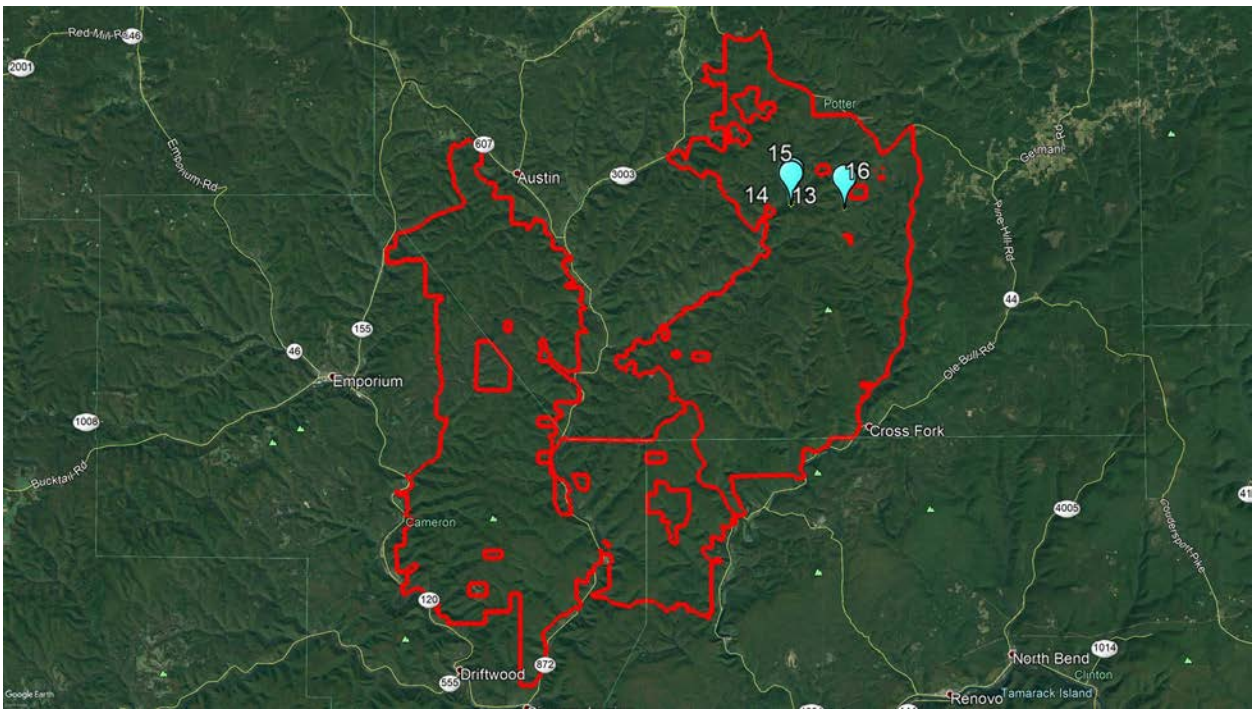
A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

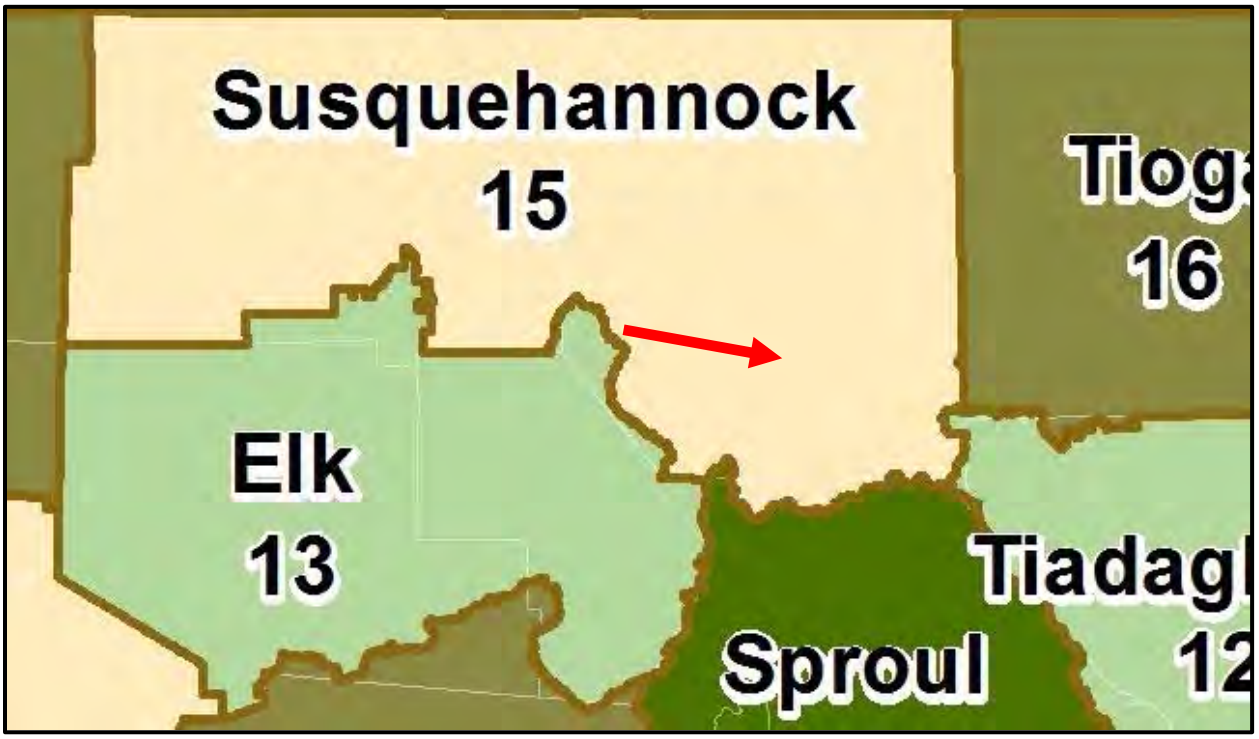
LWCF Area #5 Property Data

The location and size of the LWCF areas are based on GIS information provided by the PA DCNR. Locations for conversion areas #13 thru #16 are identified by the blue tags.



©Google Earth 2018

LWCF Area #5 Map



Susquehannock State Forest District

LWCF Area Acreage

LWCF Area #5 is mostly located within the 265,000 acre District 15 - Susquehannock State Forest. LWCF Area #5 is approximately 160,604 Acres and extends into District 10 – Sproul State Forest and District 13 – Elk State Forest.

Use History

The property has been owned by the Commonwealth of PA for many decades. The Bureau of Forestry is charged with managing the State Forests for two primary reasons.

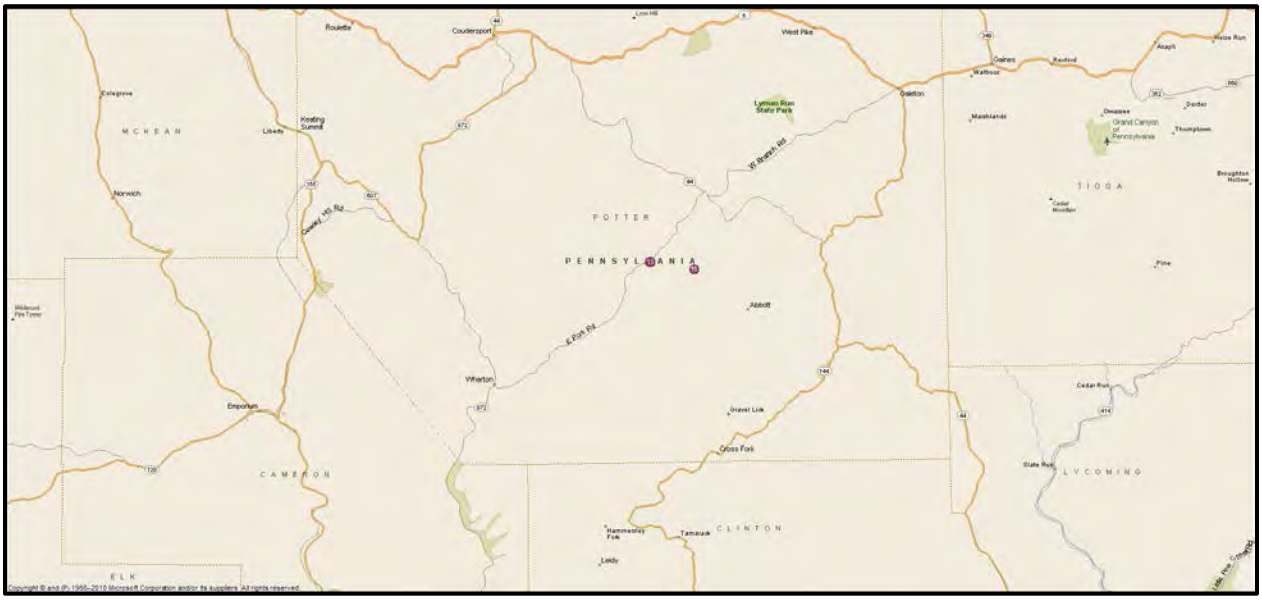
The first is forest recreation. Forest recreation is one of the most common ways that people connect with and enjoy the state forest. The state forest system provides bountiful opportunities for citizens to recreate and enjoy the forest.

The second use, Management of state forests, is guided by Penn's Woods, the bureau's strategic plan, and the State Forest Resource Management Plan. The district staff promotes wild plant conservation and private forest land conservation and stewardship.

The area has had unconventional gas well drilling into the Marcellus Shale within the last decade. This use has caused a land use from forested recreation to well pads, impoundment areas, compressor stations and transmission pipelines.

Location

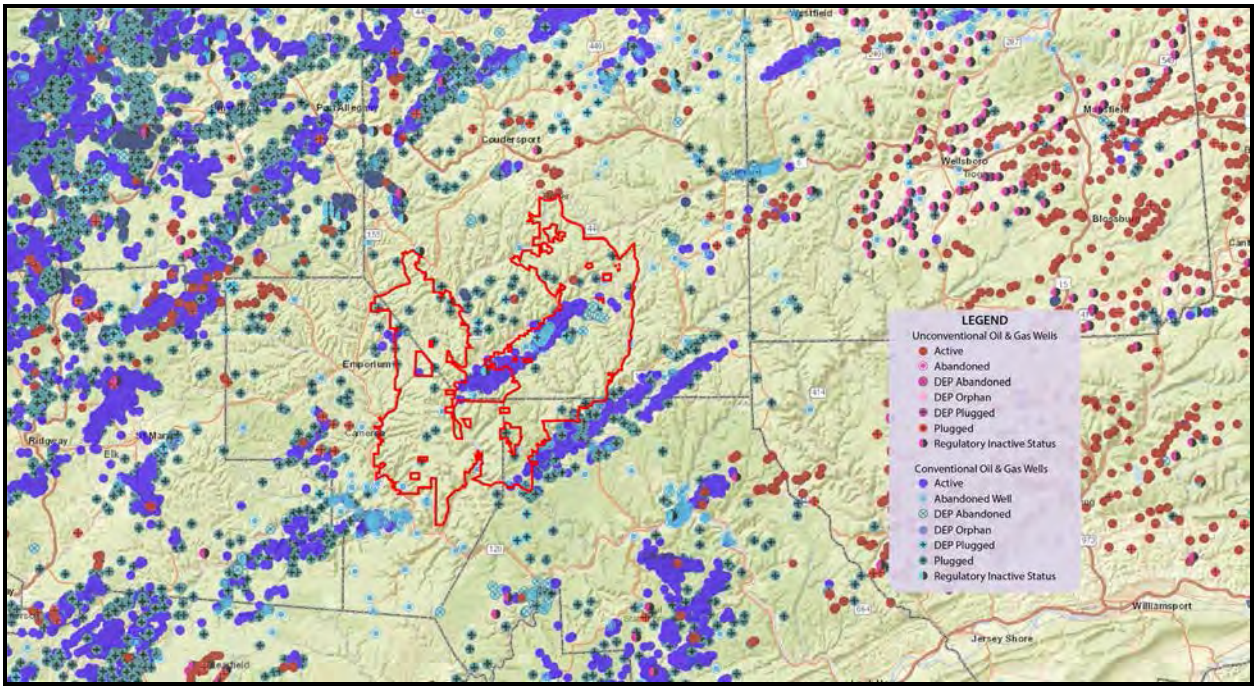
LWCF Area #5 is located in the southern portion of Potter County, in northeastern Cameron County and northwestern Clinton County.



Environmental

The scope of this appraisal does not include any environmental audits or testing for hazardous materials. No apparent environmental concerns were noted. However, as in the case of all real estate, the owners of the subject property are advised to have a complete understanding of the environmental issues surrounding the subject site. As such, a Phase I environmental audit is recommended.

Gas Wells in Proximity to LWCF Area #5



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of LWCF Area #5

Conversion Site #13 – PGE Pine Hill Pad A

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Emporium Lumber Company
Deed Reference #:	108-186 (Addendum A)
Date of Recording and Purchase:	February 1, 1929
Purchase Price:	$71,365
Deeded Acreage:	25,950.91 Acres

Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer was not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #13 is a part of the following tax parcel.

Tax Assessment Identification:	310-013-001
Tax Assessment Ownership:	Commonwealth of Penna
Tax Assessment Acreage:	27,378
Market Value Tax Assessment:	$4,106,720
Act 319 Assessment:	No
Common Level Ratio:	2.77
Indicated Market Value:	$11,375,614
Millage Rate:	84.995
Annual Market Value Taxes:	$966,870
Annual Act 319 Taxes:	None

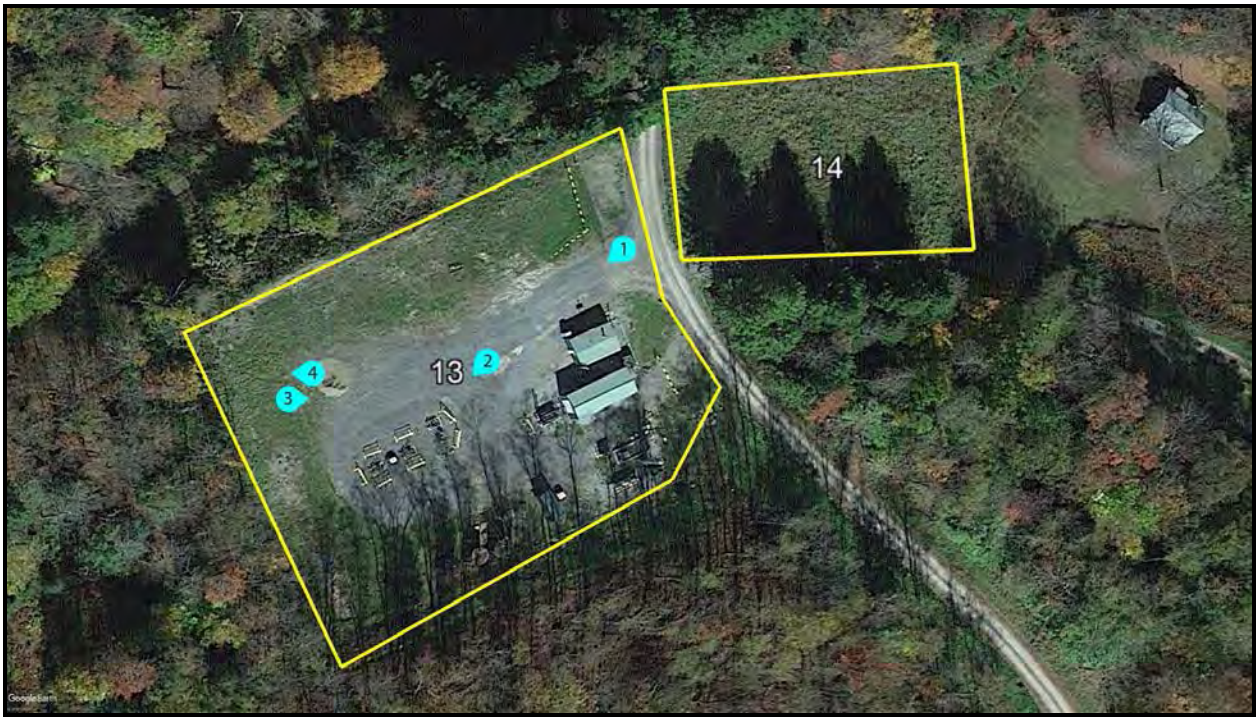
Tax Parcel Map - Potter County GIS

Acreage

The acreage amount of this site is assumed to be 1.47 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

Photo Key Map



©Google Earth 2018

#1 Pad Site looking southwest

Conversion Site #13 – Susquehannock State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

#2 Well Heads looking southwest

Conversion Site #13 – Susquehannock State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

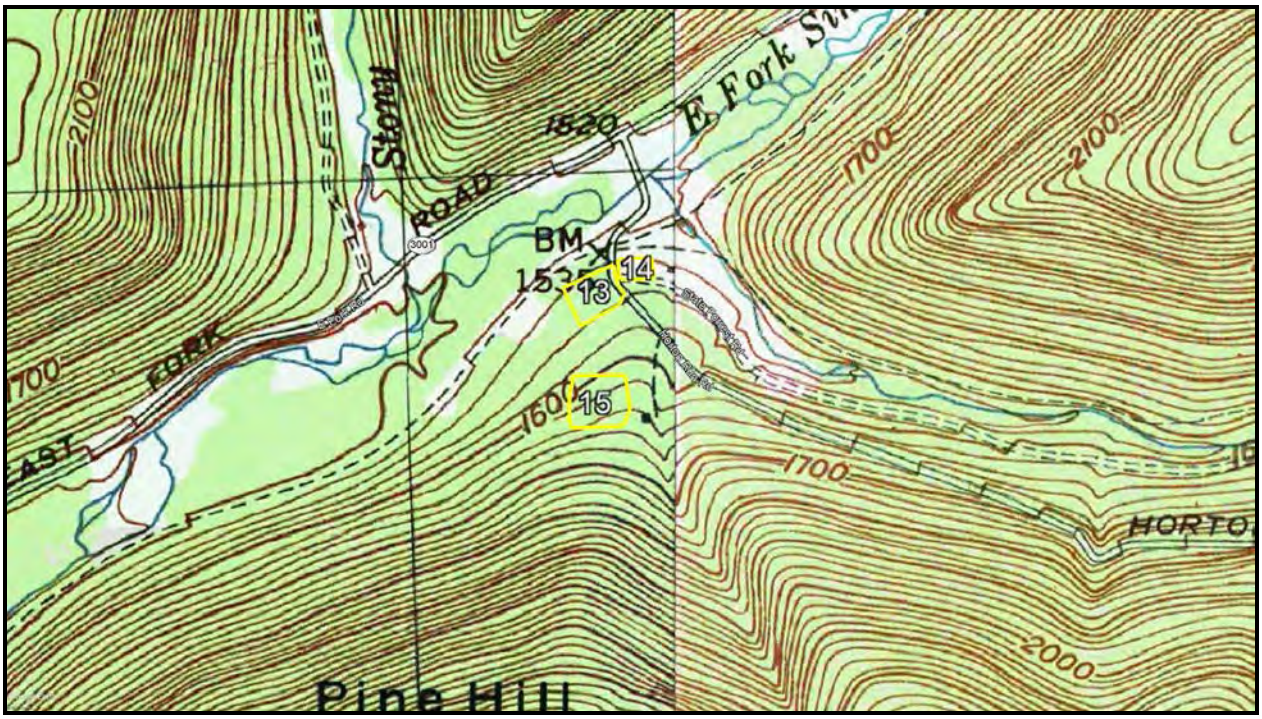
#3 Pad Site looking east

Conversion Site #13 – Susquehannock State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

#4 Surrounding Woodland looking west

Conversion Site #13 – Susquehannock State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

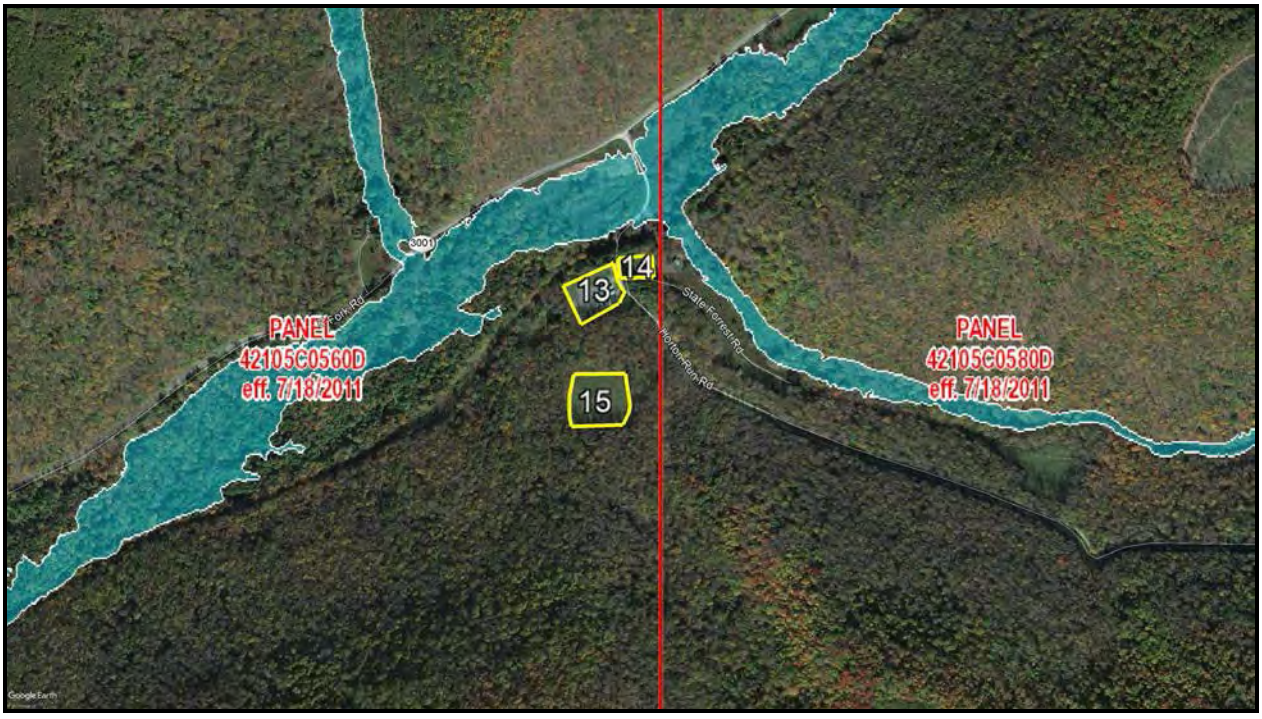
Conversion Site #13 is located in Wharton Township, Potter County, on Horton Run Road, east of the intersection with E. Fork Road. It is approximately 14 miles southeast of Coudersport (Potter County Seat). Post office is Austin, PA 16720.

Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

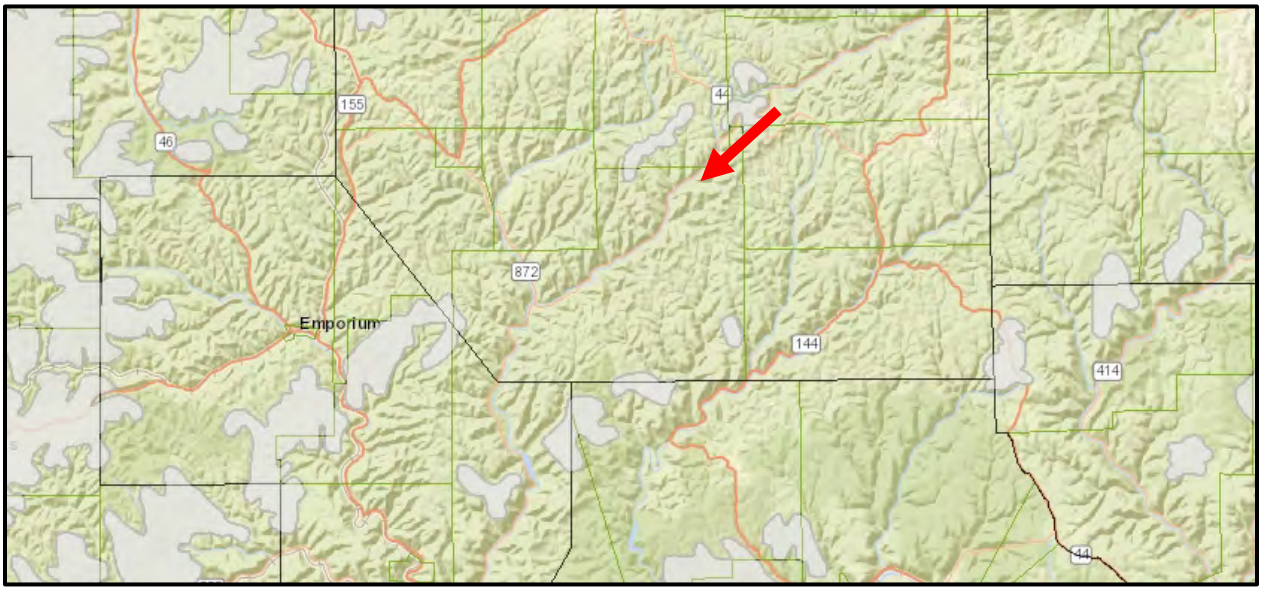
The subject is located on FEMA map 42105C0560D (map date 7/18/2011). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

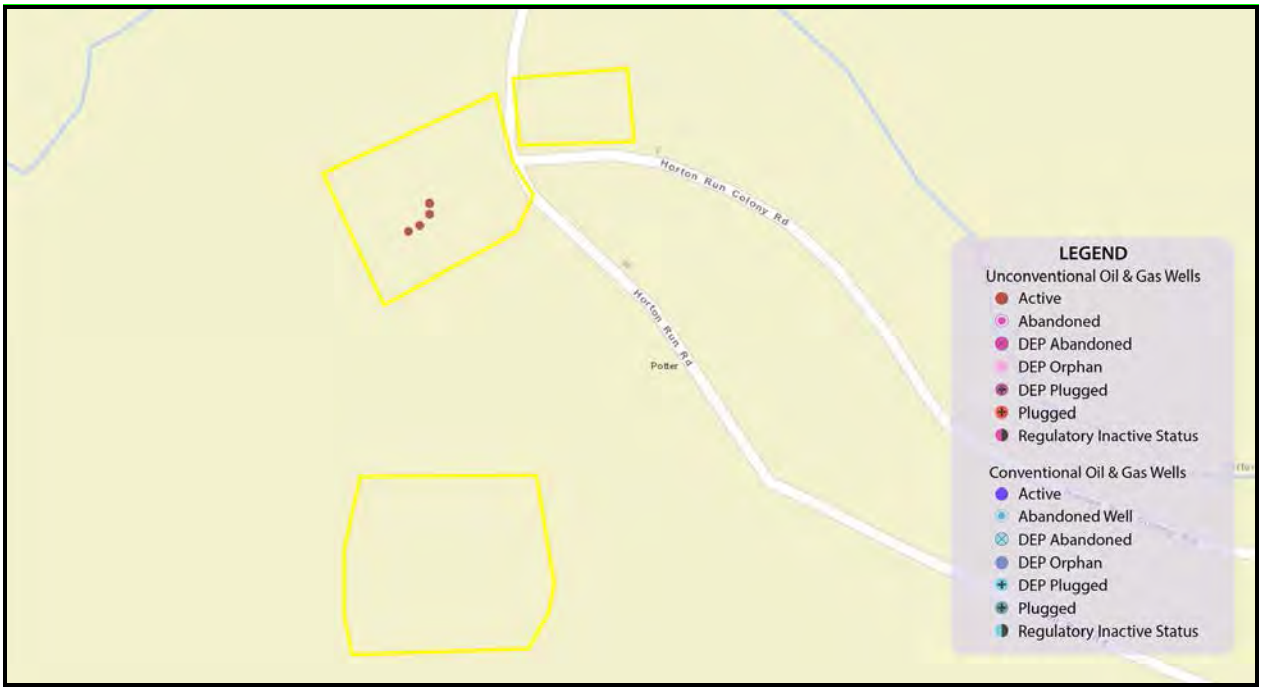
Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Pennsylvania General Energy Company (East Penn Development Company is original lessee, lease was modified on December 22, 2003 (Deed 17-756) which covers 23,000 acres of Susquehannock State Forest).

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 4 active wells. The site also has the well heads, conveyance piping, gas processing units, and condensate and brine storage tanks. The site was converted in September, 2007.



PA DEP, PA Oil and Gas Mapping

Other Minerals: No severance – none known to exist

Zoning & SALDO

Wharton Township has no zoning. The present use complies with Potter County's Subdivision and Land Development Ordinance.

Easements

Unrecorded highway ROW's.

Conversion Site #14 – Pine Hill Impoundment

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Emporium Lumber Company
Deed Reference #:	108-186 (Addendum A)
Date of Recording and Purchase:	February 1, 1929
Purchase Price:	$71,365
Deeded Acreage:	25,950.91 Acres

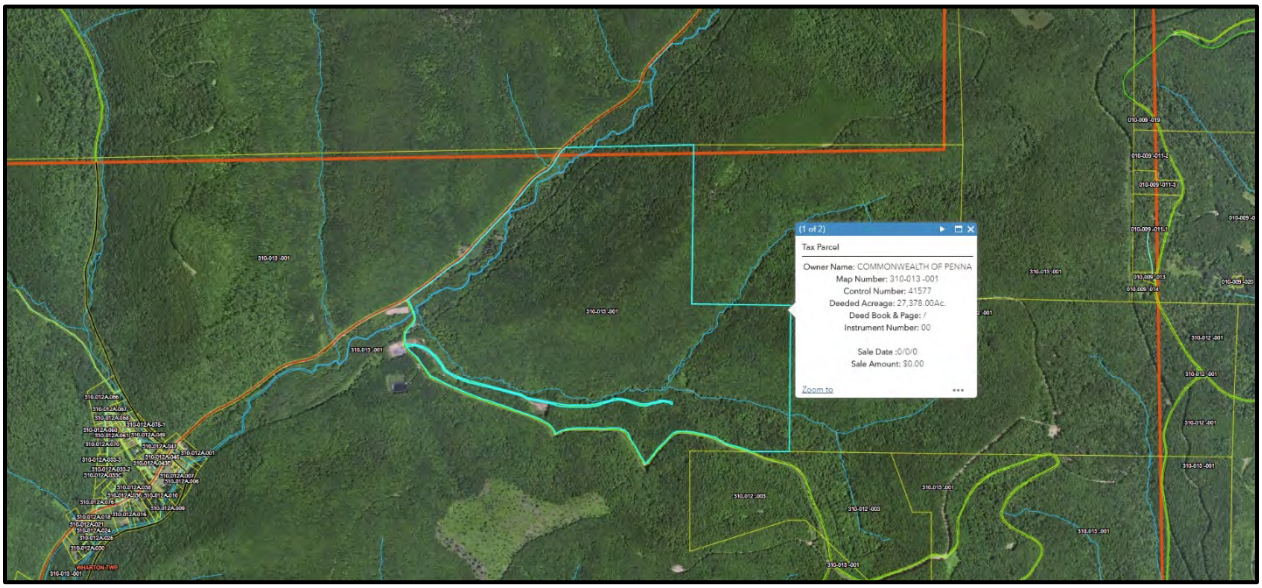
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer was not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #13 is a part of the following tax parcel.

Tax Assessment Identification:	310-013-001
Tax Assessment Ownership:	Commonwealth of Penna
Tax Assessment Acreage:	27,378
Market Value Tax Assessment:	$4,106,720
Act 319 Assessment:	No
Common Level Ratio:	2.77
Indicated Market Value:	$11,375,614
Millage Rate:	84.995
Annual Market Value Taxes:	$966,870
Annual Act 319 Taxes:	None



Tax Parcel Map - Potter County GIS

Acreage

The acreage amount of this site is assumed to be 0.48 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

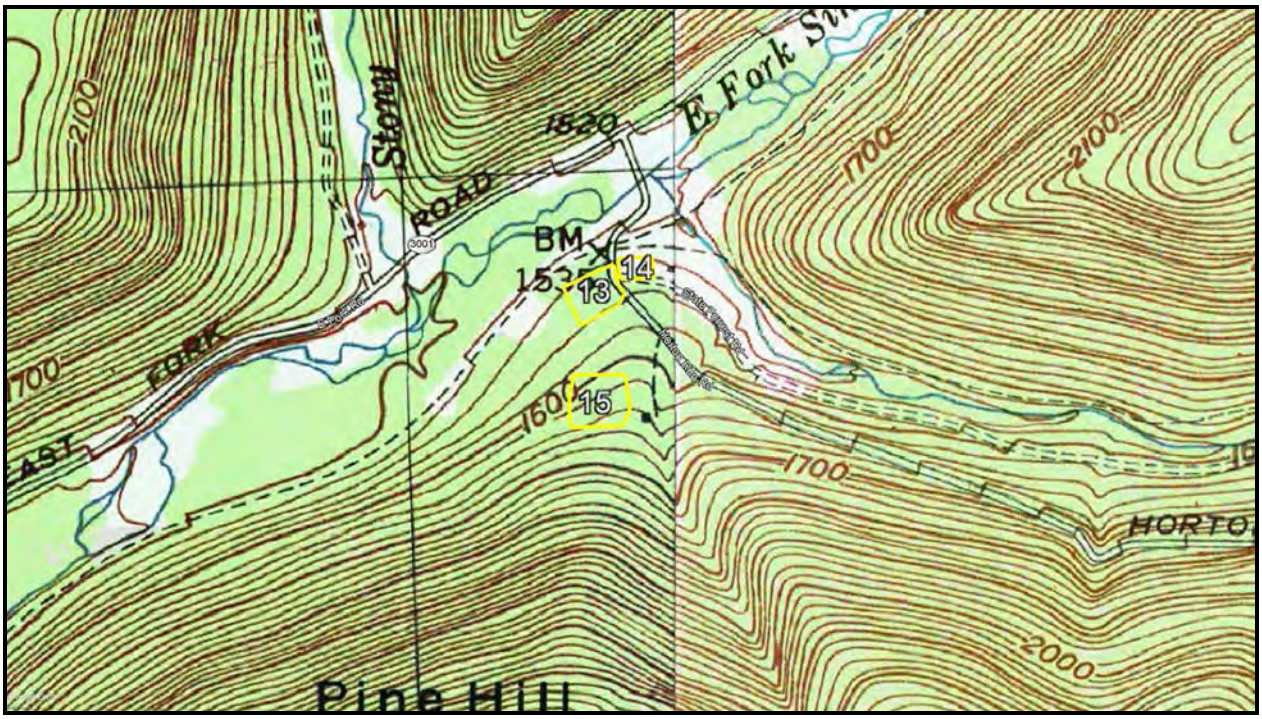
The conversion site had been used for a water impoundment site. It has since been reclaimed as an herbaceous wildlife opening.

Photo Key Map

#1 Reclaimed Impoundment
looking northeast

Conversion Site #14 – Susquehannock State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

Overall Surrounding Topography: Gentle slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

None – Conversion site has been reclaimed

Location

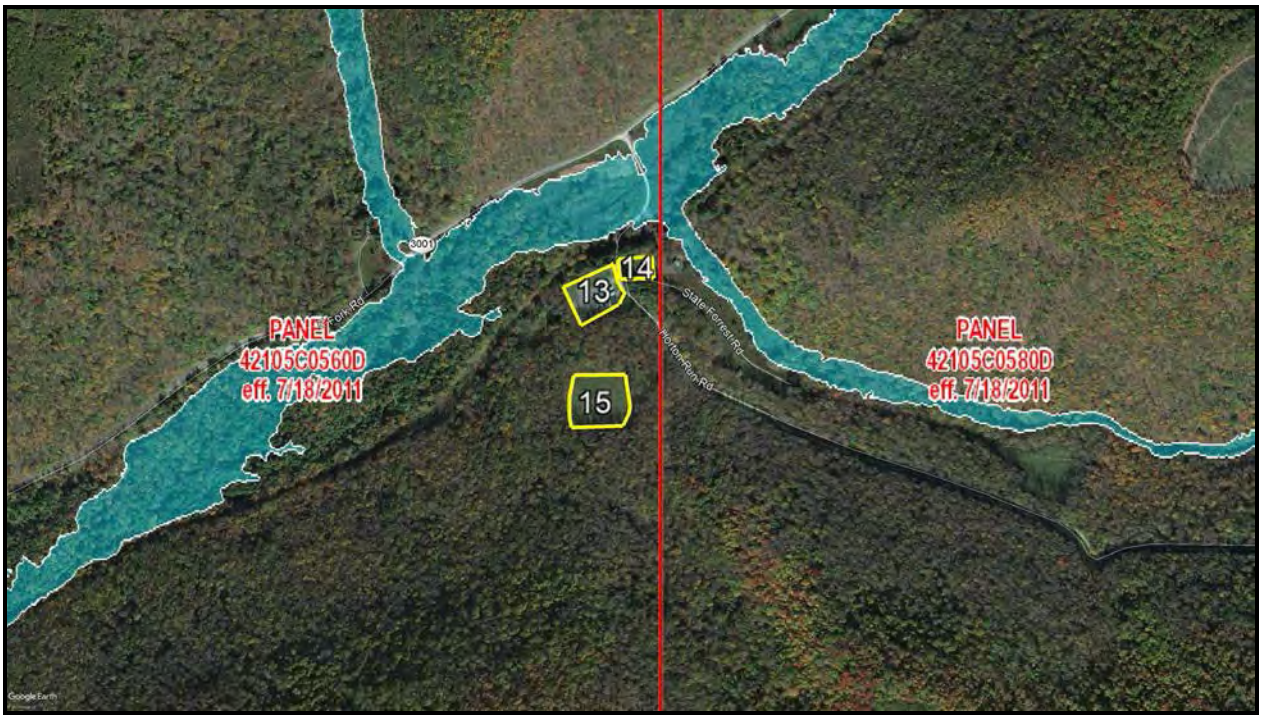
Conversion Site #14 is located in Wharton Township, Potter County, at the intersection of Horton Run Road and State Forest Road, east of the intersection with E. Fork Road. It is approximately 14 miles southeast of Coudersport (Potter County Seat). Post office is Austin, PA 16720.

Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

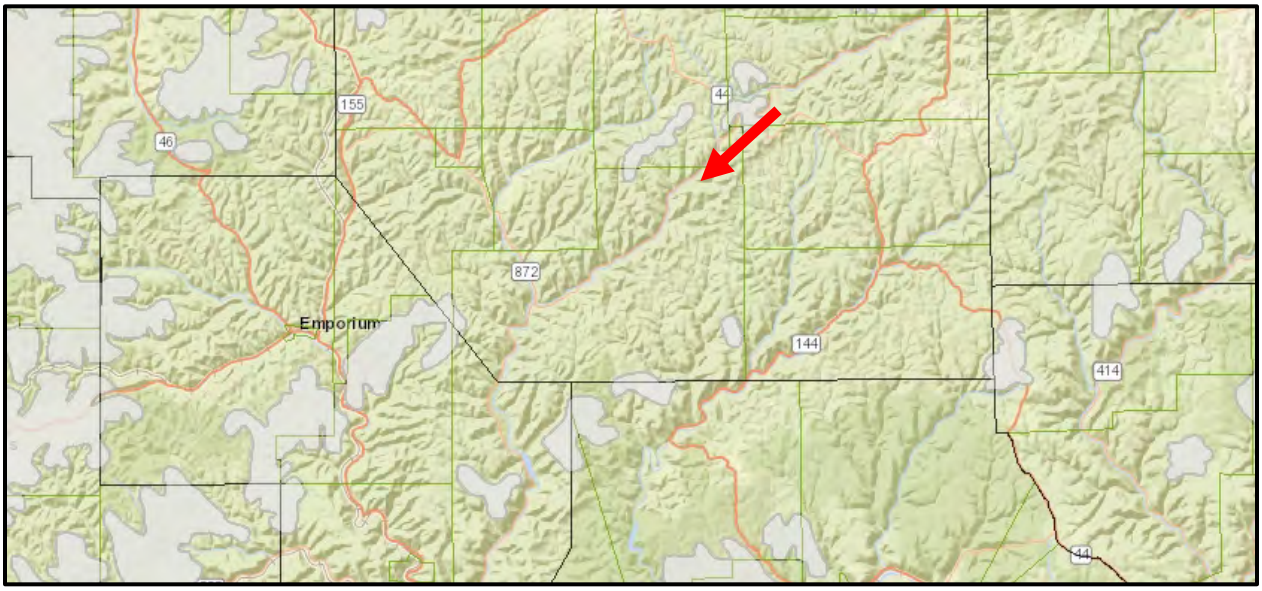
The subject is located on FEMA map 420105C0560D (map date 7/18/2011). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

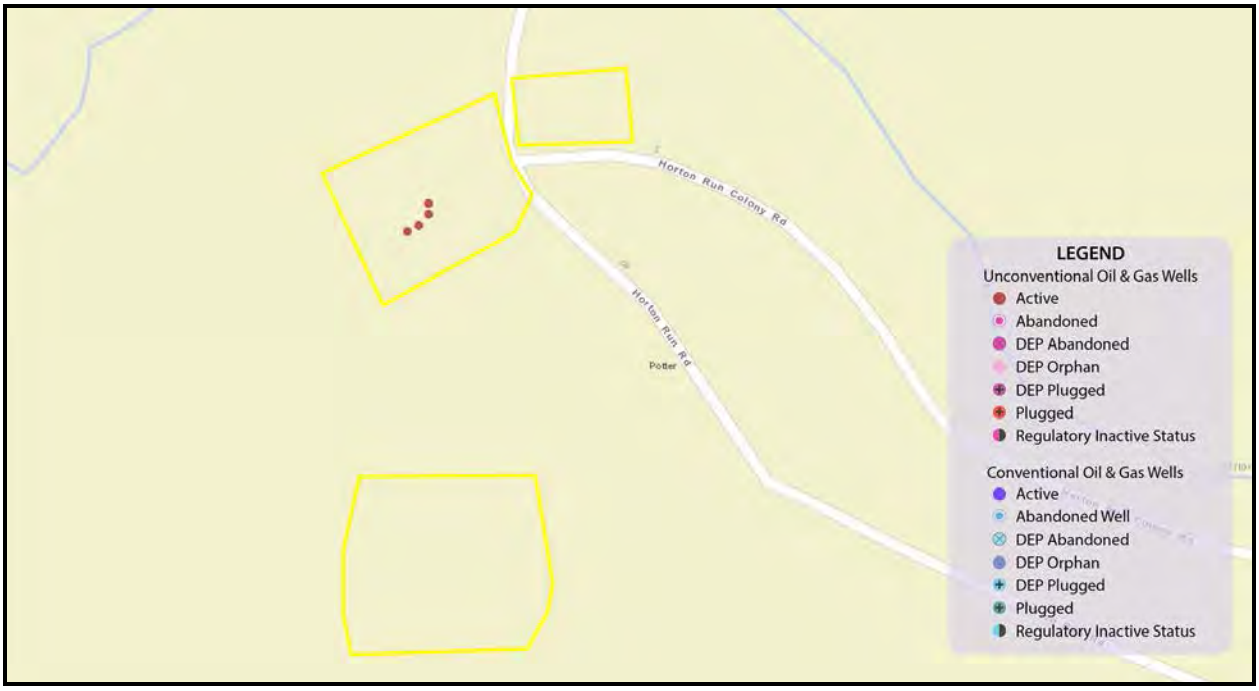
Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Pennsylvania General Energy Company (East Penn Development Company is original lessee, lease was modified on December 22, 2003 (Deed 17-756) which covers 23,000 acres of Susquehannock State Forest).

Oil & Gas Development: The conversion site is adjacent to an active well pad. The site was converted in September, 2007 for use in developing the adjacent well pad.



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist.

Zoning & SALDO

Wharton Township has no zoning. The present use complies with Potter County's Subdivision and Land Development Ordinance.

Easements

Unrecorded highway ROW's.

Conversion Site #15 – PGE Pine Hill Impoundment A

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Emporium Lumber Company
Deed Reference #:	108-186 (Addendum A)
Date of Recording and Purchase:	February 1, 1929
Purchase Price:	$71,365
Deeded Acreage:	25,950.91 Acres

Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer was not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #13 is a part of the following tax parcel.

Tax Assessment Identification:	310-013-001
Tax Assessment Ownership:	Commonwealth of Penna
Tax Assessment Acreage:	27,378
Market Value Tax Assessment:	$4,106,720
Act 319 Assessment:	No
Common Level Ratio:	2.77
Indicated Market Value:	$11,375,614
Millage Rate:	84.995
Annual Market Value Taxes:	$966,870
Annual Act 319 Taxes:	None

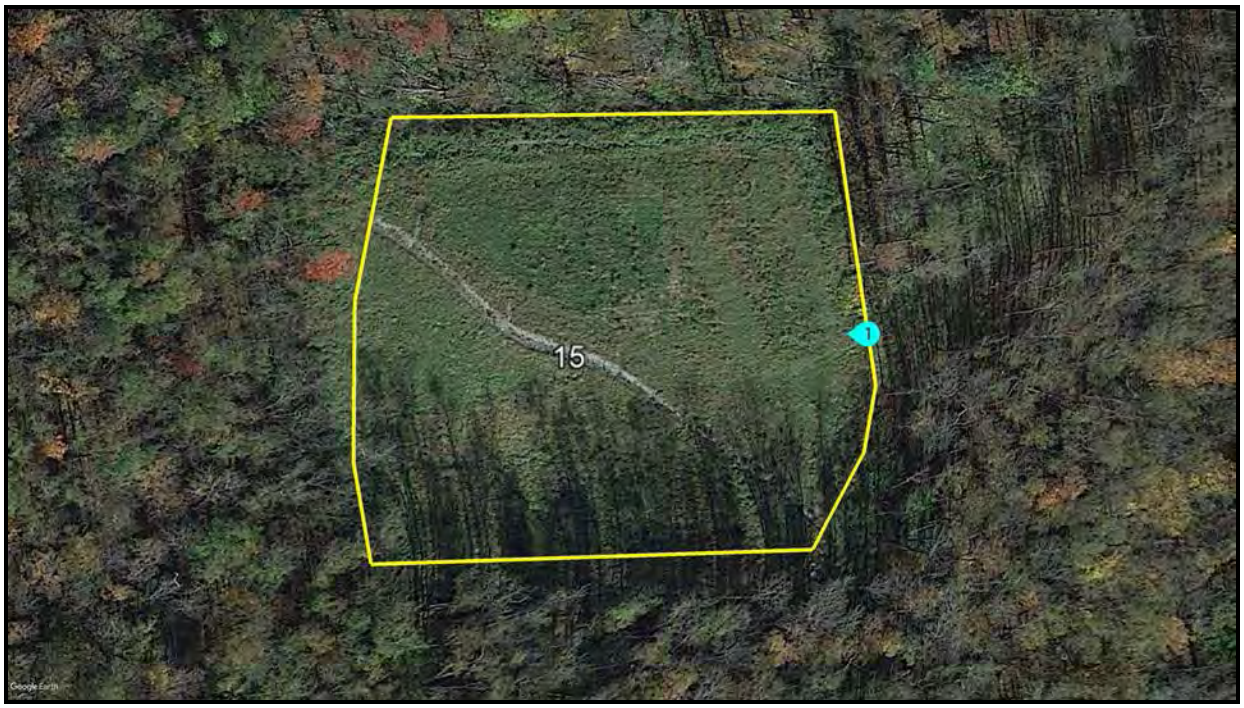
Tax Parcel Map - Potter County GIS

Acreage

The acreage amount of this site is assumed to be 2.05 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

The conversion site had been used for a water impoundment site. It has since been reclaimed as an herbaceous wildlife opening.

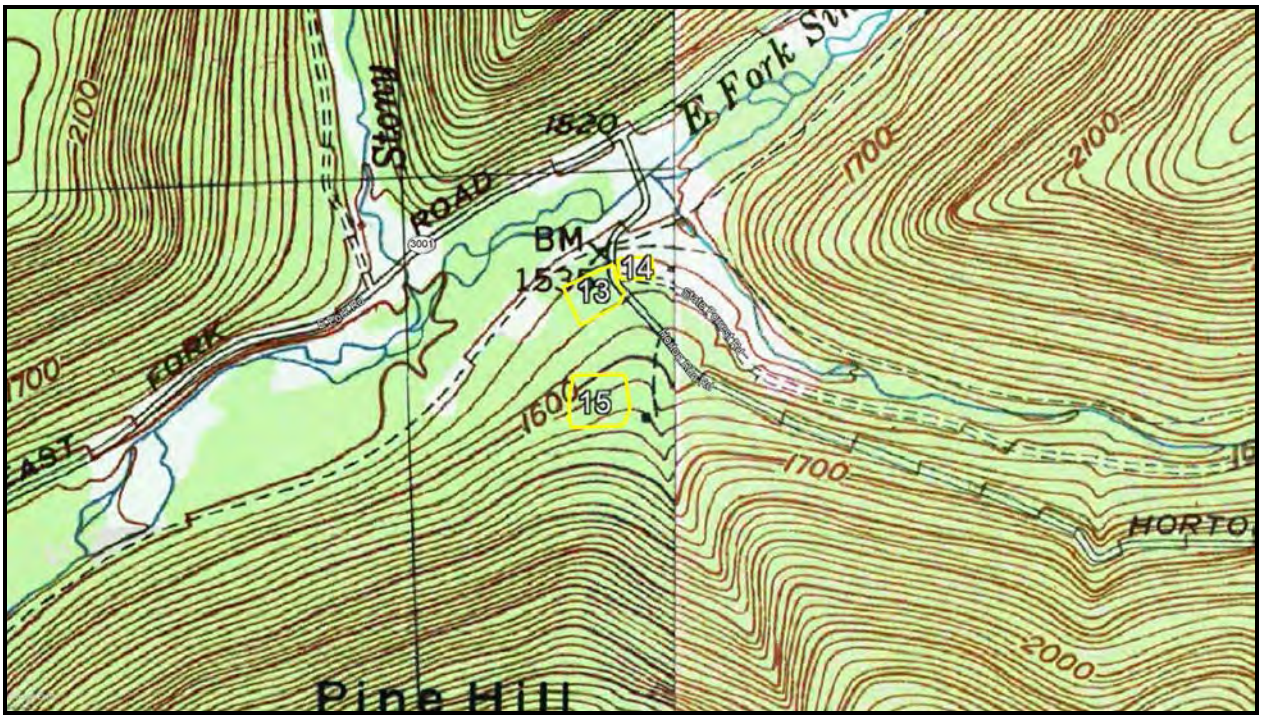
Photo Key Map



#1 Reclaimed impoundment looking west

Conversion Site #15 – Susquehannock State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

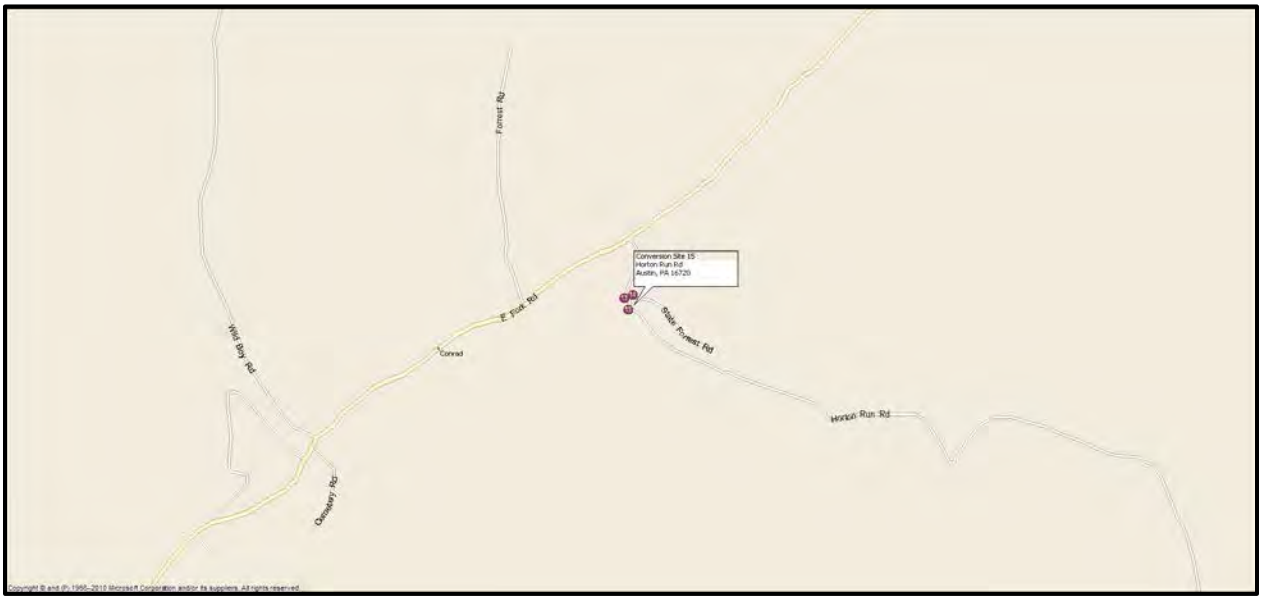
Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

None – Conversion site has been reclaimed

Location

Conversion Site #15 is located in Wharton Township, Potter County, on Horton Run Road, east of the intersection with E. Fork Road. It is approximately 14 miles southeast of Coudersport (Potter County Seat). Post office is Austin, PA 16720.

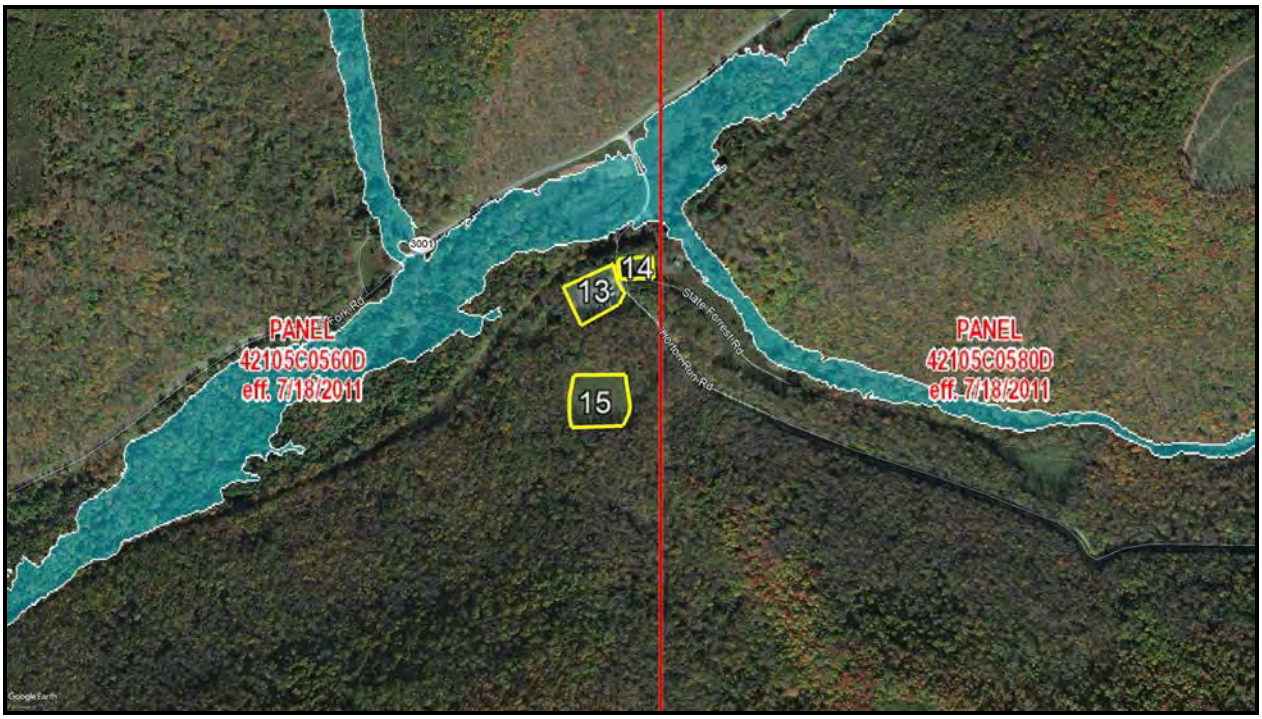


Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

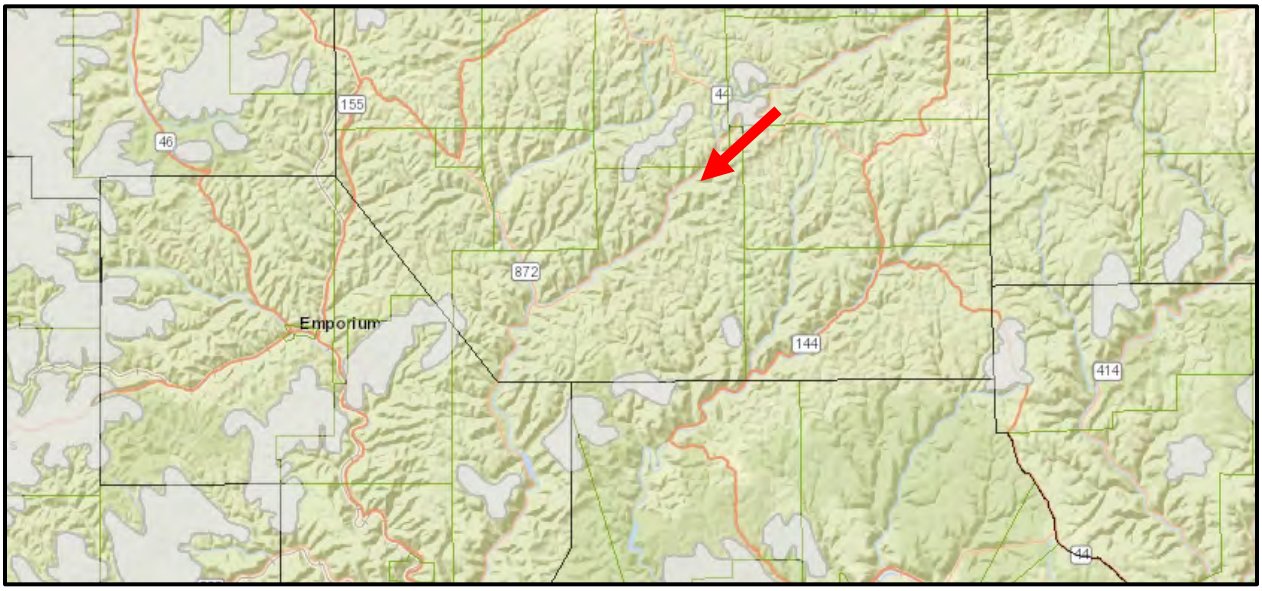
The subject is located on FEMA map 42105C0560D (map date 7/18/2011). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

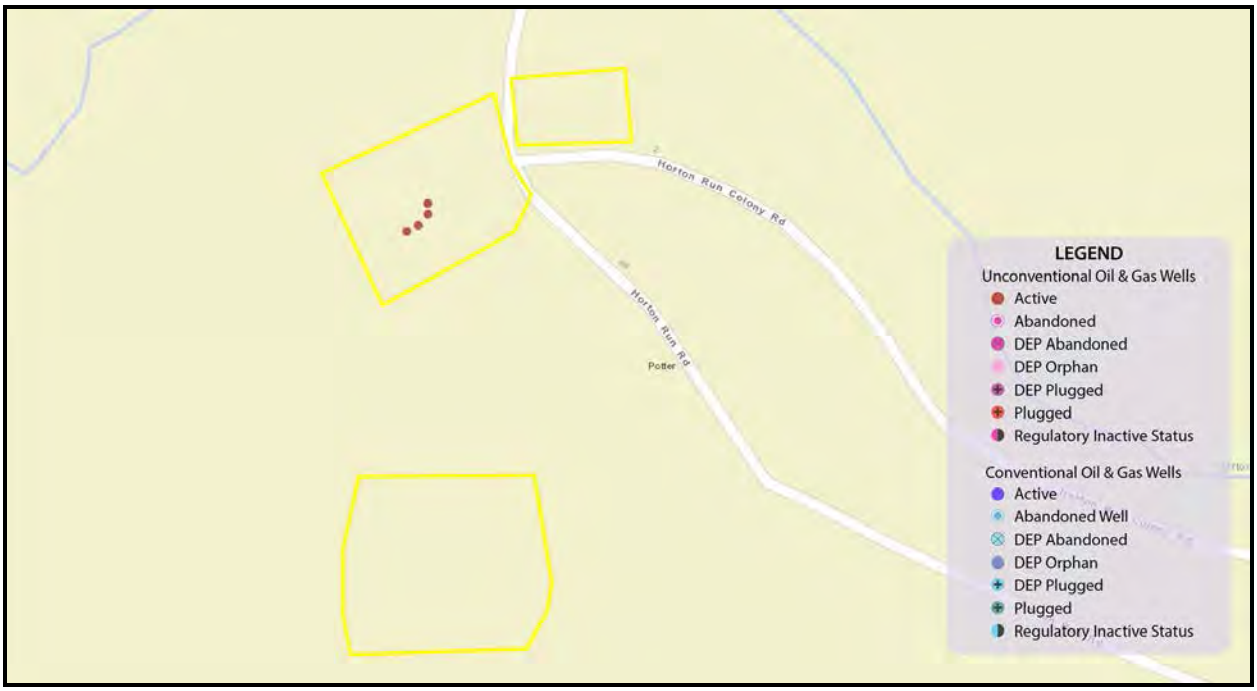
Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Owned by Landowner, leased to Pennsylvania General Energy Company (East Penn Development Company is original lessee, lease was modified on December 22, 2003 (Deed 17-756) which covers 23,000 acres of Susquehannock State Forest).

Oil & Gas Development: The conversion site is adjacent to an active well pad. The site was converted in May, 2009 for use in developing the adjacent well pad.



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

Wharton Township has no zoning. The present use complies with Potter County's Subdivision and Land Development Ordinance.

Easements

Unrecorded highway ROW's.

Conversion Site #16 – PGE Pine Hill Compressor

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Masonite Corporation
Deed Reference #:	196-1062 (Addendum A)
Date of Recording and Purchase:	May 22, 1975
Purchase Price:	$1
Deeded Acreage:	5,082.39 Acres

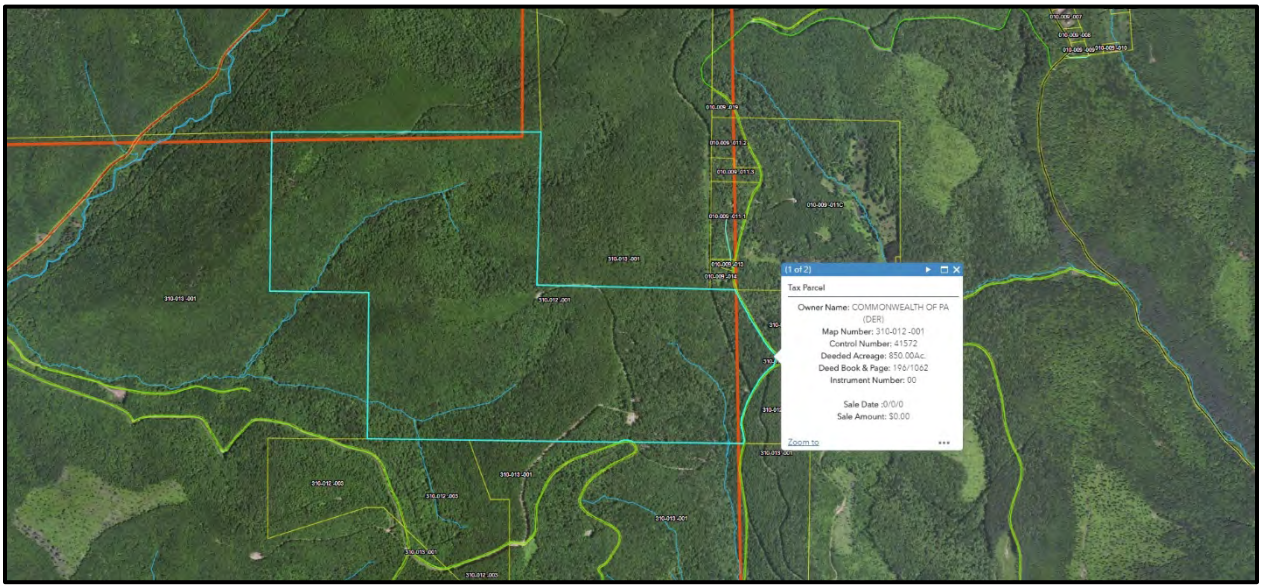
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer is not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #16 is a part of the following tax parcel.

Tax Assessment Identification:	310-012-001
Tax Assessment Ownership:	Commonwealth of PA
Tax Assessment Acreage:	850
Market Value Tax Assessment:	$127,520
Act 319 Assessment:	No
Common Level Ratio:	2.77
Indicated Market Value:	$353,230
Millage Rate:	84.995
Annual Market Value Taxes:	$30,023
Annual Act 319 Taxes:	None



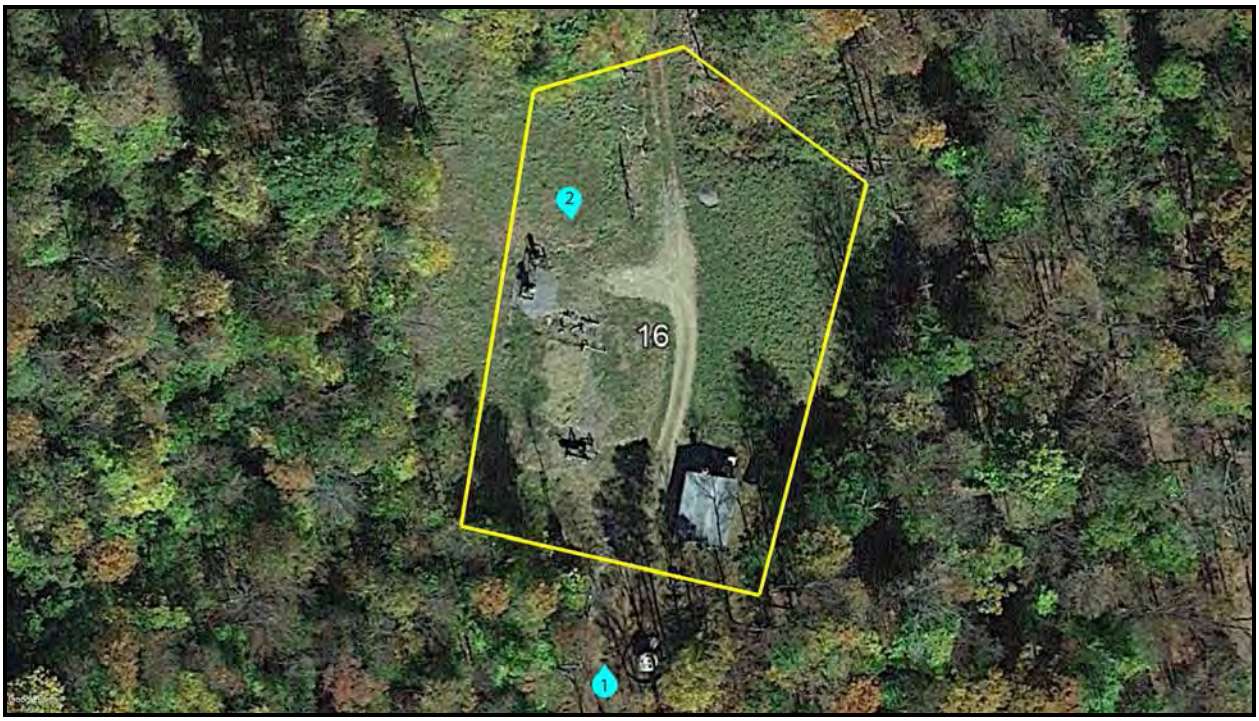
Tax Parcel Map - Potter County GIS

Acreage

The acreage amount of this site is assumed to be 0.77 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes a compressor station and the access road to the compressor station site. The access road and compressor site have been improved with crushed stone.

Photo Key Map



©Google Earth 2018

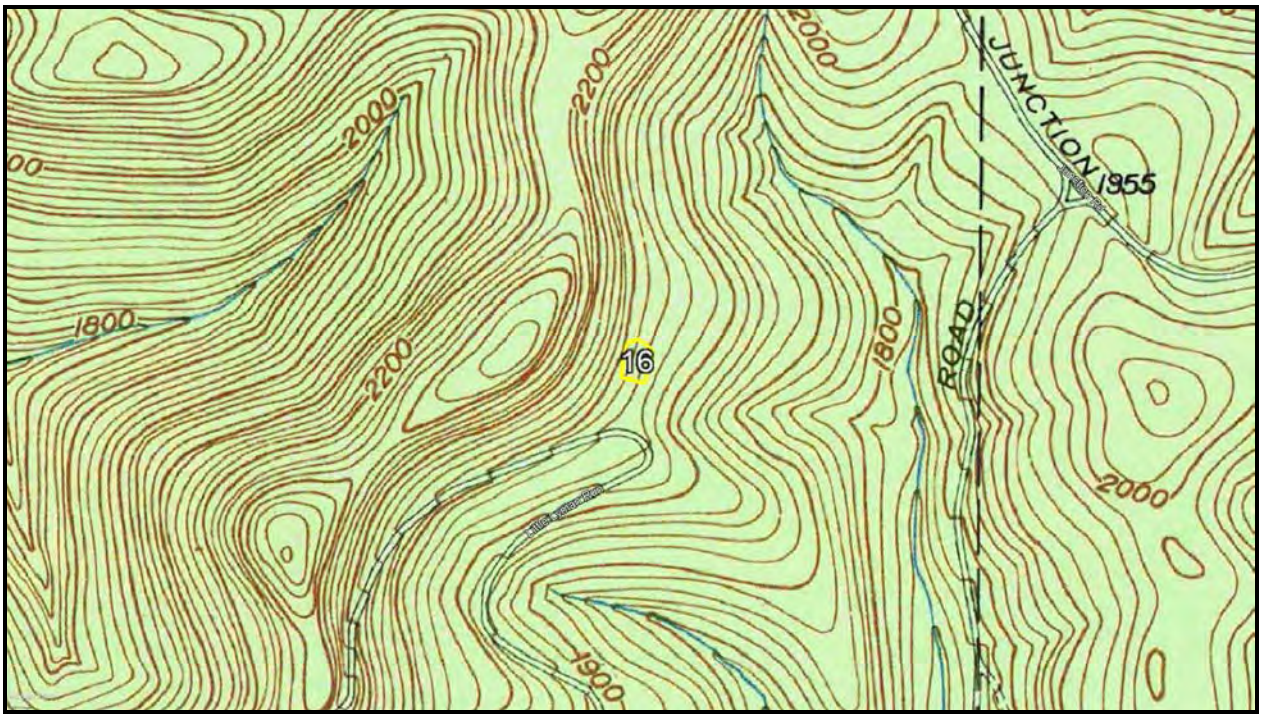
#1 Compressor Site looking north

Conversion Site #16 – Susquehannock State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

#2 Compressor Site looking south

Conversion Site #16 – Susquehannock State Forest, PA
Photo by Gregory L. Snyder 8/21/2018

Overall Surrounding Topography: Steep slopes



©Google Earth 2018 & USGS National Map

Topographic Map

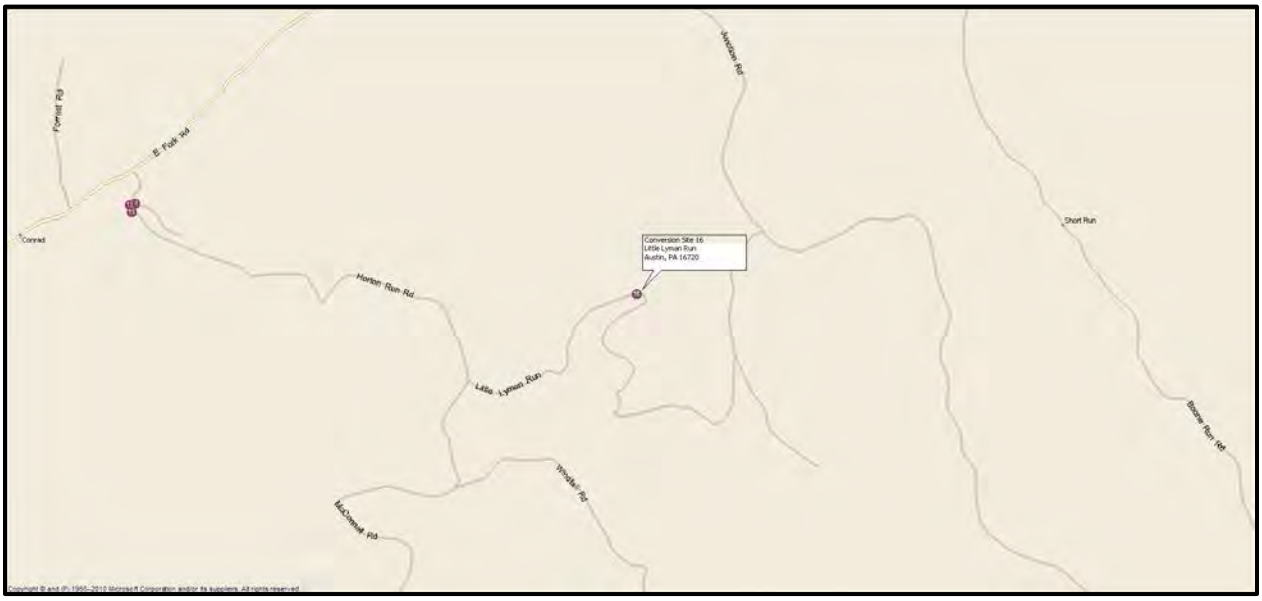
Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate a compressor station that is used in the transmission of the natural gas from surrounding unconventional wells. The improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

Conversion Site #16 is located in Wharton Township, Potter County, on Little Lyman Run, east of the intersection with Horton Run Road. It is approximately 15 miles southeast of Coudersport (Potter County Seat). Post office is Austin, PA 16720.



Rental History

No rental – managed by the Bureau of Forestry.

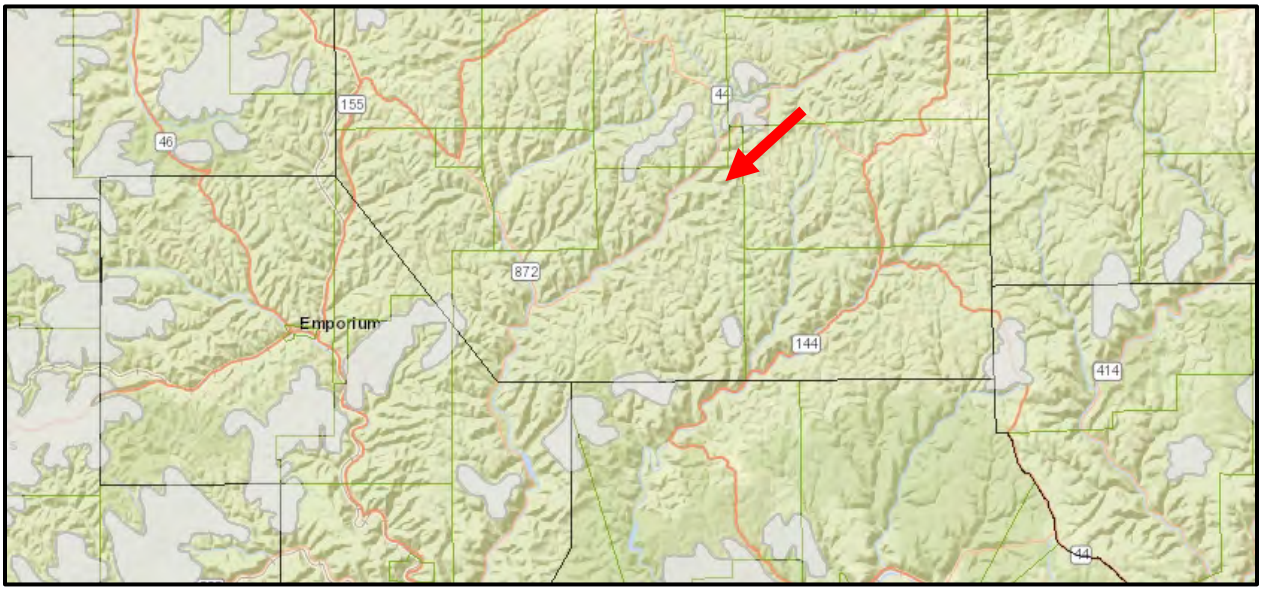
Flood Map Information

The subject is located on FEMA map 42105C0580D (map date 7/18/2011). 100% is located in Flood Zone X.

©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

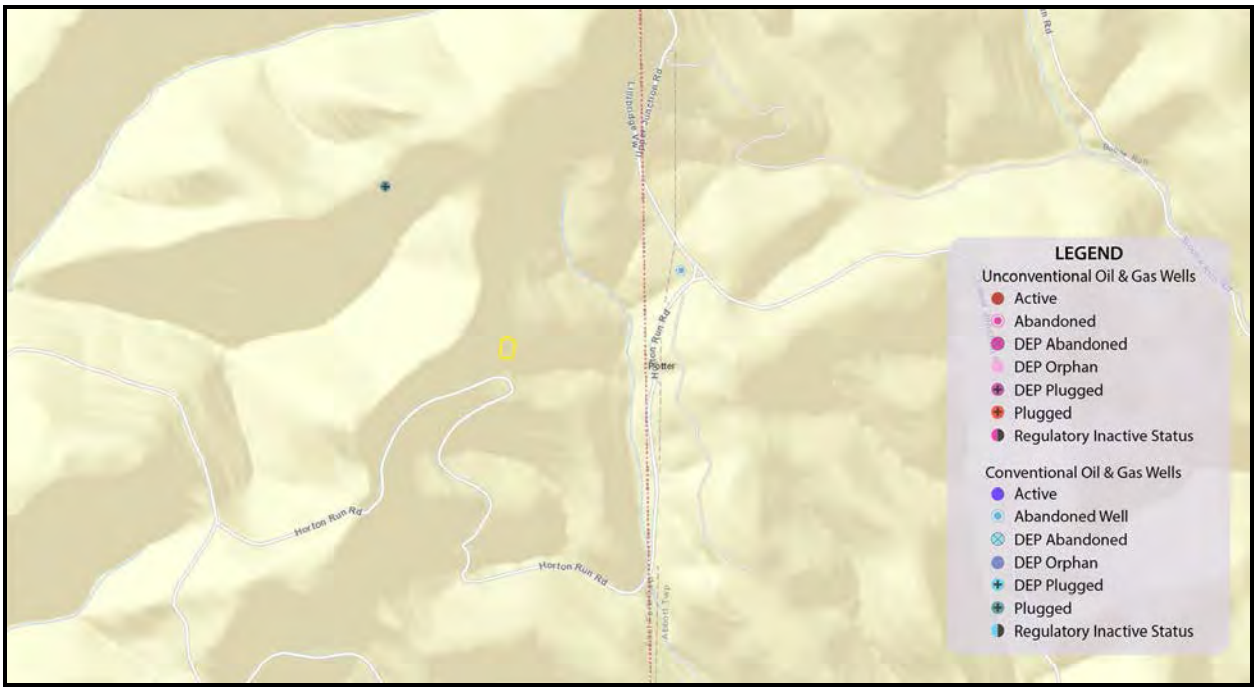
Coal: Severed and owned by another party (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – Pennsylvania DEP

Oil & Gas: Severed – owned by another party.

Oil & Gas Development: The conversion site has been developed into a compressor station used in the transmission of gas from surrounding wells. The site has a compressor and supporting equipment and piping. The site was converted on June 2011.



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – none known to exist

Zoning & SALDO

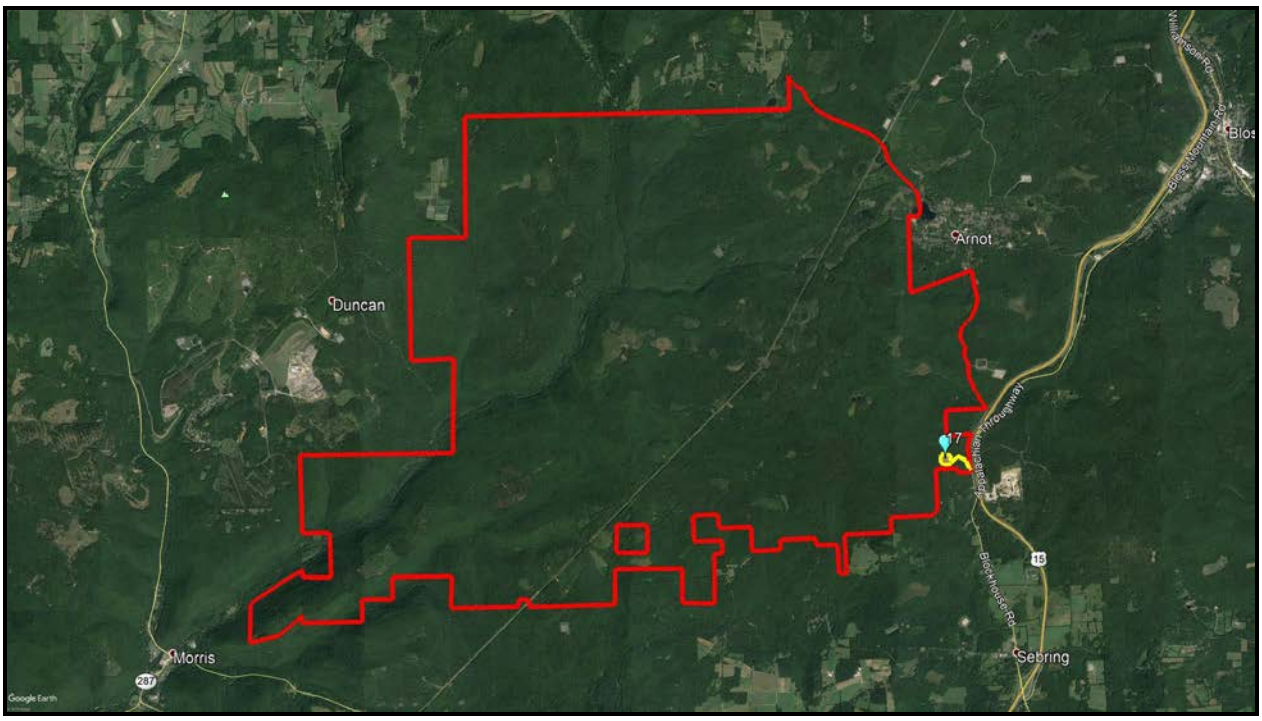
Wharton Township has no zoning. The present use complies with Potter County's Subdivision and Land Development Ordinance.

Easements

Unrecorded highway ROW's.

LWCF Area #6 Property Data

The location and size of the LWCF areas are based on GIS information provided by the PA DCNR. Locations for conversion areas #1 and #2 are identified by the blue tags.



LWCF Area #6 Map

Tioga State Forest Map

LWCF Area Acreage

LWCF Area #6 is located within the 161,890 acre District 16 - Tioga State Forest. The LWCF Area #1 is 19,597.60 Acres.

Use History

The property has been owned by the Commonwealth of PA for many decades. The Bureau of Forestry is charged with managing the State Forests for two primary reasons.

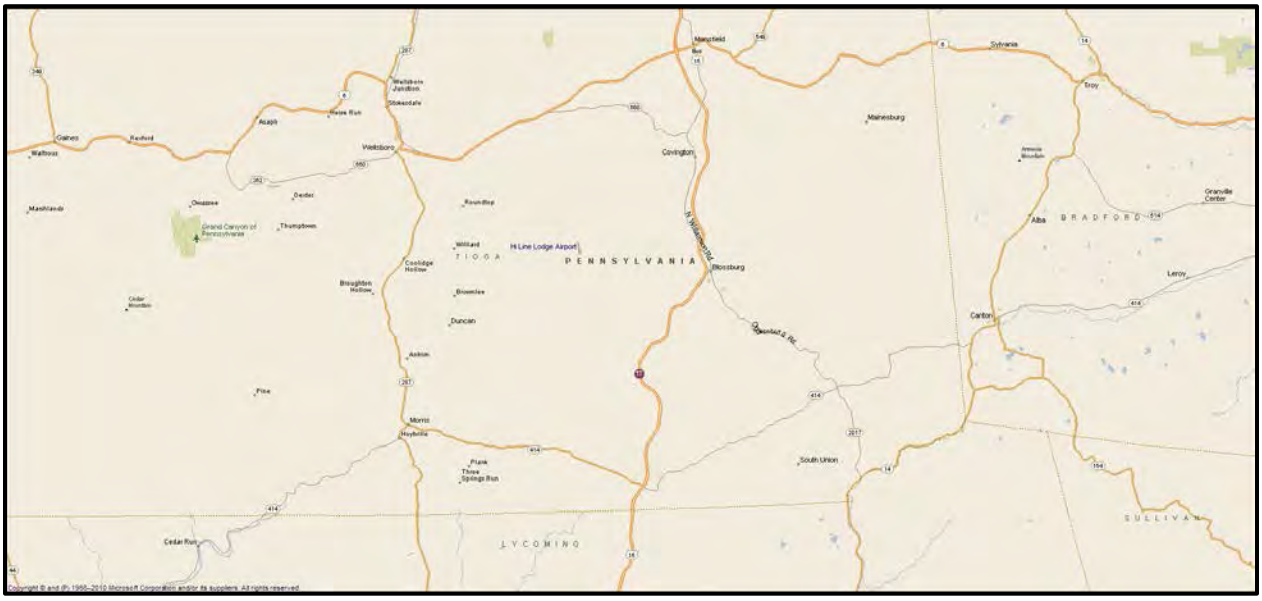
The first is forest recreation. Forest recreation is one of the most common ways that people connect with and enjoy the state forest. The state forest system provides bountiful opportunities for citizens to recreate and enjoy the forest.

The second use, Management of state forests, is guided by Penn's Woods, the bureau's strategic plan, and the State Forest Resource Management Plan. The district staff promotes wild plant conservation and private forest land conservation and stewardship.

The area has had unconventional gas well drilling into the Marcellus Shale within the last decade. This use has caused a land use from forested recreation to well pads, impoundment areas, compressor stations and transmission pipelines.

Location

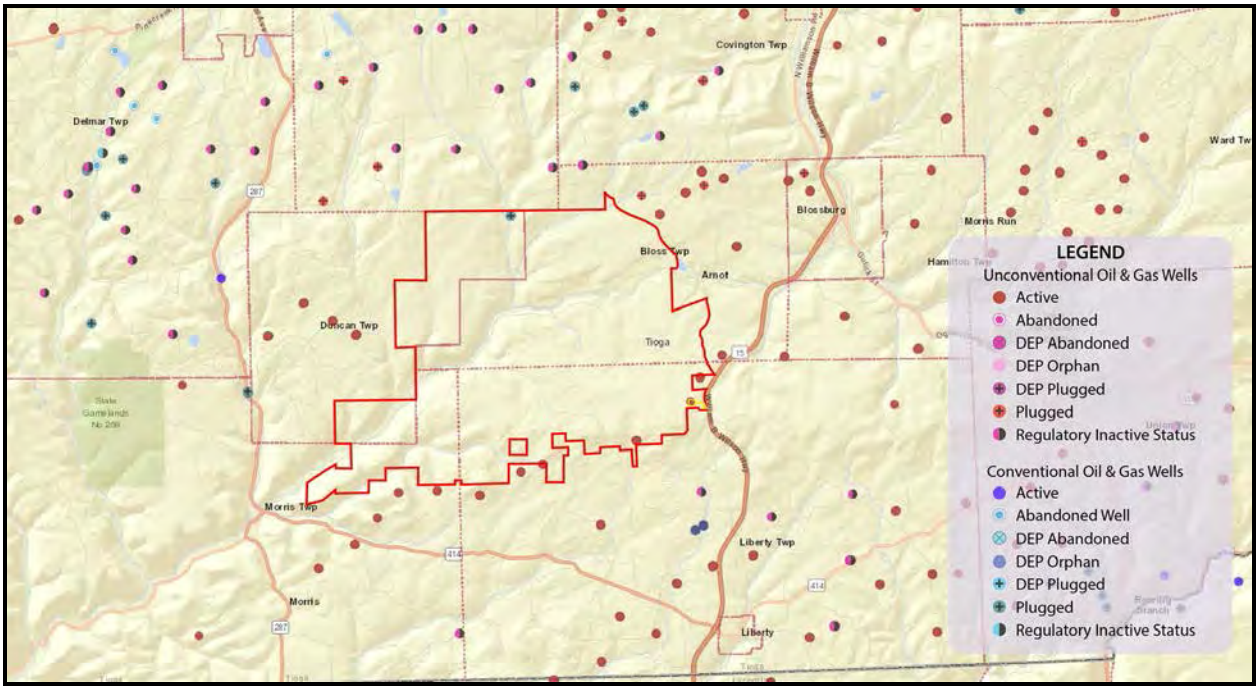
LWCF Area #6 is located in the southern portion of Tioga County, in Bloss, Liberty, Morris & Duncan Townships. The area is approximately 10 miles southeast of Wellsboro (Tioga County Seat).



Environmental

The scope of this appraisal does not include any environmental audits or testing for hazardous materials. No apparent environmental concerns were noted. However, as in the case of all real estate, the owners of the subject property are advised to have a complete understanding of the environmental issues surrounding the subject site. As such, a Phase I environmental audit is recommended.

Gas Wells in Proximity to LWCF Area



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Conversion Site #17 – Pad 3

Legal Description & Sales History

Property is deeded to:	Commonwealth of Pennsylvania
Previous Owner:	Blossburg Coal Company
Deed Reference #:	272-284 (Addendum A)
Date of Recording and Purchase:	November 10, 1954
Purchase Price:	$148,407.85
Deeded Acreage:	27,984 Acres

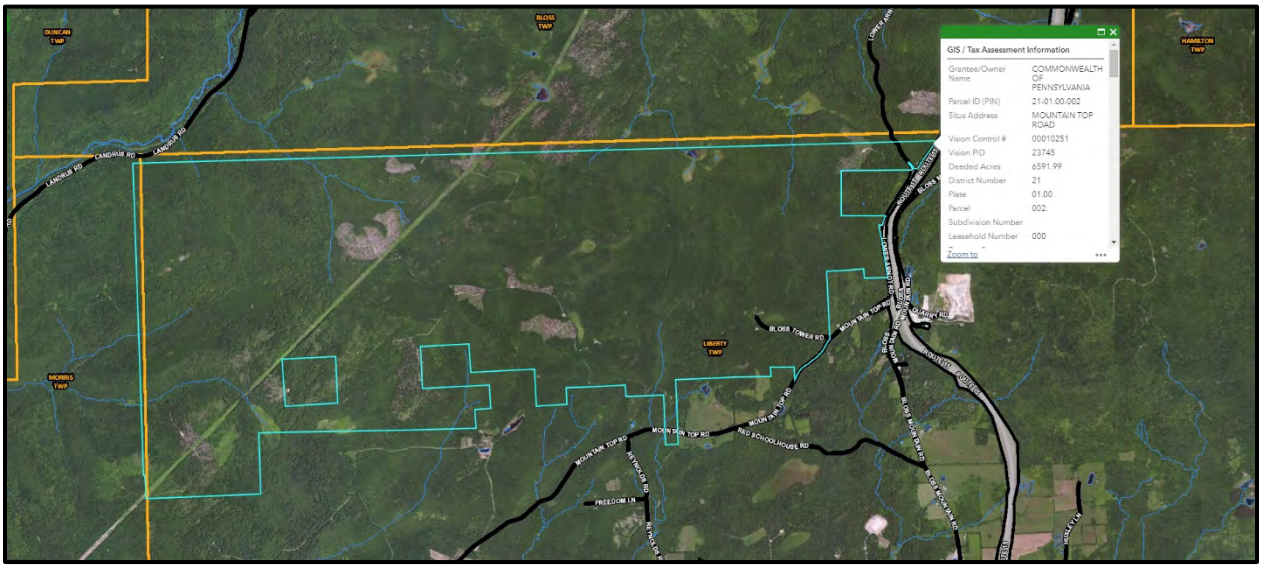
Due to the age of the sale, an analysis to determine if the sale was market value at time of transfer was not possible.

The subject property is not currently listed for sale, under contract, or on the market.

Tax Assessment

Conversion Site #17 is a part of the following tax parcel.

Tax Assessment Identification:	21-01.00-002
Tax Assessment Ownership:	Commonwealth of Pennsylvania
Tax Assessment Acreage:	6591.99
Market Value Tax Assessment:	$1,720,070
Act 319 Assessment:	No
Common Level Ratio:	1.43
Indicated Market Value:	$2,459,700
Millage Rate:	24.77
Annual Market Value Taxes:	$60,927
Annual Act 319 Taxes:	None



Tax Parcel Map – Tioga County GIS

Acreage

The acreage amount of this site is assumed to be 9.32 acres. This assumption is based on the GIS data provided by the client (***Extraordinary Assumption #1***).

This acreage includes the well site and the access road to the well site. The access road and pad site have been improved with crushed stone.

Photo Key Map

©Google Earth 2018

#1 Access looking southeast

Conversion Site #17 - Tioga State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#2 Pad Site looking west

Conversion Site #17 – Tioga State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#3 Pad Site looking west

Conversion Site #17 – Tioga State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

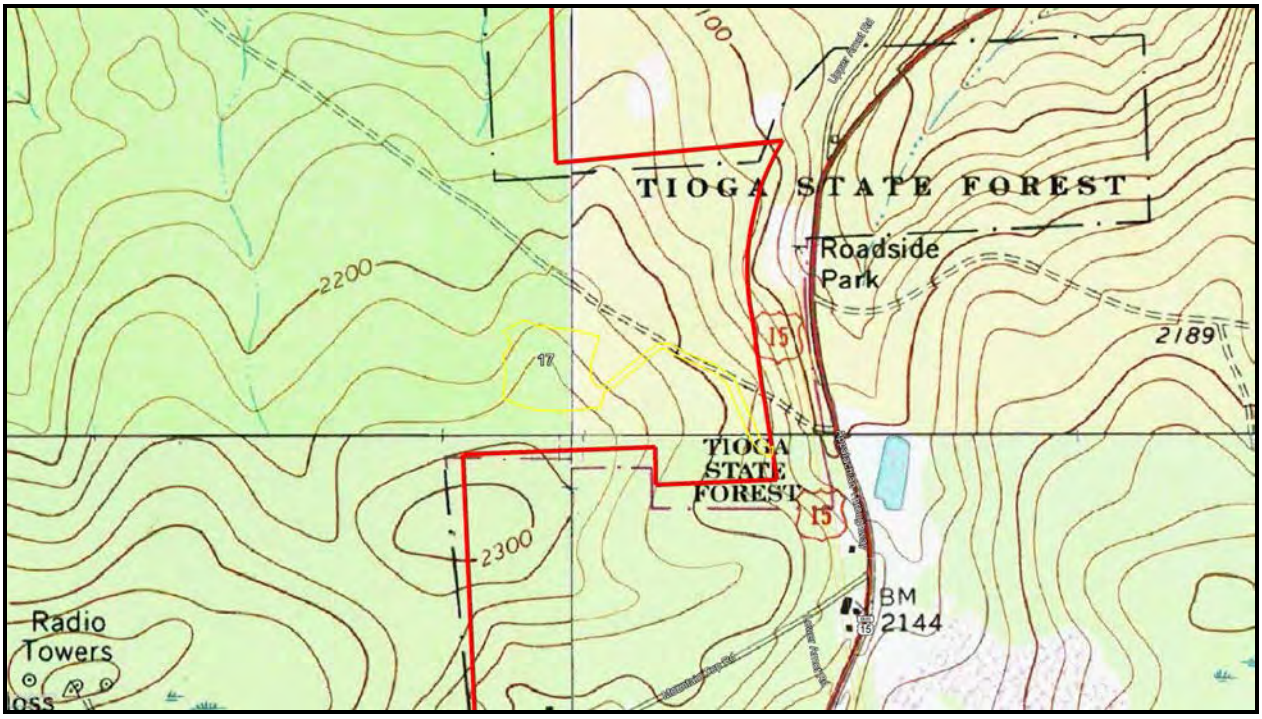
#4 Well Head looking west

Conversion Site #17 – Tioga State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

#5 Well Pad looking southwest

Conversion Site #17 – Tioga State Forest, PA
Photo by Gregory L. Snyder 8/20/2018

Overall Surrounding Topography: Gentle slopes



©Google Earth 2018 & USGS National Map

Timber: The conversion site was wooded prior to conversion. The surrounding forest indicates that the standing timber is typical of hardwood forests in this State Forest. There was no indication of any recent timbering noted during the site visit.

Improvement Description & Fixtures

The conversion site has been altered from the surrounding woodland to accommodate the drilling of an unconventional well. The leasehold improvements include the leveling of the property and surface covering with a bed of crushed limestone. Other gas infrastructure is described in the subsurface rights section. None of the improvements or gas infrastructure are owned by the Commonwealth of Pennsylvania.

Location

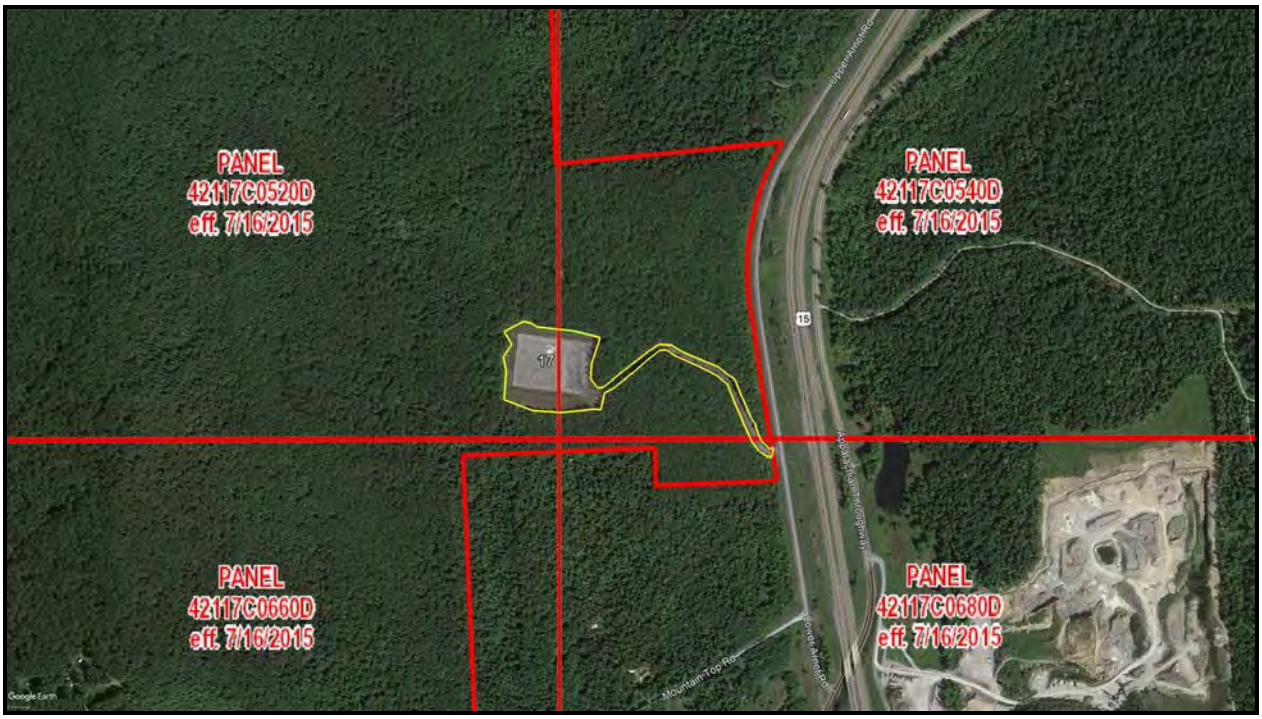
Conversion Site #17 is located in Liberty Township, Tioga County, on the west side of Lower Arnot Road, north of the intersection with Mountain Top Road. It is approximately 5 miles southwest of Blossburg and 12 miles southeast of Wellsboro (Tioga County Seat). Post Office is Liberty, PA 16930.

Rental History

No rental – managed by the Bureau of Forestry.

Flood Map Information

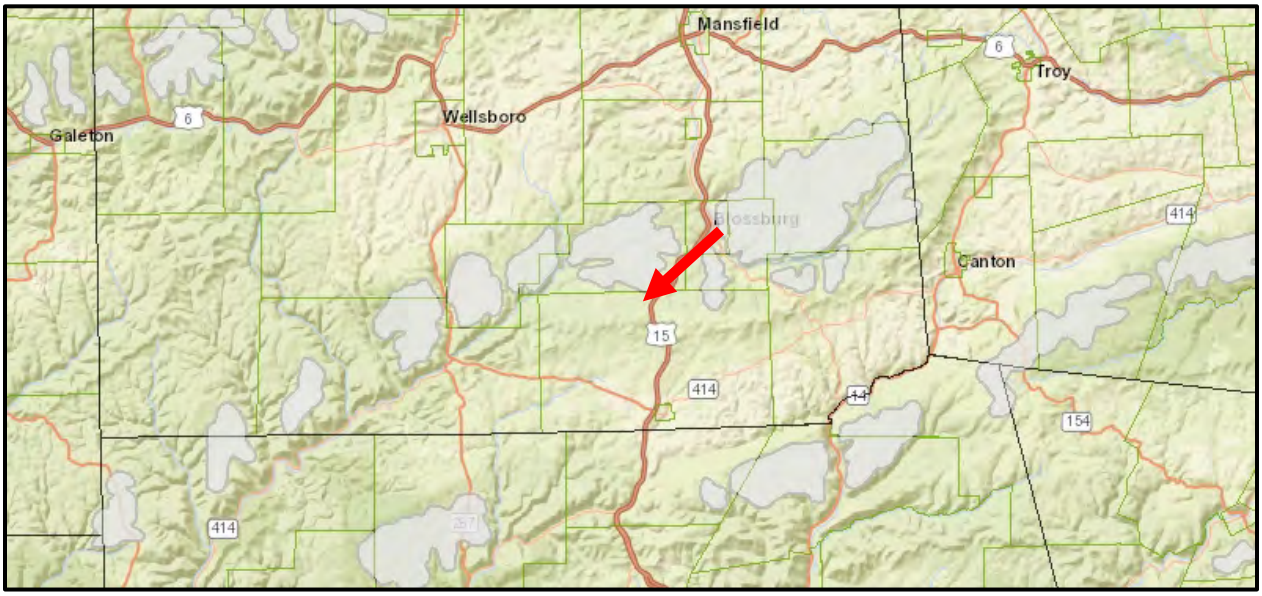
The subject is located on FEMA map 42117C0520D, 42117C0540D, 42117C0680D (map date 7/16/2015). 100% is located in Flood Zone X.



©Google Earth 2018 & FEMA National Flood Hazard Layer

Subsurface Rights

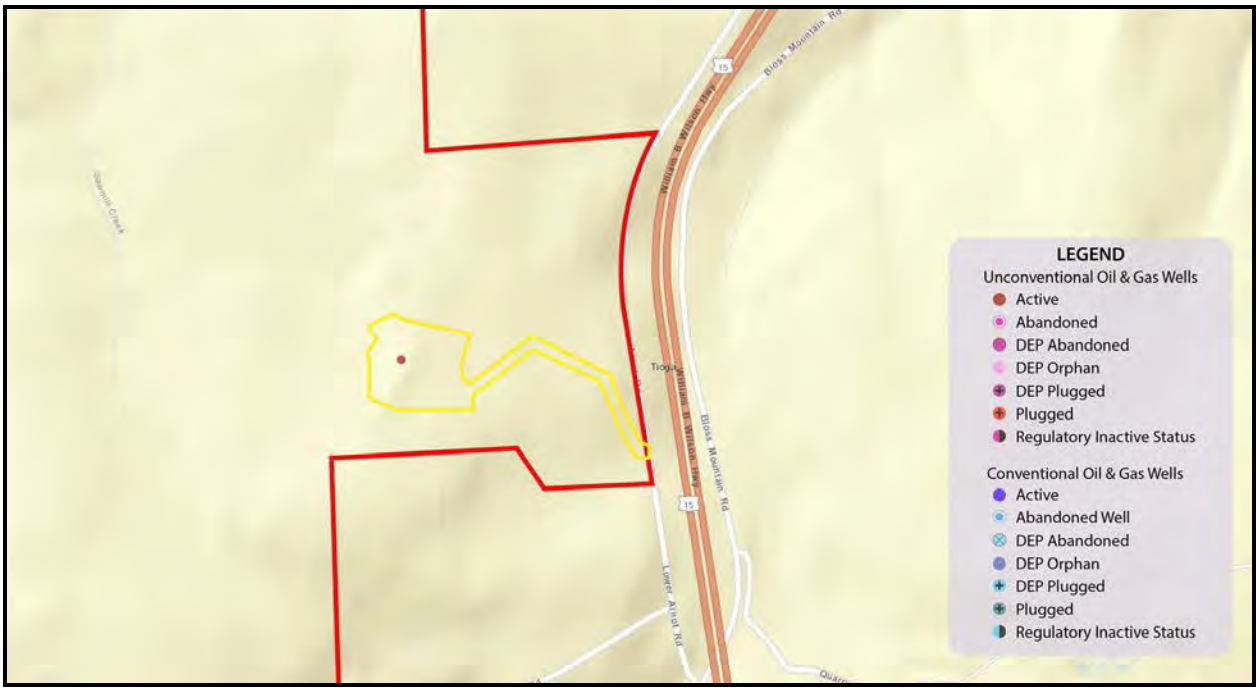
Coal: Owned by Landowner (PA Mine Map indicates there are no known coal fields in this area)



PA Mine Map – PA DEP

Oil & Gas: Owned by Landowner, leased to Talisman Energy USA, Incl. (Fortuna Energy, Inc. is original lessee – Contract #M-110594-16 which covers 3,598 acres of Tioga State Forest).

Oil & Gas Development: The conversion site has been developed into an unconventional well site. The site presently has 1 active well. The site also has the well head, conveyance piping, gas processing unit, and condensate and brine storage tanks. Additionally, there is one conventional well southeast of the Unconventional well pad. The site was converted in June, 2013.



PA DEP, PA Oil and Gas Mapping

Gas Wells in Proximity of Subject

Other Minerals: No severance – None known to exist

Zoning & SALDO

Zoning: The subject is located in Tioga County's Resource Protection District as adopted by Liberty Township. The present use complies with zoning and the Tioga County's Subdivision and Land Development Ordinance.

A copy of the relevant zoning ordinance sections are included in Addendum C of this report.

Easements

Unrecorded highway ROW's.

Analysis and Conclusions

The Valuation Process

The following is an overall discussion of the process used to develop this appraisal. Highest and Best Use is defined and the Approaches to Value are described.

Highest and Best Use Defined

Highest and Best Use reflects a basic assumption about real estate market behavior; that the price a buyer will pay for a property is based on their conclusions about the most profitable use of the site or property. Determination of Highest and Best Use must be based on careful consideration of prevailing market conditions, trends affecting market participation and change, and the existing use of the subject property.

The Highest and Best Use may be defined as "The highest and most profitable use for which the property is adaptable and needed or likely to be needed in the reasonably near future."[6]

Because the use of land can be limited by the presence of improvements, Highest and Best Use is determined separately for the land or site *as though vacant* and available to be put to its Highest and Best Use, and for the property *as improved*. The Highest and Best Use of land *as though vacant* and property *as improved* must meet four criteria: legal permissibility, physical possibility, financial feasibility and maximal productivity.

The determination of *as though vacant* Highest and Best Use reflects that land value is derived from potential land use. Land has limited value unless there is a present or anticipated use for it. The amount of value depends on the nature of the land's anticipated use according to the concept of surplus productivity. Among all reasonable, alternative uses, the use that yields the highest present land value, after payments are made for labor, capital, and coordination, is generally regarded as the Highest and Best Use of the land *as though vacant*. This is the "classic" definition of a land residual analysis.

For the purpose of analysis, the appraiser assumes the parcel of land in question is vacant. Even a site with a large building on it can be made vacant by demolishing the building. The question to be answered is: If the land were vacant, what new improvements should be constructed on the site?

[6] Section 4.3.1, *Uniform Appraisal Standards For Federal Land Acquisition*, 2016

The Highest and Best Use of a property *as improved* refers to the optimal use that could be made of the property including all existing structures. The implication is that the existing improvements should be renovated or retained so long as they continue to contribute to the total market value of the property, or until the return from a new improvement would more than offset the cost of demolishing the existing building and constructing a new one.

The determination of the Highest and Best Use of land *as though vacant* is useful for land or site valuation. Determining the Highest and Best Use of an *improved* property provides a decision regarding continued use or demolition of the property. The reader should note that demolition is indicated when the land *as though vacant* has more value than the parcel as presently improved.

Methods of Valuation

It is normal appraisal practice to assemble as much relevant data from the marketplace as possible. This data is applied in the three recognized approaches to value: the Cost Approach, the Income Approach, and the Sales Comparison Approach.

In the Cost Approach, an estimate of the site's value is derived by comparing the subject site to similar sites that have sold. The subject site is valued in accordance with the conclusions reached in the Highest and Best Use section of this report.

Based on the physical characteristics of the property, the subject's replacement cost new (RCN) can be estimated based on comparative costs derived from the market and from *Marshall & Swift Commercial/Agricultural Estimator*. Accrued depreciation from all observed sources is subtracted from the RCN to yield depreciated replacement cost. The depreciated building value is added to the indicated land value to yield an estimate of value based on the Cost Approach.

The Income Approach analysis is concerned with the present worth of anticipated future benefits derived from ownership of the subject property, expressed in terms of net operating income (NOI) that ownership of a property may be expected to produce. The anticipated stabilized NOI available from owning a property is then converted into a value estimate by applying an appropriate rate derived from market observations.

The Sales Comparison Approach uses sales of similar properties as an indication of value for the subject property. This comparison may be made per square-foot, per acre or any other basis that is recognized in the marketplace and that provides an adequate unit of measure of indicated market value. In this appraisal, the unit of comparison is the price paid per acre for the comparable properties.

The Sales Comparison Approach is essential to almost every appraisal of real property. This approach best mirrors the actions of buyers in the marketplace for similar-type

properties. In this appraisal, information has been presented on recent sales similar in utility and location to the subject property.

After arriving at an indication of value, the results are correlated into a single conclusion of value based on the approach or approaches that have the highest quality or quantity of data available and the ones in which the appraiser has the greatest confidence. Pertinent data and facts used in the appraisal process are analyzed on the following pages of this report.

The Cost and Income Approaches are not developed in this report.

The **Cost Approach** is not developed because there are no improvements on the subject other than the leasehold improvements; therefore, the development of the Cost Approach is not necessary.

The **Income Approach** is not developed in this report due to the small larger parcel size and the limited income that is derived from such small acreage. The comparable sales with both surface and subsurface rights were purchased for investments. The buyers are holding the properties for potential future income benefits.

Sales and Data Analysis

Database

In the development of this appraisal, no sales of privately owned, small acreage, vacant land that are located within a State Forest were found. Since no inholding sales were found, a search was completed for larger acreage recreational tracts.

The appraiser developed a database of 83 comparable sales in the PA Wilds market area that have transferred in the last 48 months. County STEB reports, public sale notices, realtors multi-list information, Datatree Real Estate Search and contacts with realtors and auctioneers in the area were utilized to locate sales used to develop this report. The sales were verified using a public record source (Recorder of Deeds), as well as further verification with buyers, sellers, realtors, auctioneers, lenders, etc. involved in the transfer whenever possible. The procedure to verify sales was first to attempt to telephone the parties involved, second, locate any MLS data available and contact an agent involved in the transaction, and finally, attempt contact via USPS. There were a few cases where no one involved in the transfer was able to be contacted; in those cases public records were relied on to confirm the sale data.

The database was reduced to 19 sales that are similar in use to the subjects. The following is a summary of the sales that were considered in this report.

#	County	Sale #	Sale Date	Acres	Sale Price	$/Acre Value	$/Acres Value Land	$/Acre Bldg	Rights
1	Clearfield	3316054	Jan-16	112.85	$240,000	$2,127	$2,127	$0	Surface
2	Clinton	3516270	Apr-16	79.20	$160,000	$2,020	$2,020	$0	Surface
3	Lycoming	8116489	Jul-16	105.89	$170,000	$1,605	$1,605	$0	Surface
4	Lycoming	8116490	Jul-16	160.00	$330,000	$2,063	$2,063	$0	Surface
5	Tioga	11716452	Jul-16	117.50	$520,000	$4,426	$4,426	$0	Fee
6	Tioga	11716652	Sep-16	216.60	$770,000	$3,555	$3,555	$0	Fee
7	Centre	2716721	Oct-16	107.73	$215,000	$1,996	$1,996	$0	Surface
8	Clinton	3516720	Oct-16	70.74	$176,850	$2,500	$2,500	$0	Fee
9	Tioga	11716719	Oct-16	143.10	$560,000	$3,913	$3,913	$0	Fee
10	Clearfield	3316791	Nov-16	340.13	$721,000	$2,120	$2,120	$0	Surface
11	Lycoming	8116792	Nov-16	177.98	$450,000	$2,528	$2,528	$0	Surface
12	Potter	10516877	Dec-16	136.00	$174,345	$1,282	$1,282	$0	Surface
13	Clinton	3517330	May-17	131.00	$205,000	$1,565	$1,565	$0	Surface
14	Tioga	11717702	Oct-17	191.72	$766,880	$4,000	$4,000	$0	Fee
15	Lycoming	8117778	Nov-17	121.88	$650,000	$5,333	$4,718	$615	Fee
16	Clearfield	3317847	Dec-17	105.59	$310,000	$2,936	$2,273	$663	Surface
17	Potter	10518088	Feb-18	172.12	$350,000	$2,033	$2,033	$0	Fee
18	Potter	10518453	Jul-18	138.90	$223,500	$1,609	$1,609	$0	Surface
			Average	146.05	$388,476	$2,645	$2,574		

The sales database includes 7 sales with fee rights (surface and subsurface) and 11 sales with surface only rights.

The 7 fee sales indicated a range of size from 70.74 to 216.60 acres with an average acreage size of 147.67 acres. The average sale price was $3,680/acre; one sale had a building contribution of $615/acre. The average land contributory value was $3,592/acre.

Factors noted on these sales include:

- Buyers' motivations were in most cases for forest recreation uses and as an investment to receive potential future income from subsurface rights.
- Two of the buyers purchased the tract with an Intention to sell the surface only rights and retain the subsurface rights.
- One tract had the timber rights reserved by seller.

The 11 surface only sales indicate a range of size from 79.20 to 340.13 acres with an average acreage size of 145.02 acres. The average sale price was $1,986/acre; one sale had a building contribution of $663/acre. The average land contributory value was $1,926/acre.

Factors noted on these sales include:

- Most sales were purchased for the forest recreation uses, specifically hunting.

- Two of the buyers were motivated by timber value.

The difference between the fee sales and the surface only sales is $1,666/acre.

Overall database comments:

- Forest recreation (hunting) is a similar motivation to both fee and surface only buyers. Typical land size for this use is between 100 to 200 acres.
- No sales were found with active unconventional well pads or well caps.
- No sales were found with active unconventional well with royalties received by the owner.
- No sales of small inholdings were found, specifically no sales of land that only had well pads or gas transportation infrastructure. There are a few sales of improved sites with hunting cabins, but their buyer's motivation was to own a cabin in an area where they can hunt; not for the subsurface rights value.
- Sales of fee simple sales property has slowed as drilling activity decreased since the beginning of this decade. Lower gas prices and the ongoing construction of transmission pipelines have slowed development of more wells at this point in time.

Market Value Analysis – LWCF Area #1

Highest and Best Use of LWCF Area #1:

The following is a discussion of the four criteria of the Highest and Best Use in regard to the subject property.

As Vacant

Legally Permissible: The conversion site's municipality has no zoning ordinance. The Centre County Subdivision and Land Development Ordinance permits a degree of subdivision for single-family dwellings. These subdivisions require legal access. Access must be either by a 50' wide right-of-way or an 18' wide cartway. Private road access requires a 50' wide right-of-way.

The conversion sites are all subject to oil and gas leases. The Commonwealth of Pennsylvania has entered into 2 separate leases in the LWCF Area #1 with two natural gas companies. The leases include not only the conversion sites, but also surrounding acreage. The Conversion Site #1 lease area is 3,655 acres and Conversion Site #2 encompasses 2,760 acres. By virtue of these leases, the 2 conversion sites have an integrated legal use with the surrounding woodland. The leases allow for unitization or pooling of the leased area with surrounding landowners whose lands are in the same strata.

Physically Possible: The two conversion sites are located in the 305,450 acre Sproul State Forest. The LWCF Area #1 comprises 10,241 acres. The two conversion sites have acreages of (1) 3.88 acres & (2) 8.07 acres. The previously described larger parcel determination specifies that each conversion site is its own separate larger parcel located within a 100 to 200 acre parcel of similar ownership. ***(Hypothetical Condition #1 and #2).***

Conversion Site #1 is developed with 2 wells. Conversion Site #2 was prepared for development, but was not drilled and has been reclaimed as an herbaceous wildlife opening.

The Market Area Analysis describes how well pads are the site of the vertical portion of the unconventional drilling infrastructure with the horizontal arms of the well extending potentially as far 15,000 feet. The well pads can be developed with multiple well heads used to move natural gas from large areas. The pad sites have been excavated to create a level site for drilling, but the surrounding wooded areas have their original gentle slopes, which are typical of the surrounding LWCF area.

The use of the converted sites is integrated with the surrounding wooded recreational acreage. The value of the two areas are tied together since the conversion sites contain a portion of the infrastructure necessary to move the natural gas from the surrounding subsurface to the market place.

Gas well sites are common on lands in the PA Wilds. Old conventional well sites and newer Marcellus Shale wells are seen on privately owned lands with the surrounding areas used for forest recreation. Marcellus Shale unconventional horizontal drilling well sites are very likely to draw natural gas from not just the subject property, but also from other properties whose landowners have pooled their interest for a specific well. There are no sales of just well pad sites.

The PA Wilds area has a significant wild game population that is sought after by the citizens of the Commonwealth. Hunting camps are common on private lands in the area. Timber harvesting is very common in the area.

The most likely private use of a property in the general LWCF Area is three part. First, for forest recreation use; second, for timber harvesting; and third, for investment in potential oil and gas extraction.

Financially Feasible: The property's forested use is financially feasible. A landowner can expect to harvest timber from the property at some point in time. The age of the standing timber, type and size of trees, and method of any recent harvest determines the amount of potential income. Income from timber can be a factor in the buyer's purchase price decision. There is also demand for forested recreational uses, specifically hunting.

The conversion sites are in an active Marcellus Shale leasing and drilling area. The active wells are mostly pooled with landowners that have land within the same strata that is being drilled. Sale data indicates the typical buyer purchases a larger tract as an investment for potential development of subsurface rights while utilizing the property's surface for forested recreation. These sales indicate the land is purchased with the hope of eventually developing an income stream from the subsurface rights. It should be noted that there are no sales of land with all surface and subsurface rights that have an active producing well on them.

A wooded recreational tract with subsurface rights is financially feasible.

Maximally Productive: The present use as a wooded recreational tract with subsurface rights is a legally permissible and physical possible use. When considering financial feasible uses, the most likely purchase of the conversion sites is for continued use as wooded recreational tracts with an investment value in the subsurface rights.

The larger parcel conversion sites are inholdings within the much larger LWCF area. This LWCF area is larger than the typical size tract sold in the open market. It was established that open market sales range between 70 and 340 acres, which is

significantly larger than the 3.88 – 8.07 acre conversion sites. There is no sales data that indicates a market for small conversion site inholdings that have all surface and subsurface rights included.

It has been established that the conversion sites have a physically integrated use with the surrounding forested recreational land. In open market transactions, the typical buyer would purchase the conversion site as a part of a 100 – 200 acre tract.

The *As Vacant* maximally productive use of the subject site is the continued use as a wooded recreational tract with subsurface rights. The most likely buyer will be a person(s) that wish to establish and use the property for their personal recreational uses.

***As Vacant* Conclusion:** Because of the reasons stated above, the final conclusion of Highest and Best Use is *As Vacant* – wooded recreational tract with subsurface rights.

As Improved

None – Any present improvements are owned and utilized by the Oil and Gas lessee. Lessor is not permitted to use these conversion sites.

Final Conclusion

The *As Vacant* Use is the final conclusion of Highest and Best Use as a wooded recreational tract with subsurface rights.

Sales Comparison Approach – Conversion Site #1

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #1 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Centre	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	3.88	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	0 Miles	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Inferior	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	None	None	Ag	AR	FC	RP	LR	RH
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparables 3, 6 and 7 are given the most weight. Therefore the value of **$15,520** or **$4,000** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$16,000** (rounded).

Sales Comparison Approach – Conversion Site #2

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #2 Sales Comparison Approach Adjustment Grid

ELEMENT OF COMPARISON	SUBJECT PROPERTY Centre	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	8.07	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arns Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	<1 Mile	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	None	None	Ag	AR	FC	RP	LR	RH
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this

area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparables 3, 6 and 7 are given the most weight. Therefore the value of **$32,280** or **$4,000** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #2 is **$32,000** (rounded).

Market Value Analysis – LWCF Area #2

Highest and Best Use of LWCF Area #2:

The following is a discussion of the four criteria of the Highest and Best Use in regard to the subject property.

As Vacant

Legally Permissible: The conversion site is located in a Rural Forest zoning district. The Clinton County Subdivision and Land Development Ordinance permits a degree of subdivision for recreational purposes. These subdivisions require legal access. Access must be either by a 33 to 50' wide right-of-way or a 12 to 15' wide cartway. The width is dependent on the number of lots being served. The smaller amount is permitted if less than 5 lots are served by that access.

The conversion site is subject to oil and gas leases. The Commonwealth of Pennsylvania has entered into a lease in the LWCF Area #2 with a natural gas company. This lease includes not only the conversion site, but also surrounding acreage. The Conversion Site #3 lease area is 2,059 acres. By virtue of this lease, the conversion site has an integrated legal use with the surrounding woodland. The lease allows for unitization or pooling of the leased area with surrounding landowners whose lands are in the same strata.

Physically Possible: The conversion site is located in the 305,450 acre Sproul State Forest. The LWCF Area #2 comprises 5,417 acres. The conversion site has an acreage of 4.44 acres. The previously described larger parcel determination specifies that each conversion site is its own separate larger parcel located within a 100 to 200 acre parcel of similar ownership. ***(Hypothetical Condition #1 and #2).***

Conversion Site #3 presently has no wells.

The Market Area Analysis describes how well pads are the site of the vertical portion of the unconventional drilling infrastructure with the horizontal arms of the well extending potentially as far 15,000 feet. The well pads can be developed with multiple well heads used to move natural gas from large areas. The pad sites have been excavated to create a level site for drilling, but the surrounding wooded areas have their original rolling to steep slopes, which are typical of the surrounding LWCF area.

The use of the converted site is integrated with the surrounding wooded recreational acreage. The value of the two areas are tied together since the conversion sites contain a portion of the infrastructure necessary to move the natural gas from the surrounding subsurface to the market place.

Gas well sites are common on lands in the PA Wilds. Old conventional well sites and newer Marcellus Shale wells are seen on privately owned lands, with the surrounding areas used for forest recreation. Marcellus Shale unconventional horizontal drilling well sites are very likely to draw natural gas from not just the subject property, but also from other properties whose landowners have pooled their interest for a specific well. There are no sales of just well pad sites.

The PA Wilds area has a significant wild game population that is sought after by the citizens of the Commonwealth. Hunting camps are common on private lands in the area. Timber harvesting is very common in the area.

The most likely physical private use of a property in the general LWCF Area is three part. First, for forest recreation use; second, for timber harvesting; and third, for investment in potential oil and gas extraction.

Financially Feasible: The property's forested use is financially feasible. A landowner can expect to harvest timber from the property at some point in time. The age of the standing timber, type and size of trees, and method of any recent harvest determines the amount of potential income. Income from timber can be a factor in the buyer's purchase price decision. There is also demand for forested recreational uses, specifically hunting.

The conversion site is in an active Marcellus Shale leasing and drilling area. The active wells are mostly pooled with landowners that have land within the same strata that is being drilled. Sale data indicates the typical buyer purchases a larger tract as an investment for potential development of subsurface rights while utilizing the property's surface for forested recreation. These sales indicate the land is purchased with the hope of eventually developing an income stream from the subsurface rights. It should be noted that there are no sales of land with all surface and subsurface rights that have an active producing well on them.

A wooded recreational tract with subsurface rights is financially feasible.

Maximally Productive: The present use as a wooded recreational tract with subsurface rights is a legally permissible and physical possible use. When considering financially feasible uses, the most likely purchase of the conversion site is for continued use as a wooded recreational tract with an investment value in the subsurface rights.

The larger parcel conversion sites are inholdings within the much larger LWCF area. This LWCF area is larger than the typical size tract sold in the open market. It was established that open market sales range between 70 and 340 acres, which is significantly larger than the 4.44 acre conversion site. There is no sales data that indicates a market for small conversion site inholdings that have all surface and subsurface rights included.

It has been established that the conversion site has a physically integrated use with the surrounding forested recreational land. In open market transactions, the typical buyer would purchase the conversion site as a part of a 100 – 200 acre tract.

The *As Vacant* maximally productive use of the subject site is the continued use as a wooded recreational tract with subsurface rights. The most likely buyer will be a person(s) that wish to establish and use the property for their personal recreational uses.

***As Vacant* Conclusion:** Because of the reasons stated above, the final conclusion of Highest and Best Use is *As Vacant* – wooded recreational tract with subsurface rights.

As Improved

None – Any present improvements are owned and utilized by the Oil and Gas lessee. Lessor is not permitted to use these conversion sites.

Final Conclusion

The *As Vacant* Use is the final conclusion of Highest and Best Use as a wooded recreational tract with subsurface rights.

Sales Comparison Approach – Conversion Site #3

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #3 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Clinton	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	4.44	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	<2 Miles	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	Rural Forest	None	Ag	AR	FC	RP	LR	RH
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparables 3, 6 and 7 are given the most weight. Therefore the value of **$17,760** or **$4,000** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #3 is **$18,000** (rounded).

Market Value Analysis – LWCF Area #3

Highest and Best Use of LWCF Area #3:

The following is a discussion of the four criteria of the Highest and Best Use in regard to the subject property.

As Vacant

Legally Permissible: The conversion site municipality has no zoning ordinance. The Clinton County Subdivision and Land Development Ordinance permits a degree of subdivision for recreational purposes. These subdivisions require legal access. No access width is stated.

The conversion site is subject to an oil and gas lease. The Commonwealth of Pennsylvania has entered into a lease in the LWCF Area #3 with a natural gas company. This lease includes not only the conversion site, but also surrounding acreage. The Conversion Site #3 lease area is 4,565 acres. By virtue of this lease, the conversion site has an integrated legal use with the surrounding woodland. The lease allows for unitization or pooling of the leased area with surrounding landowners whose lands are in the same strata.

Physically Possible: The conversion site is located in the 190,031 acre Moshannon State Forest. The LWCF Area #3 comprises 7,366 acres. The conversion site has an acreage of 6.25 acres. The previously described larger parcel determination specifies that each conversion site is its own separate larger parcel located within a 100 to 200 acre parcel of similar ownership. ***(Hypothetical Condition #1 and #2).***

Conversion Site #4 is developed with 2 wells.

The Market Area Analysis describes how well pads are the site of the vertical portion of the unconventional drilling infrastructure with the horizontal arms of the well extending potentially as far 15,000 feet. The well pads can be developed with multiple well heads used to move natural gas from large areas. The pad sites have been excavated to create a level site for drilling, but the surrounding wooded areas have their original rolling to steep slopes, which are typical of the surrounding LWCF area.

The use of the converted site is integrated with the surrounding wooded recreational acreage. The value of the two areas are tied together since the conversion sites contain a portion of the infrastructure necessary to move the natural gas from the surrounding subsurface to the market place.

Gas well sites are common on lands in the PA Wilds. Old conventional well sites and newer Marcellus Shale wells are seen on privately owned lands with the surrounding areas used for forest recreation. Marcellus Shale unconventional horizontal drilling well sites are very likely to draw natural gas from not just the subject property, but also from other properties whose landowners have pooled their interest for a specific well. There are no sales of just well pad sites.

The PA Wilds area has a significant wild game population that is sought after by the citizens of the Commonwealth. Hunting camps are common on private lands in the area. Timber harvesting is very common in the area.

The most likely physical private use of a property in the general LWCF Area is three part. First, for forest recreation use; second, for timber harvesting; and third, for investment in potential oil and gas extraction.

Financially Feasible: The property's forested use is financially feasible. A landowner can expect to harvest timber from the property at some point in time. The age of the standing timber, type and size of trees, and method of any recent harvest determines the amount of potential income. Income from timber can be a factor in the buyer's purchase price decision. There is also demand for forested recreational uses, specifically hunting.

The conversion site is in an active Marcellus Shale leasing and drilling area. The active wells are mostly pooled with landowners that have land within the same strata that is being drilled. Sale data indicates the typical buyer purchases a larger tract as an investment for potential development of subsurface rights while utilizing the property's surface for forested recreation. These sales indicate the land is purchased with the hope of eventually developing an income stream from the subsurface rights. It should be noted that there are no sales of land with all surface and subsurface rights that have an active producing well on them.

A wooded recreational tract with subsurface rights is financially feasible.

Maximally Productive: The present use as a wooded recreational tract with subsurface rights is a legally permissible and physical possible use. When considering financially feasible uses, the most likely purchase of the conversion site is for continued use as a wooded recreational tract with an investment value in the subsurface rights.

The larger parcel conversion sites are inholdings within the much larger LWCF area. This LWCF area is larger than the typical size tract sold in the open market. It was established that open market sales range between 70 and 340 acres, which is significantly larger than the 6.25 acre conversion site. There is no sales data that indicates a market for small conversion site inholdings that have all surface and subsurface rights included.

It has been established that the conversion site has a physical integrated use with the surrounding forested recreational land. In open market transactions, the typical buyer would purchase the conversion site as a part of a 100 – 200 acre tract.

The *As Vacant* maximally productive use of the subject site is the continued use as a wooded recreational tract with subsurface rights. The most likely buyer will be a person(s) that wish to establish and use the property for their personal recreational uses.

***As Vacant* Conclusion:** Because of the reasons stated above, the final conclusion of Highest and Best Use is *As Vacant* – wooded recreational tract with subsurface rights.

As Improved

None – Any present improvements are owned and utilized by the Oil and Gas lessee. Lessor is not permitted to use these conversion sites.

Final Conclusion

The *As Vacant* Use is the final conclusion of Highest and Best Use as a wooded recreational tract with subsurface rights.

Sales Comparison Approach – Conversion Site #4

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #4 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Clearfield	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	6.25	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements Adjustment	None	None 0	Cabin -615	Yes - $0/CV 0	Yes - $0/CV 0	Yes - $0/CV 0	None 0	Yes - $0/CV 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred Adjustment	Fee Simple	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing Adjustment		Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0
Conditions of Sale Adjustment		Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0
Market Conditions Adjustment		Feb-18 0	Nov-17 0	Oct-17 0	Oct-16 0	Oct-16 0	Sep-16 0	Jul-16 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev Adjustment	0 Miles	10 Miles Inferior	2 Miles Similar	>3 Miles Inferior	2 Miles Similar	1.5 Miles Similar	<1 Mile Similar	1 Mile Similar
Timber Adjustment	Average	Average Similar	Average Similar	Average Similar	Average Similar	Average Similar	Fair to Poor Inferior	Fair Inferior
Access Adjustment	Direct	Direct Similar	ROW Inferior	Direct Similar	Direct Similar	Direct Similar	Direct Similar	ROW Inferior
Zoning Adjustment	None	None Similar	Ag Similar	AR Similar	FC Similar	RP Similar	LR Similar	RH Similar
Proximity to State Forest Adjustment	Within	11 Miles Inferior	3 Miles Inferior	½ Mile Similar	½ Mile Similar	Adjacent Similar	1 Mile Similar	10 Miles Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparables 3, 6 and 7 are given the most weight. Therefore the value of **$25,000** or **$4,000** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #4 is **$25,000** (rounded).

Market Value Analysis – LWCF Area #4

Highest and Best Use of LWCF Area #4:

The following is a discussion of the four criteria of the Highest and Best Use in regard to the subject property.

As Vacant

Legally Permissible: The conversion sites are located in a Resource Protection zoning district. The Lycoming County Subdivision and Land Development Ordinance permits a degree of subdivision for single-family dwellings. These subdivisions require legal access. Access must be either by a 50' wide right-of-way or a 20' wide cartway.

The conversion sites are all subject to oil and gas leases. The Commonwealth of Pennsylvania has entered into a lease in the LWCF Area #4 with a natural gas company. The lease includes not only the conversion sites, but also surrounding acreage. The lease area is 8,891 acres. By virtue of this lease, the eight conversion sites have an integrated legal use with the surrounding woodland. The leases allow for unitization or pooling of the leased area with surrounding landowners whose lands are in the same strata.

Physically Possible: The eight conversion sites are located in the 114,552 acre Loyalsock State Forest. The LWCF Area #4 comprises 5,229 acres. The eight conversion sites have acreages of (5) 7.54 acres (6) 28.66, (7) 18.20 acres, (8) 5.22 acres, (9) 12.39 acres, (10) 20.13 acres, (11) 0.85 acres, & (12) 8.65 acres. The previously described larger parcel determination specifies that each conversion site is its own separate larger parcel located within a 100 to 200 acre parcel of similar ownership. ***(Hypothetical Condition #1 and #2).***

Conversion Site #5 is developed with 6 wells. Conversion Site #6 is a road that connects two pads. Conversion Site #7 is a compressor station and has a holding pond. Conversion Site #8 is developed with 4 wells. Conversion Site #9 is developed with 9 wells. Conversion Site #10 is developed with 10 wells. Conversion Site #11 is a relocation of a road. Conversion Site #12 is developed with 7 wells.

The Market Area Analysis describes how well pads are the site of the vertical portion of the unconventional drilling infrastructure with the horizontal arms of the well extending potentially as far 15,000 feet. The well pads can be developed with multiple well heads used to move natural gas from large areas. The pad sites have been excavated to create a level site for drilling, but the surrounding wooded areas have their original rolling to steep slopes, which are typical of the surrounding LWCF area.

The use of the five converted well pad sites (5, 8, 9, 10 & 12) is integrated with the surrounding wooded recreational acreage. The value of the two areas are tied together since the conversion sites contain a portion of the infrastructure necessary to move the natural gas from the surrounding subsurface to the market place.

Conversion Site #7 is a compressor station and holding pond. This area is integrated with the surrounding woodland wooded recreational acreage as it is necessary for gas transportation or for the development of the unconventional wells.

Conversion Sites #6 and 11 converted wooded land necessary to develop roads used in the drilling process. Site #6 is a long narrow area with a road that is closed to the public and is used to connect well pad sites. Site #11 is a change in a road configuration to accommodate the movement of large drilling rigs.

Gas well sites are common on lands in the PA Wilds. Old conventional well sites and newer Marcellus Shale wells are seen on privately owned lands with the surrounding areas used for forest recreation. Marcellus Shale unconventional horizontal drilling well sites are very likely to draw natural gas from not just the subject property, but also from other properties whose landowners have pooled their interest for a specific well. There are no sales of just well pad sites.

The PA Wilds area has a significant wild game population that is sought after by the citizens of the Commonwealth. Hunting camps are common on private lands in the area. Timber harvesting is very common in the area.

The most likely physical private use of a property in the general LWCF Area is three part. First, for forest recreation use; second, for timber harvesting; and third, for investment in potential oil and gas extraction.

Financially Feasible: The property's forested use is financially feasible. A landowner can expect to harvest timber from the property at some point in time. The age of the standing timber, type and size of trees, and method of any recent harvest determines the amount of potential income. Income from timber can be a factor in the buyer's purchase price decision. There is also demand for forested recreational uses, specifically hunting.

The conversion sites are in an active Marcellus Shale leasing and drilling area. The active wells are mostly pooled with landowners that have land within the same strata that is being drilled. Sale data indicates the typical buyer purchases a larger tract as an investment for potential development of subsurface rights while utilizing the property's surface for forested recreation. These sales indicate the land is purchased with the hope of eventually developing an income stream from the subsurface rights. It should be noted that there are no sales of land with all surface and subsurface rights that have an active producing well on them.

A wooded recreational tract with subsurface rights is financially feasible.

Maximally Productive: The present use as a wooded recreational tract with subsurface rights is a legally permissible and physical possible use. When considering financial feasible uses, the most likely purchase of the conversion sites is for continued use as wooded recreational tracts with an investment value in the subsurface rights.

The larger parcel conversion sites are inholdings within the much larger LWCF area. This LWCF area is larger than the typical size tract sold in the open market. It was established that open market sales range between 70 and 340 acres, which is significantly larger than the 0.85 – 28.66 acre conversion sites. There is no sales data that indicates a market for small conversion site inholdings that have all surface and subsurface rights included.

It has been established that the conversion sites have a physically integrated use with the surrounding forested recreational land. In open market transactions, the typical buyer would purchase the conversion site as a part of a 100 – 200 acre tract.

The *As Vacant* maximally productive use of the subject site is the continued use as a wooded recreational tract with subsurface rights. The most likely buyer will be a person(s) that wish to establish and use the property for their personal recreational uses.

***As Vacant* Conclusion:** Because of the reasons stated above, the final conclusion of Highest and Best Use is *As Vacant* – wooded recreational tract with subsurface rights.

As Improved

None – Any present improvements are owned and utilized by the Oil and Gas lessee. Lessor is not permitted to use these conversion sites.

Final Conclusion

The *As Vacant* Use is the final conclusion of Highest and Best Use as a wooded recreational tract with subsurface rights.

Sales Comparison Approach – Conversion Site #5

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #5 Sales Comparison Approach Adjustment Grid

ELEMENT OF COMPARISON	SUBJECT PROPERTY Lycoming	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	7.54	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arns Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	0 Miles	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	Resource	None	Ag	AR	FC	RP	LR	RH
Adjustment	Protection	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Since Lycoming County has some of the highest producing wells in the area, comparable 2 was weighted the heaviest, since it is located in Lycoming County. Therefore the value of **$35,438** or **$4,700** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #5 is **$35,000** (rounded).

Sales Comparison Approach – Conversion Site #6

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #6 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Lycoming	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	28.66	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements Adjustment	None	None 0	Cabin -615	Yes - $0/CV 0	Yes - $0/CV 0	Yes - $0/CV 0	None 0	Yes - $0/CV 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred Adjustment	Fee Simple	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing Adjustment		Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0
Conditions of Sale Adjustment		Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0
Market Conditions Adjustment		Feb-18 0	Nov-17 0	Oct-17 0	Oct-16 0	Oct-16 0	Sep-16 0	Jul-16 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev Adjustment	0 Miles	10 Miles Inferior	2 Miles Similar	>3 Miles Inferior	2 Miles Similar	1.5 Miles Similar	<1 Mile Similar	1 Mile Similar
Timber Adjustment	Average	Average Similar	Average Similar	Average Similar	Average Similar	Average Similar	Fair to Poor Inferior	Fair Inferior
Access Adjustment	Direct	Direct Similar	ROW Inferior	Direct Similar	Direct Similar	Direct Similar	Direct Similar	ROW Inferior
Zoning Adjustment	Resource Protection	None Similar	Ag Similar	AR Similar	FC Similar	RP Similar	LR Similar	RH Similar
Proximity to State Forest Adjustment	Within	11 Miles Inferior	3 Miles Inferior	½ Mile Similar	½ Mile Similar	Adjacent Similar	1 Mile Similar	10 Miles Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Since Lycoming County has some of the highest producing wells in the area, comparable 2 was weighted the heaviest, since it is located in Lycoming County. Therefore the value of **$134,702** or **$4,700** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #6 is **$135,000** (rounded).

Sales Comparison Approach – Conversion Site #7

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #7 Sales Comparison Approach Adjustment Grid

ELEMENT OF COMPARISON	SUBJECT PROPERTY Lycoming	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	18.20	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	<1 Mile	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	Resource	None	Ag	AR	FC	RP	LR	RH
Adjustment	Protection	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4

is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Since Lycoming County has some of the highest producing wells in the area, comparable 2 was weighted the heaviest, since it is located in Lycoming County. Therefore the value of **$85,540** or **$4,700** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #7 is **$86,000** (rounded).

Sales Comparison Approach – Conversion Site #8

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #8 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Lycoming	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	5.22	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements Adjustment	None	None 0	Cabin -615	Yes - $0/CV 0	Yes - $0/CV 0	Yes - $0/CV 0	None 0	Yes - $0/CV 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred Adjustment	Fee Simple	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing Adjustment		Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0
Conditions of Sale Adjustment		Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0
Market Conditions Adjustment		Feb-18 0	Nov-17 0	Oct-17 0	Oct-16 0	Oct-16 0	Sep-16 0	Jul-16 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev Adjustment	0 Miles	10 Miles Inferior	2 Miles Similar	>3 Miles Inferior	2 Miles Similar	1.5 Miles Similar	<1 Mile Similar	1 Mile Similar
Timber Adjustment	Average	Average Similar	Average Similar	Average Similar	Average Similar	Average Similar	Fair to Poor Inferior	Fair Inferior
Access Adjustment	Direct	Direct Similar	ROW Inferior	Direct Similar	Direct Similar	Direct Similar	Direct Similar	ROW Inferior
Zoning Adjustment	Resource Protection	None Similar	Ag Similar	AR Similar	FC Similar	RP Similar	LR Similar	RH Similar
Proximity to State Forest Adjustment	Within	11 Miles Inferior	3 Miles Inferior	½ Mile Similar	½ Mile Similar	Adjacent Similar	1 Mile Similar	10 Miles Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Since Lycoming County has some of the highest producing wells in the area, comparable 2 was weighted the heaviest, since it is located in Lycoming County. Therefore the value of **$24,534** or **$4,700** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #8 is **$25,000** (rounded).

Sales Comparison Approach – Conversion Site #9

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #9 Sales Comparison Approach Adjustment Grid

ELEMENT OF COMPARISON	SUBJECT PROPERTY Lycoming	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	12.39	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	0 Miles	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	Resource	None	Ag	AR	FC	RP	LR	RH
Adjustment	Protection	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4

is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Since Lycoming County has some of the highest producing wells in the area, comparable 2 was weighted the heaviest, since it is located in Lycoming County. Therefore the value of **$58,233** or **$4,700** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$58,000** (rounded).

Sales Comparison Approach – Conversion Site #10

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #10 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Lycoming	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	20.13	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements Adjustment	None	None 0	Cabin -615	Yes - $0/CV 0	Yes - $0/CV 0	Yes - $0/CV 0	None 0	Yes - $0/CV 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred Adjustment	Fee Simple	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing Adjustment		Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0
Conditions of Sale Adjustment		Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0
Market Conditions Adjustment		Feb-18 0	Nov-17 0	Oct-17 0	Oct-16 0	Oct-16 0	Sep-16 0	Jul-16 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev Adjustment	0 Miles	10 Miles Inferior	2 Miles Similar	>3 Miles Inferior	2 Miles Similar	1.5 Miles Similar	<1 Mile Similar	1 Mile Similar
Timber Adjustment	Average	Average Similar	Average Similar	Average Similar	Average Similar	Average Similar	Fair to Poor Inferior	Fair Inferior
Access Adjustment	Direct	Direct Similar	ROW Inferior	Direct Similar	Direct Similar	Direct Similar	Direct Similar	ROW Inferior
Zoning Adjustment	Resource Protection	None Similar	Ag Similar	AR Similar	FC Similar	RP Similar	LR Similar	RH Similar
Proximity to State Forest Adjustment	Within	11 Miles Inferior	3 Miles Inferior	½ Mile Similar	½ Mile Similar	Adjacent Similar	1 Mile Similar	10 Miles Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Since Lycoming County has some of the highest producing wells in the area, comparable 2 was weighted the heaviest, since it is located in Lycoming County. Therefore the value of **$94,611** or **$4,700** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$95,000** (rounded).

Sales Comparison Approach – Conversion Site #11

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #11 Sales Comparison Approach Adjustment Grid

ELEMENT OF COMPARISON	SUBJECT PROPERTY Lycoming	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	0.85	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	<1 Mile	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	Resource	None	Ag	AR	FC	RP	LR	RH
Adjustment	Protection	Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4

is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Since Lycoming County has some of the highest producing wells in the area, comparable 2 was weighted the heaviest, since it is located in Lycoming County. Therefore the value of **$3,995** or **$4,700** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$4,000** (rounded).

Sales Comparison Approach – Conversion Site #12

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #12 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Lycoming	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	8.65	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements Adjustment	None	None 0	Cabin -615	Yes - $0/CV 0	Yes - $0/CV 0	Yes - $0/CV 0	None 0	Yes - $0/CV 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred Adjustment	Fee Simple	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing Adjustment		Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0
Conditions of Sale Adjustment		Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0
Market Conditions Adjustment		Feb-18 0	Nov-17 0	Oct-17 0	Oct-16 0	Oct-16 0	Sep-16 0	Jul-16 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev Adjustment	0 Miles	10 Miles Inferior	2 Miles Similar	>3 Miles Inferior	2 Miles Similar	1.5 Miles Similar	<1 Mile Similar	1 Mile Similar
Timber Adjustment	Average	Average Similar	Average Similar	Average Similar	Average Similar	Average Similar	Fair to Poor Inferior	Fair Inferior
Access Adjustment	Direct	Direct Similar	ROW Inferior	Direct Similar	Direct Similar	Direct Similar	Direct Similar	ROW Inferior
Zoning Adjustment	Resource Protection	None Similar	Ag Similar	AR Similar	FC Similar	RP Similar	LR Similar	RH Similar
Proximity to State Forest Adjustment	Within	11 Miles Inferior	3 Miles Inferior	½ Mile Similar	½ Mile Similar	Adjacent Similar	1 Mile Similar	10 Miles Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Since Lycoming County has some of the highest producing wells in the area, comparable 2 was weighted the heaviest, since it is located in Lycoming County. Therefore the value of **$40,655** or **$4,700** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$41,000** (rounded).

Market Value Analysis – LWCF Area #5

Highest and Best Use of LWCF Area #5:

The following is a discussion of the four criteria of the Highest and Best Use in regard to the subject property.

As Vacant

Legally Permissible: The conversion site's municipality has no zoning ordinance. The Potter County Subdivision and Land Development Ordinance permits a degree of subdivision for single-family dwellings. These subdivisions require legal access. Access must be by a 50' wide right-of-way.

The conversion sites are all subject to oil and gas leases. The Commonwealth of Pennsylvania has entered into a lease and a coordination agreement in the LWCF Area #5 with a natural gas company. The lease includes not only the conversion sites, but also surrounding acreage. The Conversion Sites #13, 14 and 15 lease area is 23,000 acres. Conversion Site #16 has no subsurface rights, but is subject to a coordination agreement. By virtue of these lease, the conversion sites #13, 14 and 15 have an integrated legal use with the surrounding woodland. The leases allow for unitization or pooling of the leased area with surrounding landowners whose lands are in the same strata.

Conversion Site #16 has been developed with a compressor station that is allowed by the leases entered into by the owners of the subsurface rights.

Physically Possible: The conversion sites are located in the 265,000 acre Susquehannock State Forest. The LWCF Area #5 comprises 74,670 acres. The four conversion sites have acreages of (13) 1.47 acres, (14) 0.48 acres, (15) 2.05 acres & (16) 0.77 acres. The previously described larger parcel determination specifies that each conversion site is its own separate larger parcel located within a 100 to 200 acre parcel of similar ownership. ***(Hypothetical Condition #1 and #2).***

Conversion Site #13 is developed with 4 wells. Conversion Sites #14 and 15 were used as holding ponds, but have been reclaimed as herbaceous wildlife openings. Conversion site #16 is being used as compressor station.

The Market Area Analysis describes how well pads are the site of the vertical portion of the unconventional drilling infrastructure with the horizontal arms of the well extending potentially as far 15,000 feet. The well pads can be developed with multiple well heads used to move natural gas from large areas. The pad sites have been excavated to create

a level site for drilling, but the surrounding wooded areas have their original gentle slopes, which are typical of the surrounding LWCF area.

The use of the converted sites is integrated with the surrounding wooded recreational acreage. The value of the two areas are tied together since the conversion sites contain a portion of the infrastructure necessary to move the natural gas from the surrounding subsurface to the market place.

Gas well sites are common on lands in the PA Wilds. Old conventional well sites and newer Marcellus Shale wells are seen on privately owned lands, with the surrounding areas used for forest recreation. Marcellus Shale unconventional horizontal drilling well sites are very likely to draw natural gas from not just the subject property, but also from other properties whose landowners have pooled their interest for a specific well. There are no sales of just well pad sites.

The PA Wilds area has a significant wild game population that is sought after by the citizens of the Commonwealth. Hunting camps are common on private lands in the area. Timber harvesting is very common in the area.

The most likely physical private use of a property in the general LWCF Area is three part. First, for forest recreation use; second, for timber harvesting; and third, for investment in potential oil and gas extraction.

When the subsurface rights are owned by another entity, as in Conversion Site #16, the use is for forest recreation and timber harvesting.

Financially Feasible: The property's forested use is financially feasible. A landowner can expect to harvest timber from the property at some point in time. The age of the standing timber, type and size of trees, and method of any recent harvest determines the amount of potential income. Income from timber can be a factor in the buyer's purchase price decision. There is also demand for forested recreational uses, specifically hunting.

The conversion sites are in an active Marcellus Shale leasing and drilling area. The active wells are mostly pooled with landowners that have land within the same strata that is being drilled. Sale data indicates the typical buyer purchases a larger tract as an investment for potential development of subsurface rights while utilizing the property's surface for forested recreation. These sales indicate the land is purchased with the hope of eventually developing an income stream from the subsurface rights. It should be noted that there are no sales of land with all surface and subsurface rights that have an active producing well on them.

A wooded recreational tract with subsurface rights is financially feasible for Conversion Sites #13, 14 and 15. Conversion Site #16 is does not have any subsurface rights and the financially feasible use is a wooded recreational tract.

Maximally Productive: The present use as a wooded recreational tract with subsurface rights is a legally permissible and physical possible use. When considering financial feasible uses, the most likely purchase of the conversion sites is for continued use as wooded recreational tracts with an investment value in the subsurface rights.

The larger parcel conversion sites are inholdings within the much larger LWCF area. This LWCF area is larger than the typical size tract sold in the open market. It was established that open market sales range between 70 and 340 acres, which is significantly larger than the 0.85 – 28.66 acre conversion sites. There is no sales data that indicates a market for small conversion site inholdings that have all surface and subsurface rights included.

It has been established that the conversion sites have a physically integrated use with the surrounding forested recreational land. In open market transactions, the typical buyer would purchase the conversion site as a part of a 100 – 200 acre tract.

The *As Vacant* maximally productive use of the subject sites #13, 14 and 15 is the continued use as a wooded recreational tract with subsurface rights. The *As Vacant* maximally productive use of the subject site #16 is the continued use as a wooded recreational tract with no subsurface rights. The most likely buyer will be a person(s) that wish to establish and use the property for their personal recreational uses.

***As Vacant* Conclusion:** Because of the reasons stated above, the final conclusion of Highest and Best Use is *As Vacant* – wooded recreational tract with subsurface rights.

As Improved

None – Any present improvements are owned and utilized by the Oil and Gas lessee. Lessor is not permitted to use these conversion sites.

Final Conclusion

The *As Vacant* Use is the final conclusion of Highest and Best Use as a wooded recreational tract with subsurface rights.

Sales Comparison Approach – Conversion Site #13

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #13 Sales Comparison Approach Adjustment Grid

ELEMENT OF COMPARISON	SUBJECT PROPERTY Potter	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	1.47	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements Adjustment	None	None 0	Cabin -615	Yes - $0/CV 0	Yes - $0/CV 0	Yes - $0/CV 0	None 0	Yes - $0/CV 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred Adjustment	Fee Simple	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing Adjustment		Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arns Length 0
Conditions of Sale Adjustment		Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0
Market Conditions Adjustment		Feb-18 0	Nov-17 0	Oct-17 0	Oct-16 0	Oct-16 0	Sep-16 0	Jul-16 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev Adjustment	0 Miles	10 Miles Inferior	2 Miles Similar	>3 Miles Inferior	2 Miles Similar	1.5 Miles Similar	<1 Mile Similar	1 Mile Similar
Timber Adjustment	Average	Average Similar	Average Similar	Average Similar	Average Similar	Average Similar	Fair to Poor Inferior	Fair Inferior
Access Adjustment	Direct	Direct Similar	ROW Inferior	Direct Similar	Direct Similar	Direct Similar	Direct Similar	ROW Inferior
Zoning Adjustment	None	None Similar	Ag Similar	AR Similar	FC Similar	RP Similar	LR Similar	RH Similar
Proximity to State Forest Adjustment	Within	11 Miles Inferior	3 Miles Inferior	½ Mile Similar	½ Mile Similar	Adjacent Similar	1 Mile Similar	10 Miles Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparables 3, 6 and 7 are given the most weight. Therefore the value of **$5,880** or **$4,000** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$6,000** (rounded).

Sales Comparison Approach – Conversion Site #14

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #14 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Potter	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	0.48	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	0 Miles	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	None	None	Ag	AR	FC	RP	LR	RH
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparables 3, 6 and 7 are given the most weight. Therefore the value of **$1,920** or **$4,000** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$2,000** (rounded).

Sales Comparison Approach – Conversion Site #15

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #15 Sales Comparison Approach Adjustment Grid

ELEMENT OF COMPARISON	SUBJECT PROPERTY Potter	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	2.05	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements	None	None	Cabin	Yes - $0/CV	Yes - $0/CV	Yes - $0/CV	None	Yes - $0/CV
Adjustment		0	-615	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arns Length
Adjustment		0	0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0	0
Market Conditions		Feb-18	Nov-17	Oct-17	Oct-16	Oct-16	Sep-16	Jul-16
Adjustment		0	0	0	0	0	0	0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev	0 Miles	10 Miles	2 Miles	>3 Miles	2 Miles	1.5 Miles	<1 Mile	1 Mile
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar	Similar
Timber	Average	Average	Average	Average	Average	Average	Fair to Poor	Fair
Adjustment		Similar	Similar	Similar	Similar	Similar	Inferior	Inferior
Access	Direct	Direct	ROW	Direct	Direct	Direct	Direct	ROW
Adjustment		Similar	Inferior	Similar	Similar	Similar	Similar	Inferior
Zoning	None	None	Ag	AR	FC	RP	LR	RH
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	11 Miles	3 Miles	½ Mile	½ Mile	Adjacent	1 Mile	10 Miles
Adjustment		Inferior	Inferior	Similar	Similar	Similar	Similar	Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this

area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparables 3, 6 and 7 are given the most weight. Therefore the value of **$8,200** or **$4,000** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$8,000** (rounded).

Sales Comparison Approach – Conversion Site #16

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 8 – 13)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #16 Sales Comparison Approach Adjustment Grid							
ELEMENT OF COMPARISON	SUBJECT PROPERTY Potter	SALE #8 10518453 Potter	SALE #9 3517330 Clinton	SALE #10 10516877 Potter	SALE #11 8116792 Lycoming	SALE #12 3316791 Clearfield	SALE #13 3316054 Clearfield
Sales Price		$223,500	$205,000	$174,345	$450,000	$721,000	$240,000
Land Area (Acres)	0.77	138.90	131.00	136.00	177.98	340.13	112.85
Sales Price per Acre		$1,609	$1,565	$1,282	$2,528	$2,120	$2,127
Improvements		None	Yes - $0/CV	None	None	None	None
Adjustment		0	0	0	0	0	0
Adjusted Sales Price		$1,609	$1,565	$1,282	$2,528	$2,120	$2,127
Rights Transferred	Surface Only	Surface Only	Surface Only	Surface Only	Surface Only	Surface Only	Surface Only
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar
Adjusted Sales Price		$1,609	$1,565	$1,282	$2,528	$2,120	$2,127
Financing		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arns Length
Adjustment		0	0	0	0	0	0
Conditions of Sale		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0
Market Conditions		Jul-18	May-17	Dec-16	Nov-16	Nov-16	Jan-16
Adjustment		0	0	0	0	0	0
Adjusted Sales Price		$1,609	$1,565	$1,282	$2,528	$2,120	$2,127
Proximity to Gas Dev	Adjacent	7 Miles	4 miles	3 Miles	2.5 Miles	3 Miles	<1 Mile
Adjustment		Superior	Superior	Superior	Similar	Superior	Similar
Timber	Average	Fair	Average	Average	Average	Average	Average
Adjustment		Inferior	Similar	Similar	Similar	Similar	Similar
Access	Direct	Direct	Direct	Direct	ROW	Direct	Direct
Adjustment		Similar	Similar	Similar	Inferior	Similar	Similar
Zoning	None	None	RF	None	None	RA	None
Adjustment		Similar	Similar	Similar	Similar	Similar	Similar
Proximity to State Forest	Within	9 Miles	Adjacent	6 miles	2½ Miles	<2 Miles	<2 Miles
Adjustment		Inferior	Similar	Inferior	Similar	Similar	Similar
Overall Comparison		Inferior Timber & State For	Similar Timber & State For	Inferior Dist from State For	Similar Dist from State For	Similar Dist from State For	Similar Dist from State For
Final Adjusted Sales Price		$1,609	$1,565	$1,282	$2,528	$2,120	$2,127

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: None of the comparables have any improvements. No adjustments were needed.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are surface only transfers; the subsurface rights have been retained by previous owners. No adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an

advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, the greater the likelihood the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparables 8, 9, 10 and 12 are outside the active drilling area. They are considered to be superior, because surface disturbance is less likely to occur.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 8 has been timbered during the last 10 years.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparable 11 is inferior because it is accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer to a State Forest, the more desirable a particular property is. Easier access to State Forests allows for an expanded recreational use area. Distances from State Forests were compared. Comparables 8 and 10 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $1,282 – 2,582 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $1,872. All comparables were chosen because of similarity of rights transferred.

It was determined that the timber and proximity to State Forests are the primary influencers of value. Other components of adjustment (proximity to gas development, access, and zoning) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 8 is the most recent sale. It is inferior because of the lesser quality of its timber and greater distance from any State Forests. The distance from active wells is greater than that of the subject and thus is rated superior. No adjustment for distance from active wells was noted.

Comparable 9 is similar because of the similar quality of its timber and its proximity to a State Forest. The distance from active wells is greater than that of the subject and thus is rated superior. No adjustment for distance from active wells was noted.

Comparable 10 is inferior because it is located 6 miles from a State Forest. The distance from active wells is greater than that of the subject and thus is rated superior. No adjustment for distance from active wells was noted.

Comparable 11 is similar because of the similar quality of its timber and reasonable distance from a State Forest.

Comparable 12 is similar because the similar quality of its timber and reasonable distance from a State Forest. The distance from active wells is greater than that of the subject and thus is rated superior. No adjustment for distance from active wells was noted.

Comparable 13 is similar because of the similar quality of its timber and reasonable distance from a State Forest.

Comparables 9, 11, 12 and 13 are given the most weight. Therefore the value of **$1,617** or **$2,100** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #1 is **$2,000** (rounded).

Market Value Analysis – LWCF Area #6

Highest and Best Use of LWCF Area #6:

The following is a discussion of the four criteria of the Highest and Best Use in regard to the subject property.

As Vacant

Legally Permissible: The conversion site is located in a Resource Protection zoning district. The Tioga County Subdivision and Land Development Ordinance permits a degree of subdivision for recreational purposes. These subdivisions require legal access. A right-of-way may only serve a maximum of 2 lots. Private streets and right-of-ways require 50' width.

The conversion site is subject to oil and gas leases. The Commonwealth of Pennsylvania has entered into a lease in the LWCF Area #6 with a natural gas company. This lease includes not only the conversion site, but also surrounding acreage. The Conversion Site #17 lease area is 3,598 acres. By virtue of this lease, the conversion site has an integrated legal use with the surrounding woodland. The lease allows for unitization or pooling of the leased area with surrounding landowners whose lands are in the same strata.

Physically Possible: The conversion site is located in the 161,890 acre Tioga State Forest. The LWCF Area #6 comprises 19,598 acres. The conversion site has an acreage of 9.32 acres. The previously described larger parcel determination specifies that each conversion site is its own separate larger parcel located within a 100 to 200 acre parcel of similar ownership. ***(Hypothetical Condition #1 and #2).***

Conversion Site #17 is developed with 1 well.

The Market Area Analysis describes how well pads are the site of the vertical portion of the unconventional drilling infrastructure with the horizontal arms of the well extending potentially as far 15,000 feet. The well pad can be developed with multiple well heads used to move natural gas from large areas. The pad site has been excavated to create a level site for drilling, but the surrounding wooded areas have their original rolling to steep slopes, which are typical of the surrounding LWCF area.

The use of the converted site is integrated with the surrounding wooded recreational acreage. The value of the two areas are tied together since the conversion site contains a portion of the infrastructure necessary to move the natural gas from the surrounding subsurface to the market place.

Gas well sites are common on lands in the PA Wilds. Old conventional well sites and newer Marcellus Shale wells are seen on privately owned lands, with the surrounding areas used for forest recreation. Marcellus Shale unconventional horizontal drilling well sites are very likely to draw natural gas from not just the subject property, but also from other properties whose landowners have pooled their interest for a specific well. There are no sales of just well pad sites.

The PA Wilds area has a significant wild game population that is sought after by the citizens of the Commonwealth. Hunting camps are common on private lands in the area. Timber harvesting is very common in the area.

The most likely physical private use of a property in the general LWCF Area is three part. First, for forest recreation use; second, for timber harvesting; and third, for investment in potential oil and gas extraction.

Financially Feasible: The property's forested use is financially feasible. A landowner can expect to harvest timber from the property at some point in time. The age of the standing timber, type and size of trees, and method of any recent harvest determines the amount of potential income. Income from timber can be a factor in the buyer's purchase price decision. There is also demand for forested recreational uses, specifically hunting.

The conversion site is in an active Marcellus Shale leasing and drilling area. The active wells are mostly pooled with landowners that have land within the same strata that is being drilled. Sale data indicates the typical buyer purchases a larger tract as an investment for potential development of subsurface rights while utilizing the property's surface for forested recreation. These sales indicate the land is purchased with the hope of eventually developing an income stream from the subsurface rights. It should be noted that there are no sales of land with all surface and subsurface rights that have an active producing well on them.

A wooded recreational tract with subsurface rights is financially feasible.

Maximally Productive: The present use as a wooded recreational tract with subsurface rights is a legally permissible and physical possible use. When considering financial feasible uses, the most likely purchase of the conversion sites is for continued use as wooded recreational tracts with an investment value in the subsurface rights.

The larger parcel conversion sites are inholdings within the much larger LWCF area. This LWCF area is larger than the typical size tract sold in the open market. It was established that open market sales range between 70 and 340 acres, which is significantly larger than the 9.32 acre conversion site. There is no sales data that indicates a market for small conversion site inholdings that have all surface and subsurface rights included.

It has been established that the conversion sites have a physically integrated use with the surrounding forested recreational land. In open market transactions, the typical buyer would purchase the conversion site as a part of a 100 – 200 acre tract.

The *As Vacant* maximally productive use of the subject site is the continued use as a wooded recreational tract with subsurface rights. The most likely buyer will be a person(s) that wish to establish and use the property for their personal recreational uses.

***As Vacant* Conclusion:** Because of the reasons stated above, the final conclusion of Highest and Best Use is *As Vacant* – wooded recreational tract with subsurface rights.

As Improved

None – Any present improvements are owned and utilized by the Oil and Gas lessee. Lessor is not permitted to use these conversion sites.

Final Conclusion

The *As Vacant* Use is the final conclusion of Highest and Best Use as a wooded recreational tract with subsurface rights.

Sales Comparison Approach – Conversion Site #17

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Seven sales were selected from the PA Wilds market area. These sales were selected because of their similarity in rights transferred. Comparables are located in **Addendum E (Sales Comps 1 – 7)**.

General Discussion of Elements of Comparison

A qualitative adjustment grid is used in the development of the Sales Comparison approach. In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. In the development of this approach, the comparables were graded for their comparability to the subject. Following is that comparison grid:

Conversion Site #17 Sales Comparison Approach Adjustment Grid								
ELEMENT OF COMPARISON	SUBJECT PROPERTY Tioga	SALE #1 10518088 Potter	SALE #2 8117778 Lycoming	SALE #3 11717702 Tioga	SALE #4 3516720 Clinton	SALE #5 11716719 Tioga	SALE #6 11716652 Tioga	SALE #7 11716452 Tioga
Sales Price		$350,000	$650,000	$766,880	$176,850	$560,000	$770,000	$520,000
Land Area (Acres)	9.32	172.12	121.88	191.72	70.74	143.10	216.60	117.50
Sales Price per Acre		$2,033	$5,333	$4,000	$2,500	$3,913	$3,555	$4,426
Improvements Adjustment	None	None 0	Cabin -615	Yes - $0/CV 0	Yes - $0/CV 0	Yes - $0/CV 0	None 0	Yes - $0/CV 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Rights Transferred Adjustment	Fee Simple	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar	Fee Simple Similar
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Financing Adjustment		Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0	Arms Length 0
Conditions of Sale Adjustment		Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0	Cash to Seller 0
Market Conditions Adjustment		Feb-18 0	Nov-17 0	Oct-17 0	Oct-16 0	Oct-16 0	Sep-16 0	Jul-16 0
Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426
Proximity to Gas Dev Adjustment	0 Miles	10 Miles Inferior	2 Miles Similar	>3 Miles Inferior	2 Miles Similar	1.5 Miles Similar	<1 Mile Similar	1 Mile Similar
Timber Adjustment	Average	Average Similar	Average Similar	Average Similar	Average Similar	Average Similar	Fair to Poor Inferior	Fair Inferior
Access Adjustment	Direct	Direct Similar	ROW Inferior	Direct Similar	Direct Similar	Direct Similar	Direct Similar	ROW Inferior
Zoning Adjustment	Resource Protection	None Similar	Ag Similar	AR Similar	FC Similar	RP Similar	LR Similar	RH Similar
Proximity to State Forest Adjustment	Within	11 Miles Inferior	3 Miles Inferior	½ Mile Similar	½ Mile Similar	Adjacent Similar	1 Mile Similar	10 Miles Inferior
Overall Comparison		Inferior Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Inferior Amt of Drilling	Similar Dist From Drilling	Similar Dist From Drilling	Similar Dist From Drilling
Final Adjusted Sales Price		$2,033	$4,718	$4,000	$2,500	$3,913	$3,555	$4,426

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Improvements: Comparable Sale 2 has an improvement; the contributory value of that improvement was subtracted to determine the contributory value of the land.

After the comparables were adjusted for improvements, the following adjustment was considered.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities. The subject tract and all the comparable sales used in this conversion site valuation are fee simple and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of

different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. The comparable data spreads almost two years. No market conditions adjustment could be found.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Proximity to Gas Development: The proximity of active gas wells to the comparables was compared. The closer a property is to an active well, there greater likelihood that the comparable will be drilled or pooled with wells from adjacent properties. New well drilling technology permits drilling slightly less than 3 miles in distance from the well head. Comparable 1 is 10 miles from an existing well and is considered inferior. Comparable 3 has several unconventional wells that are in close proximity to the subject. The closest active well is greater than 3 miles, making it inferior. Although, comparable 4 is only 2 miles from an active unconventional well and there are a number of unconventional capped wells north and west of Comparable 4, indicating wells in this area are either low producing or not economical to operate. It was determined that Comparable 4 is inferior because of its distance from active unconventional wells.

Timber: The amount and type of timber on a property can influence sales prices. The subject and the comparables were compared using onsite inspections and aerial images to determine the quality of the timber. Timber was rated average if no recent timbering was noted. Comparable 6's timber rights were retained by the seller and which is inferior to the subject. Comparable 7 has some wetlands that decreased the timber value in those areas.

Access: Access to the subject is compared to the comparable sales. The 100-200 acre area that surrounds the subject is considered in this adjustment. The larger parcel being valued is an inholding within a larger tract that has some type of direct access. Comparables 2 and 7 are inferior because they are accessed by a ROW.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The Highest and Best Use of wooded recreational land is permitted in all cases. The comparables and subject are similar.

Proximity to State Forest: Since the buyers' motivation is often tied to hunting, the closer the proximity to a State Forest, the more desirable a particular property is. Distances from State Forests were compared. Comparables 1, 2 and 7 are distant from a State Forest and thus considered inferior.

Conclusions: A value range of $2,033 – 4,718 per acre was established. Adjustments were considered for buildings, financing, conditions of sale, market conditions, proximity to gas development, timber, access, zoning and proximity to State Forest differences. The mean value is $3,592. All comparables were chosen because of similarity of rights transferred.

It was determined that proximity to active producing unconventional gas wells is the primary influencer of value. Other components of adjustment (timber, access, zoning and proximity to State Forests) had little to no effect on market value. The following is a discussion of the overall ratings of the comparables:

Comparable 1 is the most recent sale. It is inferior because of its distance from any established unconventional wells. It is also distant from any State Forests.

Comparable 2 is similar because it is within 2 miles of an established unconventional well. Comparable 2 is in Lycoming County, which is the best natural gas producing area. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparable 3 is similar because it is within 3 miles of an established unconventional well. It is also ½ mile from a State Forest.

Comparable 4 is inferior since the well activity in the area shows a number of capped inactive wells to the north and west, which indicate the drilled unconventional wells in this area are not economical to operate.

Comparable 5 is similar since it is 1.5 miles from an established unconventional well. It has been given limited weight and is only provided as support due to lack of verification with a party involved in the sale.

Comparable 6 is similar since it is less than 1 mile from an active unconventional well.

Comparable 7 is similar since it is 1 mile from an active unconventional well. It has limited access by ROW, but the market is not indicating any value change because of the access.

Comparables 3, 6 and 7 are given the most weight. Therefore the value of **$37,280** or **$4,000** per acre is considered the indicated value.

The value by the Sales Comparison Approach for Conversion Area #17 is **$37,000** (rounded).

Reconciliation and Correlation

The three generally accepted approaches to value include the Income Approach, the Cost Approach and the Sales Comparison Approach. Only the Sales Comparison Approach is developed to appraise the 17 Conversion sites located in the 6 LWCF areas situated in the PA Wilds.

Therefore, the final opinion of Market Value of the fee simple interests of the subject property is estimated as:

LWCF Area #1	Conversion Site #1	$16,000
	Conversion Site #2	$32,000
LWCF Area #2	Conversion Site #3	$18,000
LWCF Area #3	Conversion Site #4	$25,000
LWCF Area #4	Conversion Site #5	$35,000
	Conversion Site #6	$135,000
	Conversion Site #7	$86,000
	Conversion Site #8	$25,000
	Conversion Site #9	$58,000
	Conversion Site #10	$95,000
	Conversion Site #11	$4,000
	Conversion Site #12	$41,000
LWCF Area #5	Conversion Site #13	$6,000
	Conversion Site #14	$2,000
	Conversion Site #15	$8,000
	Conversion Site #16	$2,000
LWCF Area #6	Conversion Site #17	$37,000

Cash or Cash Equivalency

ADDENDA

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

August 10, 2018

Snyder Appraisal Associates LLC
3004 Hempland Road
Suite 3
Lancaster, PA 17601-1389

RE: Purchase Order #4300595089

Dear Mr. Snyder:

This letter shall serve as your official Notice to Proceed for Purchase Order #4300595089. This contract is to provide Yellow Book Appraisals for 17 impacted sites in 6 counties in Northern Pennsylvania. Please refer to the Statement of Work specifics.

The project shall commence upon execution and receipt of purchase order and terminate September 30, 2018.

Please contact Thomas Ford at 717-783-2659 or thoford@pa.gov should you have any questions. Feel free to also contact me if you have any purchasing, contracting, or invoicing questions at 717-783-3309 or cdurham@pa.gov.

Thank you for your interest and participation in this project.

Sincerely,

Carol Durham

Carol Durham
Purchasing Agent

cc: Thomas Ford
File

Statement of Work

Yellow Book Appraisal

Department of Conservation and Natural Resources
Bureau of Recreation and Conservation

I. SCOPE OF WORK

The Department of Conservation and Natural Resources, Bureau of Recreation and Conservation, requires a vendor to provide Yellow Book Appraisals, by a Pennsylvania Yellow Book Appraiser experienced with LWCF 6(F) reports, for 17 impacted sites in 6 counties in Northern Pennsylvania.

Questions regarding the technical aspects of this bid should be directed to Thomas Ford at (717) 783-2659, or thoford@pa.gov. Questions regarding the contracting or bidding aspects of this solicitation should be directed to Carol Durham at (717) 783-3309 or cdurham@pa.gov.

II. TASKS

1. Appraisals are to be completed using USFLA "yellow book standards" under LWCF 6(F) guidelines.
2. The appraisal report is to have 6 sections (coordinated by the 6 respective counties) establishing the value for each of the 17 impact areas.

III. LOCATIONS

The 17 sites which are contained in 3 LWCF 6(F) areas. (See attached maps)

1. **Centre County** - Sproul State Forest, Forest District 10 (Burnside Township)
   Sites: 259-259 Pad B: 41.131006, -77.888679
   706-Pad 10: 41.130525, -77.949210
2. **Clinton County** – Sproul State Forest, Forest District 10 (Grugan Township)
   Site: 284-284-Pad A: 41.339985, -77.577248
3. **Clearfield County** - Moshannon State Forest, Forest District 9 (Girard Township)
   Site: 324-COP 324 A: 41.162560, -78.314526
4. **Lycoming County** - Loyalsock State Forest, Forest District 20
   Sites: 100-Pad N: 41.429924, -77.058186 (Lewis Twp.)
   100-Neuman Field Holding Pond: 41.454814, -77.050990 (Lewis Twp.)
   100-Neuman Field Compressor Station: 41.456110, -77.052760 (Lewis Twp.)
   100-T 100 pad G: 41.462363, -77.034329 (McIntyre Twp.)
   100-Pad P: 41.434319, -77.039226 (Lewis Twp.)
   100-Pad P Impoundment: 41.433235, -77.040392 (Lewis Twp.)
   100-Pad T: 41.438728, -77.030231 (Lewis Twp.)
   100-Pad R: 41.419526, -77.059206 (Lewis Twp.)

5. **Potter County** - Susquehannock State Forest, Forest District 15 (Wharton Township)
   Sites: 154 Pine Hill: 41.614882, -77.876248
   154 Pine Hill Impoundment: 41.615206, -77.875562
   154 Pine Hill Impoundment (2): 41.613269, -77.876187
   997 Pine Hill Compressor: 41.611038, -77.834367

6. **Tioga County** - Tioga State Forest, Forest District 16 (Liberty Township)
   Site: 594-3: 41.626330, -77125147

IV. CONTRACTOR REQUIREMENT

1. Must be a Pennsylvania Yellow Book Appraiser experienced with LWCF 6(F) reports.
2. The offeror shall be able to provide appraisal reports to Thomas P. Ford at PA Department of Conservation and Natural Resources, 400 Market Street, 5th Floor, Harrisburg, PA 17106 by September 8, 2018.

V. CONTRACTOR REFERENCES

After the bid opening, and prior to awarding the contract, the Department has the right to request references (names, addresses, and telephone numbers) of similar Yellow Book Appraiser work performed in the previous four (4) years as proof of qualifications to perform the work outlined in this contract.

References are an optional tool available to the Department to help determine bidder capabilities. If any of these references are requested and the bidder cannot supply the necessary documentation and proof of compliance, the Department reserves the right to reject the bidder. The decision to both request references or reject bidders based on inadequate reference will be made solely at the discretion of the Department.

VI. INSURANCE REQUIREMENTS

The contractor shall purchase and maintain, at its expense, the following types of insurance, issued by companies acceptable to the Commonwealth.

1. Workmen's Compensation Insurance for all of the Contractor's employees and those of any subcontractor, engaged in work at the site of the project as required by law.
2. Public Liability and Property Damage Insurance to protect the Commonwealth, the Contractor, and any and all subcontractors from claims for damages for personal injury (including bodily injury), sickness or disease, accidental death and damage to property including the loss of use resulting from any property damage, which may arise from the activities performed under the Contract, or the failure to perform under the Contract, whether such performance or non-performance be by the Contractor, by any subcontractor, or by anyone directly or indirectly employed by either. The minimum amounts of coverage shall be $250,000 per person and $1,000,000 per occurrence for bodily injury, including death, and $250,000 per person and $1,000,000 per occurrence for property damage. Such policies shall be occurrence rather than

claims-made policies and shall not contain any endorsements or any other form designated to limit and restrict any action by the Commonwealth, as an additional insured, against the insurance coverage in regard to work performed for the Commonwealth.

Prior to commencement of the work under the Contract and at each insurance renewal date during the term of the Contract, the Contractor shall provide the Commonwealth with current certificates of insurance. These certificates or policies shall name "The Commonwealth of PA-DCNR" as an additional insured and shall contain a provision that the coverage's afforded under the policies will not be cancelled or changed until at least thirty (30) days written notice has been given to the Commonwealth. These certificates shall include the location and a brief description of the work to be performed under the contract.

The Commonwealth shall be under no obligation to obtain such certificates from the Contractor(s). Failure by the Commonwealth to obtain the certificates shall not be deemed a waiver of the Contractor's obligation to obtain and furnish certificates. The Commonwealth shall have the right to inspect the original insurance policies.

VII. CONTRACT TERM

The term of this contract shall commence upon execution and receipt of purchase order and Notice to Proceed letter and terminates September 30, 2018.

VIII. BID AWARD

Bidder must complete and return the electronic Invitation for Bid to be found at www.pasupplierportal.state.pa.us

The bid will be awarded based on the total sum as indicated on the IFB-Invitation for Bids.

Quantities are estimated and may increase or decrease per actual agency need.

The Department will only accept out to two decimal points when entering your "Unit Price" figures in the Invitation for Bid.

XI. PAYMENT TERMS

Payment shall be made upon satisfactory completion of the appraisals. Any deficiencies will be corrected by the contractor at no expense to the Department.

X. INVOICING

Invoice format shall be in accordance with the IFB – Invitation for Bid.

All invoices for this contract MUST either be:

1. Emailed to the following for a Paperless Email Invoice Option:

Email a copy of the correctly executed invoice to: 69180@pa.gov.

For information on the Commonwealth's E-Invoicing Program, visit: http://www.budget.pa.gov/Programs/Pages/E-Invoicing.aspx.

2. Or mailed to the following address:
   Commonwealth of PA – PO Invoice
   PO Box 69180
   Harrisburg PA 17106

All invoices MUST have the purchase order number as well as your SAP Vendor Number on the invoice. The name and address listed on the purchase order must also be listed on each invoice. Failure to provide this information may result in a delay of payment.

Please Note: Vendors are reminded to **NOT** include employer identification numbers, Social Security Numbers, bank account information, or other personally identifiable information on their invoices. That information is uniquely tied to your SAP Vendor Number and, for security purposes, should not be explicitly stated on an invoice.

XI. RECEIPT AND OPENING OF BIDS

Bids must be submitted via the PA Supplier Portal, to be found at www.pasupplierportal.state.pa.us. Fax bids and mailed bids will not be accepted.

No responsibility will be attached to any employee of the Department for the premature opening of, or the failure to open, a bid not properly addressed and identified, or for any reason whatsoever.

XII. BID RESULTS

Bidder can obtain bid results by accessing http://www.emarketplace.state.pa.us/BidTabs.aspx. The bids will be posted within three (3) business days following the bid opening. The results are the apparent bidders, and all bids are under review until final award of the purchase order.

Tract ID 259

Vol 79 P6 510

Wt John Dewart
G-356

Map # 604

Title Brief 5-1-1

Simon P. Wolverton and Elizabeth D., his wife; Lloyd T. Rohrbach and Jane C., his wife; Monroe H. Kulp and Sarah W., his wife,

to

Commonwealth of Pennsylvania

Special Warranty Deed

Dated April 10, 1900.

Ack eo. die. by Simon P. Wolverton and Elizabeth, D., hiswife, and Lloyd T. Rohrbach and Jane C., his wife, before Chas. A. Sidler, N. P. in Northumberland County.

Ack. April 14, 1900 by Monroe H Kulp and Sarah H., his wife, before D. C. Kaseman, N. P., Northumberland County.

Recorded April 25, 1900 in Centre County in Deed Book Vol. 79, page 510.

Recorded May 2, 1900 in Clinton County in Deed Book Vol. 58, page 734.

Consid. $24,003.41.

U. S. Revenue Stamp $24.50.

Conveys all those several 29 tracts of land situate, bounded and described as follows.

First. A certain tract of land called "Switzerland" situate in the Township of Beech Creek, County of Clinton (formerly Bald Eagle Township, Mifflin County) and State of Pennsylvania, surveyed on the 6th of August, 1794, in pursuance of a Warrant dated the 20th day of Jan , 1794, granted to John Young; for which letters Patent were granted to William Harrison dated Apr. 1, 1795 and enrolled in the Rolls Office at Harrisburg, Pennsylvania, in Patent Book Vol. 25, page 13, said tract being bounded and described by official courses and distances as follows.

Beginning at a Chestnut Oak; thence by land of Henry Goodheart West 320 per. to a Beech; thence by land of William Wilson, South 220 per. to an Ash; thence by land of Flavel Roan, East 320 per. to a Pine; and thence by vacant land, North 220 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

SECOND. A certain tract of land called "Carthagina", situate in said Township and County, surveyed on the 6th of August, 1794, in pursuance of a Warrant dated the 20th day of Jan., 1794, to Paul Lebo, for which Letters Patent were granted William Harrison, dated May 30, 1795 and enrolled at Harrisburg in Patent Book Vol. 24, page 313, bounded and described by official courses and distances as follows

Beginning at a Pine, thence by land of Flavel Roan West 320 per. to a Juneberry; thence by land of John Boyd, South 220 per. to a Maple; thence by land of John Deemer, East 320 per. to a pine; and thence by vacant land North 220 per to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

THIRD. A certain tract of land called "Hope" in said Township and County, surveyed on the 6th of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to Flavel Roan, for which Letters Patent were granted to William Morrison, dated April 1, 1795, enrolled at Harrisburg in Patent Book Vol. 24, page 309, bounded and described by official courses and distances as follows:

Beginning at a pine; thence by land of John Young, West 320 per. to an Ash; thence by land of John Boyd, South 220 per to a Juneberry; thence by land of Paul Lebo, East 320 per. to a pine; and thence by vacant land, North 220 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

FOURTH. A certain tract of land called "Carolstat" situate in said Township and County , surveyed on the 6th of August, 1794, in pursuance of a Warrant dated the 20th of January, 1794 to Henry Goodheart, for which Letters Patent were granted to William Harrison, dated March 30, 1795 and enrolled at Harrisburg in Patent Book Vol. 24, page 313, bounded and described as follows.

Beginning at a pine; thence by land of Robert Irwin West 320 per. to a Chestnut; thence by William Wilson, South 220 per. to a Beech; thence by land of John Young, East 320 per to a Chestnut Oak; and thence by vacant land, North 220 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

FIFTH. A certain tract of land called "Chester" situate in said Township and County, surveyed on the 6th of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794 to Daniel Smith, for which Letters Patent were granted to William Harrison April 1, 1795, and enrolled in the Rolls Office at Harrisburg in Patent Book Vol. 23, page 350, bounded and described by official courses and distances as follows

Beginning at a pine; thence by land of John Deemer, South 220 per. to a sassafras; thence by land of William Miller, East 320 per. to a post; thence by vacant land, North 220 per. to a post, and West 320 per. to the beginning Containing 415 acres and allowance of 6% for roads, etc.

SIXTH. A certain tract of land called "Rockingham", situate partly in the said Township and County, and partly in the Township of Burnside, County of Centre, surveyed on the 6th of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794 to Martin Withington, for which Letters Patent were granted to William Harrison on April 1, 1795 and enrolled in Harrisburg in Patent Book Vol 25, page 10, bounded and

described by official courses and distances as follows.

Beginning at a Sassafras; thence by land of John Deemer West 320 per. to a Sassafras; thence by land of Jacob Widner, South 220 per. to a Beech; thence by land of J. J. Wallace, East 320 per. to a White Oak; and thence by land of William Miller, North 220 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

(X) SEVENTH. A certain tract of land called "Springfield", situate in the Township of Burnside, County of Centre (formerly Bald Eagle Township, Mifflin County), and State of Pennsylvania, surveyed on the 4th of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to John Kidd, for which Letters Patent were granted on April 1, 1795 to William Harrison, enrolled at Harrisburg in Patent Book Vol 23, page 362, bounded and described by official courses and distances as follows

Beginning at a Maple; thence by land of Benjamin Young, South 230 per. to a pine; thence by land of John Donely, Esq., ----- 320 per. to a post; thence by land of William Dewart and John Dewart, North 230 per. to a post; and thence by land of Thomas Grant, West 320 per. to the beginning. Containing 433 acres, 163 per. and allowance of 6% for roads, etc.

(X) EIGHTH. A certain tract of land called "Bound Creek", situate in said Township and County, surveyed on the 4th of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to James Towers, for which Letters Patent were granted to William Harrison on March 27, 1795, and enrolled at Harrisburg in Patent Book Vol. 24, page 288, bounded and described by official courses and distances as follows

Beginning at a pine; thence by land of Chas. Hall, West 320 per. to a post; thence by land of Chas. Gobin, South 230 per. to a post; thence by land of John Dewart, East 320 per

Addendum A
Conversion Site #1

to a Chestnut; and thence by land of John Kugg, North 230 per to the beginning. Containing 433 acres, 163 per and allowance of 6% for roads, etc.

NINTH. A certain tract of land called "The Farm" situate in said Township and County, surveyed on the 4th of August 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to William Cook, for which Letters Patent were granted to William Harrison dated April 1, 1795, and enrolled at Harrisburg in Patent Book Vol. 25, page 7, bounded by official courses and distances as follows.

Beginning at a post; thence by land of Alexander Bell West 320 per. to a post; thence by land of John Couden, South 230 per. to a chestnut; thence by land of John Howell, East 320 per. to a post; and thence by land of Jacob Widner, North 230 per. to the beginning. Containing 433 acres, 163 per. and allowance of 6% for roads, etc.

TENTH. A certain tract of land called "Mt. Hope", situate in said Township and County, surveyed on the 4th of August, 1794, in pursuance of a Warrant dated the 20th of Jan , 1794, to Robert Brady, for which Letters Patent were issued to William Harrison Apr. 4, 1795, enrolled at Harrisburg in Patent Book Vol. 25, page 8, bounded and described by official courses and distances as follows.

Beginning at a White Oak; thence by land of Henry Donely West 320 per. to a Pine; thence by vacant land, South 230 per to a Pine; thence by land of George McClakan, Ann McClahan and surveyed land, East 320 per. to a White Pine; and thence by land of Robert Gray, North 230 per to the beginning. Containing 433 acres and 163 per. and allowance of 6% for roads, etc.

(X) ELEVENTH. A certain tract of land called "St. Johns", situate in said Township and County, surveyed on the 4th day

10 of 477
Addendum A
Conversion Site #1

of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, for which Letters Patent were granted to William Harrison, dated April 4, 1795, enrolled at Harrisbirg in Patent Book Vol. 23, page 360, to John Brady, bounded and described by official courses and distances as follows.

Beginning at a Maple; thence by land of Samuel Scott, West 320 per. to a Chestnut, thence by vacant land South 230 per. to a Chestnut; thence by land of Benjamin Young, East 320 per. to a Maple; and thence by land of Thomas Grant, North 230 per. to the beginning. Containing 433 acres, 163 per. and allowance of 6% for roads, etc.

TWELFTH. A certain tract of land called "Fair Prospect" situate in said Township and County, surveyed on the 5th of August, 1794, in pursuance of a Warrant dated the 20th day of Jan., 1794, to William P Brady, for which Letters Patent were granted to William Harrison, dated March 30, 1795, enrolled at Harrisburg in Patent Book Vol. 25, page 12, bounded and described by official courses and distances as follows

Beginning at a Gum; thence by vacant land West 320 per. to a Chestnut; South 230 per. to a White Pine; East 320 per to a Chestnut; and thence by land of Henry Sheaffer, North 230 per. to the beginning. Containing 433 acres, 163 per. and allowance of 6% for roads, etc.

THIRTEENTH. A tract of land called "High Plain", situate in said Township and County, surveyed on the 4th day of August, 1794, in pursuance of a Warrant dated the 20th of Jan 1794, to Charles Gobin, for which Letters Patent were granted March 30, 1795 to William Harrison, and enrolled at Harrisburg in Patent Book Vol. 24, page 31, bounded and described by official courses and distances as follows

Beginning at a post; thence by land of John Byers, Esq., West 320 per. to a Pine, thence by land of James Scott, South 230 per. to a Sassafras; thence by land of Thomas Grant, East

11 of 477
Addendum A
Conversion Site #1

320 per. to a post, and thence by land of James Towers, Charles Hall and John Weitzel, North 230 per. to the beginning Containing 433 acres, 163 per. and allowance of 6% for roads,etc

(8) FOURTEENTH. A certain tract of land called "Boston" situate in said Township and County, surveyed on the 5th of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to John Housel, for which Letters Patent were granted William Harrison on April 1, 1795, and enrolled at Harrisburg in Patent Book Vol. 24, page 314, bounded and described by official courses and distances as follows

Beginning at a Chestnut, thence by land of Henry Sheaffer, South 230 per. to an Ash; thence by land of John Lyon, East 320 per. to a post; thence by land of Jacob Widner, North 230 per. to a post; and thence by land of William Cook, West 320 per. to the beginning. Containing 433 acres, and 163 per and allowance of 6% for roads, etc.

(X) FIFTEENTH. A certain tract of land called "Pleasant Farm", situate in said Township and County, surveyed on the 4th of Aug., 1794, in pursuance of a Warrant dated Jan. 20, 1794, to William Dewart, for which Letters Patent were granted March 27, 1795 to William Harrison, and enrolled at Harrisburg in Patent Book Vol. 23, page 336, bounded and described by official courses and distances as follows

Beginning at a Chestnut; thence by land of John Dewart West 320 per. to a post; thence by land of John Kidd and John Donley, South 230 per. to a post; thence by land of William Gray, East 320 per. to a Pine; and thence by land of Samuel M. Fox, North 230 per. to the beginning Containing 433 acres 163 per. and allowance of 6% for roads, etc.

SIXTEENTH. A certain tract of land called "Clearfield" situate in said Township and County, surveyed on the 5th day of Aug., 1794, on Warrant dated Jan. 20, 1794 to John Cowden,

Addendum A
Conversion Site #1

for which Letters Patent were granted William Harrison on Apr 4, 1795, enrolled at Harrisburg in Patent Book Vol. 24, page 310, bounded and described by official courses and distances as follows.

Beginning at a Gum; thence by land of Henry Sheaffer East 320 per. to a Chestnut; thence by land of William Cook, North 230 per. to a post; thence by vacant land, West 320 per. to a post; and South 230 per. to the place of beginning Containing 433 acres, 163 per. and allowance of 6% for roads, etc

SEVENTEENTH. A certain tract of land called "Fertility" situate in said Township and County, surveyed on the 4th of August, 1794, in pursuance of a Warrant dated Jan. 20, 1794, to William Gray, for which Letters Patent were granted William Harrison, dated March 27, 1795, enrolled at Harrisburg in Patent Book Vol. 24, page 288, bounded and described by official courses and distances as follows;

Beginning at a Pine; thence by land of William Dewart, West 320 per. to a post; thence by land of John Donely and Robert Gray, South 230 per. to a post; thence by land of David Connagam, East 320 per to a post; and thence by land of Thos. Grives, North 230 per. to the beginning. Containing 433 acres 163 per. and allowance of 6% for roads, etc.

EIGHTEENTH. A certain tract of land called "Violet Grove", situate in said Township and County, surveyed on the 4th of August, 1794, in pursuance of a Warrant dated Jan. 20, 1794, to John Dewart, for which Letters Patent were granted Wm. Harrison on March 27, 1795, enrolled in Patent Book Vol. 23, page 355, bounded and described by official courses and distances as follows.

Beginning at a Chestnut; thence by land of James Tower West 320 per. to a post; thence by land of Thomas Grant and John Kidd, S[redacted] 230 per. to a post; thence by land of William

Addendum A
Conversion Site #1

Dewart, East 320 per. to a Chestnut, and thence by land of Alexander Grieves, North 230 per. to the beginning. Containing 433 acres, 163 per. and allowance of 6% for roads, etc.

NINETEENTH. A tract of land called "The Retreat" situate in said Township and County, surveyed on the 5th of Aug., 1794, in pursuance of a Warrant dated the 20th day of Jan., 1794, to Henry Sheafer, for which Letters Patent were granted to William Harrison on March 30, 1895, enrolled at Harrisburg in Patent Book Vol. 25, page 10, bounded and described by official courses and distances as follows

Beginning at a Chestnut; thence by land of John Cowden West 320 per. to a Gum; thence by land of William P. Brady, South 230 per. to a Chestnut; thence by land of Alexander Hunter, East 320 per. to an Ash; and thence by land of John Housel, North 230 per. to the beginning. Containing 433 acres, 163 per. and allowance of 6% for roads, etc.

(X) TWENTIETH. A certain tract of land called "Portsmouth" situate in said Township and County, surveyed on the 4th of Aug., 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to John Lyon, for which Letters Patent were granted William Harrison on April 1, 1795, enrolled at Harrisburg in Patent Book Vol. 23, page 364, bounded and described by official courses and distances as follows

Beginning at an Ash, thence by land of Alexander Hunter South 230 per. to a Maple; thence by land of John Buyers, Esq., East 320 per. to a post; thence by land of John Weitzel and Jacob Widner, North 230 per. to a post, and thence by land of John Housel, West 320 per. to the beginning. Containing 433 acres, 163 per. and allowance of 6% for roads, etc.

(X) TWENTY-FIRST. A certain tract of land called "Derry", situate in the said Township and County, surveyed on the 4th of August, 1794, on a Warrant dated the 20th of Jan., 1794, to

Addendum A
Conversion Site #1

Henry Donelly, for which Letters Patent were granted William Harrison on April 4, 1795, and enrolled at Harrisburg in Patent Book Vol. 25, page 9, bounded and described by official courses and distances as follows.

Beginning at a Chestnut; thence by vacant land, South 230 per. to a Pine; thence by land of Robert Brady, East 320 per. to a White Oak; thence by land of John Donely, North 230 per. to a pine; and thence by land of Benjamin Young, West 320 per. to the beginning. Containing 433 acres, 163 per. and allowance of 6% for roads, etc.

(X) TWENTY-SECOND. A certain tract of land called "Middleton", situate in said Township and County, surveyed August 4, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to Robert Gray, for which Letters Patent were granted William Harrison on March 30, 1795, enrolled at Harrisburg in Patent Book Vol. 25, page 12, bounded and described by official courses and distances asfollows:

Beginning at a White Oak; thence by land of Robert Brady South 230 per. to a White Pine; thence by land of John Nesbitt East 320 per. to a Chestnut; thence by land of David Cunnagam and William Gray, North 230 per. to a post; and thence by land of John Donely, West 320 per. to the beginning. Containing 433 acres and 163 per. and allowance of 6% for roads, etc

(X) TWENTY-THIRD. A certain other tract of land called "St. Thomas", situate in said Township and County, surveyed on the 4th of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to Thomas Grant, for which Letters Patent were granted William Harr ison on April 4, 1795, and enrolled in Patent Book Vol. 23, page 360, bounded and described by official courses and distances as follows.

Beginning at a Sassafras; thence by land of John Brady South 230 per. to a Maple, thence by land of John Kidd, East

Addendum A
Conversion Site #1

320 per. to a post; thence by land of John Dewart and James Tower, North 230 per. to a post; and thence by land of Charles Gobin, West 320 per. to the beginning. Containing 433 acres and 163 per. and allowance of 6% for roads, etc.

(X) TWENTY-FOURTH. A certain tract of land called "Nantz", situate in said Township and County, surveyed on the 6th of Aug., 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to Joseph J. Wallace, for which Letters Patent were granted William Harrison on March 30, 1795, and enrolled at Harrisburg in Patent Book Vol. 24, page 314, bounded and described by official courses and distance as follows

Beginning at a White Oak; thence by land of Martin Withington, West 320 per. to a Birch; thence by land of Jacob Widner and John Weitzel, South 220 per. to a Chestnut; thence by land of James Black, East 320 per. to a pin; and thence by land of Nathaniel Levy, North 220 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

TWENTY-FIFTH. A certain tract of land called "Abbington", situate in said Township, surveyed on the 6th of Aug., 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to John Boyd, for which Letters Patent were granted William Harrison on April 1, 1795, and enrolled at Harrisburg in Patent Book Vol. 23, page 361, bounded and described by official courses and distances as follows.

Beginning at a post; thence by land of Jacob Widner East 138 per. to a post; thenceby land of John Deemer, Paul Lebo, Flavel Roan and John Young, North 510 per. to a post; thence by land of William Wilson, West 138 per. to a post; and thence by vacant land, land of Thomas Hamilton and Alexander Bell, South 510 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

(X) TWENTY-SIXTH. A certain tract of land called "Burnham"

16 of 477
Addendum A
Conversion Site #1

situate in said Township and County, surveyed on the 4th of August, 1794, in pursuance of a Warrant dated Jan. 20, 1795, to James Black, for which Letters Patent were granted William Harrison on March 30, 1795, and enrolled at Harrisburg in Patent Book Vol. 25, page 11, bounded by official courses and distances as follows

Beginning at a pine; thence by land of J. J. Wallis, West 320 per. to a Chestnut; thence by land of John Weitzel, South 220 per. to a Chestnut; thence by land of Charles Hall and surveyed land, East 320 per. to a post; and thence by land of Joseph Thomas, North 220 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

TWENTY-SEVENTH. A certain tract of land called "Greenland", situate in said Township and County, surveyed on the 4th of August, 1794, in pursuance of a Warrant dated the 20th of Jan., 1794, to John Weitzel, for which Letters Patent were granted William Harrison on March 30, 1795, and enrolled at Harrisburg in Patent Book Vol. 23, page 363, bounded and described by official courses and distances as follows.

Beginning at a post; thence by land of John Lyon, John Buyers, Esq., and Charles Gobin, South 510 per. to a post; thence by land of Charles Hall, East 138 per. to a post; thence by surveyed land, land of James Black, and J J. Wallis, North 510 per. to a post; thence by land of Jacob Widner, West 138 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

TWENTY-EIGHTH. A certain tract of land called "Hamburg" situate in said Township and County, surveyed on the 6th day of Jan., 1795, in pursuance of a Warrant dated the 20th day of Jan., 1794, to William Wilson, for which Letters Patent were granted William Harrison on April 1, 1795, enrolled at Harrisburg in Patent Book Vol. 23, page 363, bounded and described by official courses and distances as follows

Addendum A
Conversion Site #1

Beginning at a post; thence by land of John Boyd, East 138 per. to a post; thence by land of John Young, Henry Goodheart and Robert Irwin, North 510per. to a post, thence by vacant land, West 138 per to a post; thence by same and surveyed land, South 510 per. to the beginning. Containing 415 acres and allowance of 6% for roads, etc.

TWENTY-NINTH. A certain tract of land situate in said Township and County, surveyed upon Warrant granted Joseph F. Quay, dated July 7, 1855, bounded on the Northwest by the River; on the South by a tract of land surveyed on a Warrant to William Wilson, last above described; and on the East by a tract of land surveyed to Robert Irwin. Containing 58 acres and 62 per. and allowance of 6% for roads, etc.

---ooo·O·ooo---

DEPARTMENT OF FORESTRY.

CENTRE COUNTY

Burnside, Snows Shoe

DETAIL MAP

See Map E-6.

Scale 1" = 100 rods

S.T.M.

Heavy lines = Lines surveyed by Grove 1911.

FILE 3-A-13

Tracing Case 8-Roll B

W. P. BRADY — East 332 — N 89½ E 332

ALEXANDER DALLAS 434a — wt Aug. 6, 1794 — sd Aug. 11, 1795 — I-364 — Spruce Hunting Club.

ALEXANDER HUNTER 433a 163p — wt Jany. 20, 1794 — sd Aug. 5, 1794 — N-152

ALEXANDER FULLERTON 434a — wt Aug. 6, 1794 — sd Aug. 11, 1795 — C-64-195.

SAMUEL YOUNG 433a 163p — wt Jany. 20, 1794 — sd Aug. 4, 1794 — S-207.

JOHN BRADY 434a — wt Aug. 6, 1794 — sd Aug. 11, 1795 — N-29-19

SAMUEL SCOTT 433a 163p — wt Jany. 20, 1794. — sd Aug. 4, 1794 — F-56

CHARLES GOBIN 433a 163p — wt Jany. 20, 1794 — sd Aug. 4, 1794 — G-372.

WILLIAM BRADY 434a — wt Aug. 6, 1794 — sd Aug. 11, 1795 — D-437 — Snow Shoe

JOHN BRADY 433a 163p — wt Jany. 20, 1794 — sd Aug. 4, 1794 — O-372.

THOMAS GRANT 433a 163p — wt Jany. 20, 1794. — sd Aug. 4, 1794. — G-367

ROBERT BRADY. 434a — wt Aug. 6, 1794. — sd Aug. 11, 1795. — C-71-44.

BENJAMIN YOUNG 433a 163p — wt Jany. 20, 1794. — sd Aug. 4, 1794. — S-208.

JOHN KIDD 433a 163p — wt Jany. 20, 1794. — sd Aug. 4, 1794. — G-371

WILLIAM GRAY 434a — wt Aug 6-1794 — sd Aug 11-1795

HENRY DONELY 433a 163h — wt Jany 20-1794 — sd Aug 4-1794 — B-94

JOHN DONELY 433a 163h — wt Jany 20 1794 — sd Aug 4 1794 — G-331

GEORGE McLANAHAN — wt July 31-1792 — sd Dec 13-1792

ANN McLANAHAN — wt July 31-1792 — sd Dec 13-1792

JOHN M. NESBIT 368 — wt July 31-1792 — sd Dec 13-1792 — C-149-169

THOMAS HAMILTON 434a — wt Aug 6-1794 — sd Aug 11-1795

ROBERT BRADY. 433a 163h — wt Jany 20 1794 — sd Aug 4 1794 — D-379.

ROBERT GRAY 433a 163h — wt Jany 20-1794 — sd Aug 4-1794

SAMl FORREST 433a 153h — wt July 3-1792 — sd July 12-1792 — C-66-187

JAMES FORREST 433a 153h — wt July 3-1792 — sd July 12 1792 — C-66-189

PERSON HUNT — wt July 31-1792 — Dec 13-1792

POLLY McLANAHAN 433a 153h — wt July 31-1792 — sd Dec 15-1792. — C-168-2

WILLIAM BINGHAM — wt July 31-1792 — sd Dec 13-1792

ANDREW BAYARD — wt July 31-1792 — sd Dec 13 1792

JAMES WHALER 433a 153h — wt July 3-1792 — sd July 12 1792 — A-44-112

JAMES WHITTAKER — wt July 3-1792 — sd July 12 1792

SAMUEL WHITTAKER 433a 153h — wt July 3-1792 — sd July 13-1792 — A-44-111

GEORGE WHITAKER 433a 153h — wt July 3-1792 — sd July 12-1792 — A-44-104

JOSEPH WHITTAKER. — wt July 3-1792 — sd July 13-1792

ANDREW CHAPMAN — wt July 3-1792 — sd July 13-1792

PETER CHAPMAN 433a 153h — wt July 3-1792 — sd July 13-1792 — 433a 153h — C-33-235

JOHN HUSTON 433a 153h — wt July 31-1792 — sd Dec 14-1792 — C-101-135.

JOHN SHYM.

JOHN BARRON.

SARAH H. TALLMAN

REBECCA WALN

JOHN WEITZELL

CHARLES HALL. 431½a — wt Jany 20-1794 — sd Aug 4-1794 — N-134

J. Z. LONG. 400a — wt June 3-1869 — Rec sd Aug 4-1874

THOMAS P. WHARTON 411a — wt Apr 29-1793 — sd Aug 15-1794

DAVID LEWIS

JACOB WALN

RICHARD WALN

JAMES TOWER 433a 163h — wt Jany 20-1794 — sd Aug 4-1794

JOHN RUGG 433a 163h — wt Apr 29-1793 — sd Aug 15-1794

ELLY CAMBY 415a — wt sd Aug 16, 1794. — G-293.

JOHN DEWART 433a 163h — wt Jany 20-1794 — sd Aug 4-1794 — G-356

ALEXANDER GREEVES 433a 163p — wt Apr 29-1793 — sd Aug 16, 1794. — G-297.

JOSEPH MORRIS 433a 163p — wt sd Aug 16, 1794. — G-296.

WILLIAM DEWART. 433a 163h — wt Jany 20-1794 — sd Aug 4-1794 — G-352

SAMl M. FOX. 433a 163p — wt Apr 29-1793 — sd Aug 16, 1794 — G-286.

SAMl PANCOAST. 433a 163p — wt sd Aug 16, 1794 — G-291.

WILLIAM GRAY 433a 163h — wt Jany 20 1794 — sd Aug 4-1794

THOMAS GREEVES. 433a 163p — wt Apr 29-1793 — sd Aug 16, 1794. — G-173.

KEARNEY WHARTON. 433a 163p — wt sd Aug 18, 1794 — G-269.

FRANCIS WEST 433a 153 — wt July 31-1792 — sd Dec 13 1792 — A-40-300

GEORGE EDDY

MOORE WHARTON

DAVID H. CUNNINGHAM.

JOHN WEST 433a 153h — wt July 31-1792 — sd Dec 14-1792 — H-424.

JEREMIAH PARKER — wt Apr 29-1793 — sd Aug 21-1794 — G-308

WILLIAM PARKER — wt Apr 29-1793 — sd Aug 21-1794 — G-294

GEORGE WHALER 400a 100h — wt July 3-1792 — sd July 12-1792 — A-44-105

WILLIAM H. WEST 433a 153h — wt July 31-1792 — sd Dec 14-1792

JOSEPH DALTON 261a 21h — wt Apr 15-1794 — sd Oct 6-1882 — C-49-11

DAVID CARSKADDON

HUGH DALTON — wt Apr 15-1794 — sd Sep 6-1794

GEORGE DALTON — wt Apr 15-1794 — sd Sep 6 1794

JAMES HAWTHORN 433a 153h — wt July 31-1792 — sd Dec 14 1792 — C-101-120.

THOMAS HAWTHORN 433a 153h — wt July 31-1792 — sd Dec 14 1792 — U-215.

JAMES DOBSON 434a — wt Apr 15-1794 — sd Sep 6-1794

SAMUEL DOBSON — wt Apr 15-1794 — sd Sep 6 1794

ABRAHAM VALENTINE 415 — wt Nov 21-1853 — sd Dec 1-1853 — D-31-77.

SARAH B. MITCHELL 100a — wt Oct 4-1859 — sd Oct 12-1859 — D-15-207

ALEXANDER J. DALLAS 433a 153h — wt July 31-1792 — sd Dec 14-1792 — C-146-133.

PATRICK MOORE 433a 153h — wt July 31-1792 — sd Dec 14-1792 — C-146-134

JOSEPH DOBSON — wt Apr 15-1794 — sd Sep 6-1794 — P-216

GEORGE DOBSON 434a — wt Apr 15-1794 — sd Sep 6-1794

JASPER MOYLAN 433a 153h — wt July 31 1792 — sd Dec 14 1792 — C-146-134

DAVID CARSKADDON 430a 17-1855 — wt Dec 17-1859 — sd Sep 7- — D-15-251

LEWIS FARMER 4-15a — wt Jany 8-1823 — sd Aug 16-1794 — A-54-130

ABRAHAM SINGER. 415 — wt Jany 8-1793 — sd Aug 16-1794 — A-54-202

Moores Run — Eddy Lick — Mosquito Run — Beech Creek — Big Sandy — Wolf Run — Little Sandy — Cherry Run — Contrary Run — Mining — North Fork Beech Creek — Clearfield & S.W. R.R.

Two Sugars Cor. Now Marble Monument.

Burned Cabin — Spring — Hunters Camp — McCarthys Camp — Mitchells

End of Survey 1911. Grove.

Tract ID 706
Vol 143 Pg 523
Wt Robert Gray
C-71-44
Map # 1719
Title Brief 212

THIS INDENTURE

Made this Twenty-sixth day of December, in the year of our Lord, One thousand nine hundred and thirty,

Between THE CITY OF PHILADELPHIA, Trustee under the Will of Elias Boudinot, deceased, acting herein by the Board of Directors of City Trusts, of the County of Philadelphia, and State of Pennsylvania, grantor, party of the first part, by virtue of the Act of Assembly approved the 30th day of June, 1869, P. L. 1276,

AND

THE COMMONWEALTH OF PENNSYLVANIA, grantee, party of the second part.

WITNESSETH:- That in consideration of Thirty-four hundred one and twenty-nine one-hundredths ($3401.29) Dollars, in hand paid, the receipt whereof is hereby acknowledged, the said grantor does hereby grant and convey to the said grantee,

ALL THAT certain tract or piece of land situate in the Township of Burnside, County of Centre and State of Pennsylvania, bounded and described as follows, to-wit:-

BEGINNING at post and stones, the Southeast corner of the tract herein described being also common to land of the Commonwealth in the Henry Donely warrant and the Ann McClenahan warrant; thence along the North line of land of the Commonwealth in the Ann McClenahan, George McClenahan, Blair McClanahan and the Andrew Pettitt warrants, the three (3) following courses and distances:- North eighty-two (82) degrees forty (40) minutes West crossing road to David Chamber's Camp, four hundred sixty-two and two tenths (462.2) rods to point on the Snow Shoe-Renovo road, North eighty three (83) degrees twenty (20) minutes West seventy-four and three tenths (74.3) rods to stones, being common to the Jeremiah Jackson warrant and land of the Commonwealth in the Blair McClenahan and the Andrew Pettitt warrants; and North eighty-two(82) degrees forty-five (45) minutes West one

C222-FEB-9615

329

Addendum A
Conversion Site #2

hundred three and five tenths (103.5) rods to post and stones, the Southwest corner of the tract herein described, being also common to the Hannah Ewing warrant and the Andrew Pettitt warrant; thence along the East line of the Hannah Ewing warrant, North seven (7) degrees forty (40) minutes East crossing a branch of Spruce Run, one hundred seventy and two tenths (170.2) rods to post and stones, being a corner common to the Hannah Ewing, the William Ewing, the Thomas Reese and the Jeremiah Jackson warrants; thence along the South line of the Thomas Reese warrant, South eighty-two (82) degrees forty (40) minutes East, crossing a branch of Spruce Run, three hundred twenty (320) rods to post and stones, being a corner common to the Thomas Reese, the Robert Gray, the William Gray and the Jeremiah Jackson warrants; thence along the East line of the Thomas Reese warrant, North seven (7) degrees forty (40) minutes East ninety four and eight-tenths (94.8) rods to stones around red oak on the East line of the Thomas Reese warrant and on the West line of the Robert Gray warrant; thence thru the Robert Gray warrant, North sixty-three (63) degrees East crossing a road leading to the City of Philadelphia Camp, two hundred fifty-eight and three tenths (258.3) rods to post and stones on the South line of the William Brady warrant and on the North line of the Robert Gray warrant, thence thru the William Brady warrant, North thirty-two (32) degrees fifteen (15) minutes East crossing Baugher Run two hundred sixty and two tenths (260.2) rods to post and stones, the Northeast corner of the William Brady warrant on the West line of land of the Commonwealth, being common also to the John Brady, the Samuel Scott and another John Brady warrant on the East line; thence along the West line of land of the Commonwealth in the John Brady, the Benjamin Young and the Henry Ponely warrants, the three (3) following courses and distances; South seven (7) degrees forty-five (45) minutes West crossing Baugher Run, Eyes Camp road and the Snow Shoe-Renovo

330

Addendum A
Conversion Site #2

road, two hundred thirty-four and two tenths (234.2) rods to post; South seven (7) degrees forty five (45) minutes West two hundred thirty four (234) rods to post and stones, and South seven (7) degrees forty(40) minutes West one hundred seventy and two-tenths (170.2) rods to post and stones, the place of beginning.

CONTAINING Eleven Hundred Thirty three (1133) acres and one hundred twenty-two (122) perches; AND being composed of the following warrants and parts of warrants:-

1. All of warrant granted to William Gray August 6th, 1794, surveyed August 11, 1795, patented to Cadwallader Evans July 26, 1796, and found enrolled in Patent Book "P", Vol. 29, Page 351.

2. All of warrant granted to Jeremiah Jackson August 6th, 1794, surveyed August 12, 1795, patented to Cadwallader Evans July 26th, 1796 and found enrolled in Patent Book "P", Vol. 29, Page 347.

3. Part of warrant granted to Robert Gray August 6, 1794, surveyed August 11, 1795, patented to Cadwallader Evans July 25, 1796, and found enrolled in Patent Book "P", Vol. 29, Page 349.

4. Part of warrant granted to William Brady August 6, 1794, surveyed August 11, 1795, patented to Cadwallador Evans July 27, 1796 and found enrolled in Patent Book "P", Vol. 29, Page 350.

It is the Intention of the Grantor herein to convey by this Indenture all its right,title and interest in, to and upon the above mentioned warrants in the warrantee names of William Gray and Jeremiah Jackson, and to so much of the warrants in the warrantee names of Robert Gray and William Brady as is particularly limited and defined herein.

Being the same premises, title to which was vested in Elias Boudinot by sundry conveyances, duly recorded, and the said Elias Boudinot being so thereof seized in fee afterwards departed this life, having first made and published his last Will and Testament in writing dated the third day of July, 1821, duly proved November

C212-EFI - 89412

331

Addendum A
Conversion Site #2

15, 1821 and recorded at Philadelphia in Will Book No. 28, Page 246, etc., wherein and whereby he devised the residue of his estate to Susan Vergereau Bradford, Richard Stockton, Lucas H. Stockton, Elias E. Bradford, and Samuel Bayard, in trust, to convey the same to the Mayor and Corporation of the City of Philadelphia, the rents and issues to be applied in the purchase and distribution of wood to the poor, and the said Susan Vergereau Bradford, Elias E. Bradford and Samuel Bayard, surviving trustees named in the last Will and Testament of Elias Boudinot, deceased, by indenture dated July 24, 1839, and recorded in Centre County in Deed Book N, Page 294, etc., granted and conveyed unto the Mayor, Aldermen and Citizens of Philadelphia, their successors and assigns, the said tracts of land, inter alia, and by an Act of Assembly of the Commonwealth of Pennsylvania, approved March 18, 1834, the Mayor, Aldermen and Citizens of Philadelphia were authorized to sell lands in Centre County devised by the will of Elias Boudinot, deceased, free of all liability of the trust contained in said devise, and by an Act of Assembly of the Commonwealth of Pennsylvania approved February 2, 1854, P. L. 1854, page 21, the corporate name of the Mayor, Aldermen and Citizens of Philadelphia was changed to "The City of Philadelphia", and by an Act of Assembly of the Commonwealth of Pennsylvania, approved June 30, 1869, P. L. 1869, page 1276, it was provided that the duties, rights andpowers of the City of Philadelphia concerning all property and estate dedicated to charitable uses vested in the City of Philadelphia should be discharged by the said City through the instrumentality of a Board to be called Directors of City Trusts.

This conveyance is made subject to a certain timber lease between the City of Philadelphia, Trustee, and John Coleman, dated July 21st, 1919, expiring by its terms within ten years from July 26th, 1919, and to a certain supplemental agreement between said parties dated November 19, 1923, extending the time for the removal of the timber upon said tracts three years

332

2212-DFT - 00412

Addendum A
Conversion Site #2

from July 26th, 1929.

AND EXCEPTING AND RESERVING unto the grantor, its successors and assigns all the gas, oil, coal, fire and soft clay and other mineral deposits found in, under and upon the aforementioned and described lots or pieces of ground, with the right of ingress, egress and regress over said tracts of land, for and during the term of Twenty-five years, together with the use of any part of the surface in the operation, development, protection and transportation of any oil, coal, fire and soft clay and other minerals, according to such rules and regulations as may be from time to time adopted by the Secretary of the Department of Forests and Waters, but such rules shall at all times be reasonable and in harmony with the usual methods of operating and producing oil, clay, fire and soft clay and other minerals.

AND ALSO RESERVING to the grantor, its successors and assigns, its and their lessees or tenants, a right-of-way over the present road hereinbefore mentioned, leading from the said Renovo-Snow Shoe Road to the said Hunting Camp of the City of Philadelphia at all times hereafter forever.

And the City of Philadelphia, Trustee aforesaid, for itself and its successors, doth covenant, promise, grant and agree to and with the said Commonwealth of Pennsylvania, its successors and assigns, by these Presents that it, the said The City of Philadelphia, Trustee aforesaid, hath not heretofore done, committed, or wittingly or willingly suffered to be done or committed any act, matter, or thing whatsoever whereby the premises hereby granted or any part thereof is, are, or shall or may be impeached, charged or encumbered in title, charge, estate or otherwise howsoever.

IN WITNESS WHEREOF the said The City of Philadelphia, Trustee as aforesaid, hath caused these Presents to be executed by Edwin S Stuart, the President of the Board of Directors of City Trusts, and the common or corporate seal of the

3333

6212-DEK - 0044

City of Philadelphia to be hereunto affixed the day and year first above written.

Edwin S. Stuart
President of Board of Directors of City Trusts.

(Corporate Seal)

Attest:-

Louis Hiland
Secretary.

****

State of Pennsylvania,)
County of Philadelphia,) SS:-

On the 10 day of January, Anno Domini 193 1, before me, the subscriber, a Notary Public in and for the State of Pennsylvania, residing in the City of Philadelphia, personally appeared Louis Heiland, who being duly sworn according to law doth depose and say that he is the Secretary of the Board of Directors of City Trusts, acting herein for the City of Philadelphia, Trustee under the Will of Elias Boudinot, deceased; that he was personally present at the execution of the above Indenture and saw the common or corporate seal of the City of Philadelphia duly affixed thereto; that the seal so affixed thereto is the common or corporate seal of said corporation and that the said indenture was duly sealed and delivered by Edwin S. Stuart, President of said Board of Directors of City Trusts as and for the act and deed of the said corporation for the uses and purposes therein mentioned in pursuance of a resolution of the said Board passed at a stated meeting thereof held on the 25th day of July, 1930, and that the name of this deponent as Secretary and Edwin S. Stuart as President of said Board subscribed to the above Indenture in attestation of its due execution and delivery are of their and each of their own proper respective handwritings.

Sworn to and subscribed before me the day and year aforesaid.

Louis Hiland

Walter R Russell
Notary Public
My Commission Expires End of next Senate

6212-DEE - 6045

334

Commonwealth of Pennsylvania, }
County of Centre, } ss:-

Recorded in the Office for Recording of Deeds, in and for the County of Centre in Deed Book 143, Page 523.

Witness my Hand and Seal of Office this 17 day of January, Anno Domini, 1931.

Lloyd A Stover
Recorder.

I hereby certify that the precise residence of the grantee is Harrisburg, Pennsylvania.

Lloyd A Stover
Gr Grantee

335

52112-DEK - 00415

Addendum A
Conversion Site #2

MAGNETIC BEARINGS

JOHN BRADY WT.

SAMUEL SCOTT WT.

DANIEL REESE WT.

WILLIAM BRADY WT.
434 As. & ALL.
WT. AUG. 6, 1794.
SD. AUG. 11, 1795.
D- 437.
PAT. CADWALDER EVANS
JULY 27, 1796.
P- 29-350.

Old Corner Stos.
Re B & W. Chest. Po & Stos.

234.2

260.2

+202.9

BAUGHER RUN

+179.7

JOHN BRADY WT.

N. 7° 45' E.

To Hall's camp →

+93.1

TO RENOVO →

+38.2

Path to Baugher's Run

N. 32° 15' E.

House

Spring

City of Phila. Hunting Camp

Built Chest. Po & Stos.

17.5

258.3

190.5

S. 83°

ROBERT GRAY WT.
434 As. & ALL.

B & W. Stos. Around R.O. at Intersection.

N. 63° E.

234.

WILLIAM EWING WT.

THOMAS REESE WT.

BENJAMIN YOUNG WT.

BR. SPRUCE RUN

B. & W. Chest. Po. & Stos.

S. 82° 40' E.

170.2

N. 7° 40' E.

94.8

WT. AUG. 6, 1794.
SD. AUG. 11, 1795.
C- 71-44.

PAT. CADWALDER EVANS
JULY 25, 1796.
P- 29-349.

320.

B & W Chst. Po & Stos.

+262.2

BR. SPRUCE RUN

N. 7° 45' E.

Post & Stos.

HANNAH EWING WT.

JEREMIAH JACKSON WT.
434 As. & ALL.
WT. AUG. 6, 1794.
SD. AUG. 12, 1795.
C- 96-89.
PAT. CADWALDER EVANS
JULY 26, 1796.
P- 29-347

WILLIAM GRAY WT.
434 As. & ALL.
WT. AUG. 6, 1794.
SD. AUG. 11, 1795.
S- 82.
PAT. CADWALDER EVANS
JULY 26, 1796.
P- 29-351.

HENRY DONELY WT.

B. & W. Ck. Po. & Stos.

+23

S. 82° 45' E.

103.5

Walker's Line

S. 83° 20' E.

Old Corner Stos. SNOW SHOE

74.3

To David Chamber's Camp.

S. 82° 40' E.

Stake

Stos. Around W.O.

462.2

Post & Stos.

ANDREW PETTITT WT.

BLAIR McCLANAHAN WT.

GEORGE McCLANAHAN WT.

ANN McCLENAHAN WT.

STATE FOREST

STATE FOREST

Deed dated Dec 26, 1930.
Deed Recorded Jan 17, 1931.
V- 143. P- 523.
1133 ac. 122 ac.

PENNSYLVANIA
DEPARTMENT OF FORESTS AND WATERS
HARRISBURG

CENTRE CO. BURNSIDE TWP.

CITY OF PHILA. PURCHASE

SURVEYED OCT. 21 TO 25, 1930 J.E. FRY
UNDER DIRECTION OF T.O. BIETSCH
PLOTTED AND TRACED NOV. 1930. E.J.W.
CHECKED NOV. 15, 1930 L.E.F.

SCALE: 1" = 100 RODS

1719

Tract ID 284

Vol 108 PG 687

Wt John Pfoutz

C-174-50

Map # 1475

Title Brief

A-169 & A-170

THIS DEED, Made this 19th day of October in the year Nineteen Hundred and Twenty-eight (1928).

BETWEEN

MARTHA E. BACON, widow; and JENNIE B. HAUPT and SAMUEL K. HAUPT, her husband; all of Williamsport, Lycoming County, Pennsylvania; WILSON T. THOMAS and NETTIE S. O. THOMAS, his wife, of Salladasburg, Lycoming County, Pennsylvania; ELLA G. HOUSER, widow, of Pittsburgh, Allegheny County, Pennsylvania; JOSEPH D. WILLIAMS and SARAH C. WILLIAMS, his wife; MARY C. WILLIAMS, widow; LAVINIA WILLIAMS, widow; GEORGE W. WILLIAMS and LULU WILLIAMS, his wife; WILLIAM H. POOL and VIRGINIA V. POOL, his wife; and SARAH M. HUTCHINSON, widow; all of Philadelphia, Philadelphia County, Pennsylvania; and HIRAM D. POOL and LAURENA C. POOL, his wife; JENNIE A. WILLIAMS, widow; MARY W. LEVEY and DAVID E. LEVEY, her husband; and ADELAIDE W. DE LUGO and ANGELO M. DE LUGO, her husband; all of New York, New York County, New York; BY AGNES W. BENNETT, their attorney in fact, of Williamsport, Lycoming County, Pennsylvania, specially constituted by two Powers of Attorney, dated October 21, 1927, and November 10, 1927, and recorded in Clinton County, Pennsylvania, in Miscellaneous Docket No. 9, pages 708 and 706 respectively, as by reference thereunto being had appears; AGNES W. BENNETT and JENNIE HAUPT, executrices of the Last Will and Testament of Rachel S. Bennett, late of Williamsport, Lycoming County, Pennsylvania, deceased; and AGNES W. BENNETT, unmarried, of Williamsport, Lycoming County, Pennsylvania, in her own right; (hereinafter called the Grantors)

AND

THE COMMONWEALTH OF PENNSYLVANIA, (hereinafter called the Grantee

249

Addendum A
Conversion Site #3

WITNESSETH:

That in consideration of FIFTY-FIVE THOUSAND, NINE HUNDRED ONE and 7/100 ($55,901.07) DOLLARS, in hand paid, the receipt whereof is hereby acknowledged, the said Grantors do hereby grant and convey to the Grantee, its successors and assigns,

ALL those thirty-one (31) tracts of land situate in Chapman and Gallagher Townships, Clinton County, Pennsylvania, bounded and described as follows, to-wit: -

FIRST: A Tract of land situate in Chapman and Gallagher Townships, Clinton County, Pennsylvania, surveyed on a warrant granted to Solomon Bastress, dated November 18, 1830, for which a patent was issued to James Wilson, January 10, 1835, enrolled in patent book Volume "H", number 33, page 399, bounded and described as follows:

BEGINNING at a hemlock, thence East three hundred sixteen (316) perches to a yellow pine; thence South two hundred thirty-three (233) perches to a yellow pine; thence West three hundred sixteen (316) perches to a yellow pine; thence North two hundred thirty-three (233) perches to the place of beginning.

CONTAINING four hundred thirty-four (434) acres and twenty-five (25) perches.

SECOND: A tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to William Gallagher, dated November 18, 1830, for which a patent was granted to George Grant, January 30, 1841, enrolled in patent book Volume "H", number 46, page 299, bounded and described as follows:

BEGINNING at a white pine, thence East one hundred fifty-eight (158) perches to a chestnut oak; thence North four hundred sixty-six (466) perches to a yellow pine; thence West one

250

Addendum A
Conversion Site #3

hundred fifty-eight (158) perches to a post; thence North four hundred sixty-six (466) perches to the place of beginning.

CONTAINING, according to the original survey, four hundred thirty-four (434) acres twenty-five (25) perches, but, due to claim of Edward and Monroe Hauck ~~owing to an intercourse with the Jones Wilson warrant~~, contains only two hundred ninety (290) acres.

THIRD: A tract of land in Chapman Township, Clinton County, granted on a warrant to James Gamble, dated August 18, 1830, for which letters patent were issued to George Crane, January 29, 1841, enrolled in patent book Volume "A", number 43, page 298, bounded and described as follows:

BEGINNING at a chestnut oak, thence East three hundred sixteen (316) perches to a yellow pine; thence South two hundred twenty (220) perches to a birch; thence West three hundred sixteen (316) perches to a chestnut oak; thence North two hundred twenty (220) perches to the place of beginning.

CONTAINING four hundred nine (409) acres.

FOURTH: A portion of a tract of land situate in Chapman Township and Gallagher Township, Clinton County, granted on a warrant to Samuel Morrison, dated November 19, 1830, for which letters patent were issued to James Wilson, June 10, 1835, enrolled in patent book Volume "H", number 35, page 150, bounded and described as follows:

BEGINNING at stones, thence South 85° 30' East two hundred forty-five (245) perches to a white pine, the northwest corner of land owned by R. G. Quigley; thence along said Quigley South 4½° West ninety-two and six-tenths (92.6) perches to a witness; thence South 85½° East fifty-three and five-tenths (53.5) perches to stones on the eastern line of said Morrison warrant; thence along said East line South 6½° West eighty-four (84) perches to a post; thence East forty (40) perches to a

251

Addendum A
Conversion Site #3

post on the West line of the Jewen Wilson warrant, now the Commonwealth of Pennsylvania; thence South sixty-nine (69) perches to stones, the southeast corner of said Morrison warrant and the northeast corner of John Schlonaker, now the Commonwealth of Pennsylvania; thence along said South line of the Morrison warrant, three hundred sixteen (316) perches to a post, the northeast corner of the Coloman Eastress, the northwest corner of John Schlonaker warrant; thence along the West line of the Morrison warrant North 60 20' East two hundred thirty-one (231) perches to the place of beginning.

CONTAINING originally three hundred ninety-four and six-tenths (394.6) acres but now containing three hundred sixty-four (364) acres and six (6) perches.

FIFTH: A tract of land situate in Chapman and Gallagher Townships, granted on a warrant to John Proutz, dated August 18, 1830, for which letters patent were issued to George Crane, January 30, 1841, enrolled in patent book Volume "H", number 43, page 301, bounded as follows:

BEGINNING at a yellow pine, the northwest corner hereof, thence East three hundred sixteen (316) perches to a yellow pine; thence South two hundred twenty (220) perches to a chestnut; thence West three hundred twenty-three and two-tenths (323.2) perches to a birch; thence North two hundred twenty (220) perches to the yellow pine, the place of beginning.

CONTAINING four hundred nine (409) acres.

SIXTH: A tract of land situate in Chapman Township, Clinton County, surveyed on a warrant numbered 3276, granted to Leroy and Linklean, dated December 13, 1793, for which letters patent were issued to John F. Ohl, dated July 18, 1850, enrolled in patent book Volume "H", number 47, page 556, bounded and

252

Addendum A
Conversion Site #3

described as follows:

BEGINNING at a yellow pine, the northwest corner hereof; thence North 89½° East four hundred sixty-nine and four-tenths (469.4) perches to a post; thence South 1° West three hundred fifty-two (352) perches to a yellow pine; thence South 89° West three hundred seventy (370) perches to a post; thence North 19° West two hundred ninety-one (291) perches to a post; thence North 1° East eighty (80) perches to the place of beginning.

CONTAINING nine hundred (900) acres.

SEVENTH: Being a portion of a tract of land situate in Chapman Township, Clinton County, surveyed on a warrant numbered 3067, granted to Leroy and Livingston, dated December 13, 1792, for which letters patent were issued to John E. Gill, July 19, 1950, enrolled in patent book Volume "H", number 47, page 557, described according to an actual survey as follows:

BEGINNING at a post in the center of the Coudersport and Jersey Shore turnpike, corner of land of the Commonwealth of Pennsylvania, thence North 89° West two hundred twenty (220) perches to a chestnut oak, the northwest corner of warrant 2657 and the southeast corner of warrant 3068; thence along warrant 3068 North 1° East two hundred seventy-eight (278) perches to a post in the center of the said turnpike, corner of land of the Commonwealth of Pennsylvania; thence along the center of said turnpike, by its various courses and distances, to the post, the place of beginning.

CONTAINING two hundred six (206) acres and forty (40) perches.

EIGHTH: A portion of a tract of land situate in Chapman Township, Clinton County, granted on a warrant numbered 2423, granted Wilhelm Willinck and Company, dated December 13, 1792, for

Addendum A
Conversion Site #3

which letters patent were issued to John F. Ohl, July 19, 1850, enrolled in Volume "H", number 47, page 560, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof, thence South 88° East seven hundred sixteen (716) perches to a white oak, the northeast corner hereof and the southeast corner of warrant 2657; thence South 1° West along warrant 589 two hundred thirty-four (234) perches to stones, the southeast corner hereof; thence North 89° West six hundred thirty-eight (638) perches to a chestnut oak; thence North 19° West two hundred twenty-five (225) perches to the place of beginning.

CONTAINING originally nine hundred (900) acres but, owing to other conveyances, now containing eight hundred (800) acres.

NINTH: A portion of a tract of land situate partly in Chapman Township, Clinton County, and McHenry Township in Lycoming County, surveyed on warrant 2757, granted to Wilhelm Willinck and Company, dated December 13, 1792, for which letters patent were issued to John F. Ohl, July 12, 1850, and enrolled in patent book Volume "H", number 47, page 302, the said portion of warrant 2757, consisting of two pieces, bounded and described as follows:

First: BEGINNING at a post in the center of the Coudersport and Jersey Shore turnpike, thence North 65½° West sixty-three and five-tenths (63.5) perches to stones; thence North 1° East one hundred thirty-five (135) perches to a post in the center of said turnpike; thence by its various courses and distances along the lands of the Commonwealth of Pennsylvania, to the post, the place of beginning.

CONTAINING seventeen (17) acres.

The other piece of said warrant described as follows:

253

Addendum A
Conversion Site #3

BEGINNING at a post in the center of the said turnpike on the North line of warrant 2657; thence along said warrant line North 89° West sixty (60) rods to a point; thence North 1° East fifty-five (55) perches to a point on the South line of warrant 5067; thence along the South line of said warrant South 89° East thirty-five (35) perches to a post in the center of said turnpike; thence southward along the center of said turnpike to the place of beginning.

CONTAINING twenty-five (25) acres.

The two (2) portions of said warrant 2757 contain forty-two (42) acres.

THIRD: Being a portion of a warrant situate in Chapman Township, Clinton County, numbered 2657, granted to William Willinck and Company, dated December 12, 1792, for which letters patent were issued to John F. Dill, July 10, 1950, enrolled in Volume "H", number 47, page 661, bounded and described as follows:

BEGINNING at the northwest corner hereof at a chestnut oak; thence South 89° East one hundred eighty-six (186) perches to a yellow pine; thence South 1° West fifty-five (55) perches to a post; thence South 89° East sixty (60) perches to a post in the center of the Coudersport and Jersey Shore turnpike; thence by its various courses and distances along lands of the Commonwealth of Pennsylvania to a post, the northern point of the seventeen (17) acre portion of warrant 2757; thence South 1° West along the West line of warrant 2757 and 588, one hundred eighty-eight (188) perches to a post, the southeastern corner hereof, and the northeastern corner of warrant 2423; thence along the North line of 2423 North 89° West three hundred forty-six (346) perches to a yellow pine, the southwestern corner hereof; thence along warrant 3276 North 1° East four hundred sixty-eight (468) perches to the post, the place of beginning.

254

Addendum A
Conversion Site #3

CONTAINING according to the actual survey eight hundred ninety-three (893) acres and one hundred five (105) perches.

ELEVENTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Abraham Reigael on a warrant dated May 8d, 1793, on which letters patent were issued to the warrantee, dated August 27, 1864, enrolled in patent book Volume "H", number 56, page 239, bounded and described as follows:

BEGINNING at a pitch pine, the northeastern corner hereof, thence South 74° West three hundred thirty-two and one-tenth (332.1) perches to a post; thence South 24° West five hundred ninety (590) perches to pine, the southern corner hereof; thence North 8° West six hundred forty (640) perches to the place of beginning.

CONTAINING five hundred eighty-four (584) acres and fifty-eight (58) perches.

TWELFTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to George K. Hall, dated March 9, 1833, for which letters patent were issued to Samuel Yeaman, dated July 30, 1838, enrolled in patent book Volume "H", number 31, page 585, bounded and described as follows:

BEGINNING at a chestnut, the northwest corner hereof; thence North 82° East two hundred twenty (220) perches to a pitch pine; thence South 8° East three hundred twenty (320) perches to a pine; thence South 82° West two hundred twenty (220) perches to a pitch pine; thence North 8° West three hundred twenty (320) perches to the place of beginning.

CONTAINING four hundred fifteen (415) acres and sixteen (16) perches.

THIRTEENTH: A tract of land situate in Chapman Township,

255

Addendum A
Conversion Site #3

Clinton County, surveyed on a warrant granted to George H. Small, dated March 6, 1833, for which letters patent were granted to Jacob Spangler, dated July 25, 1838, enrolled in patent book Volume "H", number 32, page 421, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof; thence North 81° East two hundred fifty (250) perches to a pine; thence South 60° East two hundred twenty-five (225) perches to a post; thence South 82° West sixty-three (63) perches to a hemlock; thence South 36° West eighty-eight (88) perches to a birch; thence South 82° West twenty-two (22) perches to a hemlock; thence South 41° West one hundred five (105) perches to a lynn tree; thence South 27° West seventy-five (75) perches to a post, the southern corner hereof; thence along land of the Commonwealth North 10° East two hundred twenty (220) perches to a white pine; thence West sixty (60) perches to a post; thence North 43° West twenty (20) perches to a post; thence West one hundred ten and five-tenths (110.5) perches to a yellow pine; thence South 66° West thirty-nine (39) perches to a yellow pine; thence North 3° West one hundred fifty-five (155) perches to the place of beginning.

CONTAINING four hundred seven (407) acres and ninety (90) perches.

FOURTEENTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Mark Schlonaker, dated November 18, 1830, for which letters patent were issued to James Wilson, dated June 10, 1835, enrolled in Volume "H", number 35, page 169, bounded and described as follows:

BEGINNING at a post, the northern corner hereof; thence South 19½° East five hundred sixteen (516) perches to a white pine; thence West two hundred seventy-six and four-tenths (276.4) perches to a white oak; thence North 30° East one hundred ninety-three (193) perches to a birch; thence North 65° West one

256

Addendum A
Conversion Site #3

hundred thirty-two (132) perches to a white pine; thence North 22½ East three hundred (300) perches to the place of beginning,

CONTAINING four hundred one (401) acres and ninety-eight (98) perches,

FIFTEENTH: A tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to John Schlonaker, dated November 18, 1830, for which letters patent were issued to James Wilson, dated June 10, 1835, enrolled in patent book Volume "H", number 33, page 403, bounded and described as follows:

BEGINNING at a chestnut oak, the northwest corner hereof; thence South 68° East two hundred fifteen (215) perches to a white pine; thence South 62½° East forty-two (42) perches to a birch; thence South 30° West three hundred twenty (320) perches to a white pine; thence North 60° West two hundred twenty-five (225) perches to a pine; thence North 24° East two hundred ninety (290) perches to the place of beginning.

CONTAINING four hundred thirty-four (434) acres and eighty-one (81) perches.

SIXTEENTH: A tract of land situate in Chapman Township, Clinton County, surveyed in pursuance of a warrant granted to James Walton, dated February 15, 1842, for which letters patent were issued to Robert F. Colter, dated June 4, 1870, recorded in patent book Volume "H", number 67, page 170, bounded and described as follows:

BEGINNING at a Spanish oak, the northwest corner hereof; thence East seventy (70) perches to a post; thence South 10½° West ninety (90) perches to a post; thence East one hundred (100) perches to a hemlock; thence South 22° West two hundred fifty-three (253) perches to a post; thence South 59½° West twenty (20) perches to a white pine; thence South 30° West one hundred

257

Addendum A
Conversion Site #3

twenty (120) perches to a chestnut; thence West twenty-four (24) perches to a chestnut; thence North 63° West thirty-three (33) perches to a chestnut oak; thence North 27° East thirty (30) perches to a white pine; thence North 63° West 57 perches to a post; thence North 27° East seventy-five (75) perches to a lynn tree; thence North 41° East one hundred five (105) perches to a hemlock; thence North 52° East twenty-two (22) perches to a birch; thence North 36° East eighty-eight (88) perches to post; thence North 61° East sixty-three (63) perches to a white pine; thence North 30° East one hundred twenty-seven (127) perches to the place of beginning.

CONTAINING originally one hundred ninety-seven (197) acres and thirteen (13) perches, but now, owing to interferences and previous conveyances, containing one hundred fifty-six (156) acres and one hundred eleven (111) perches.

SEVENTEENTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant, number 629, granted to Nathan Andrews, dated September 21, 1795, for which letters patent were issued to M. L. Johnson and others, dated October 15, 1871, enrolled in patent book Volume "H", number 68, page 757, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof; thence East two hundred fifty-seven and eight-tenths (257.8) perches to a white pine; thence South four hundred sixty-six (466) perches to a post; thence West one hundred fifty-eight (158) perches to a chestnut oak; thence North 27° East one hundred seventy (170) perches to a locust; thence North two hundred fifty (250) perches to a chestnut; thence West one hundred seventy-seven (177) perches to a hemlock; thence North forty-four and six-tenths (44.6) perches to the place of beginning.

CONTAINING officially three hundred twenty-three (323)

258

Addendum A
Conversion Site #3

acres and one hundred fifty (150) perches, but by interferences contains three hundred eleven (311) acres and one hundred fifty (150) perches.

EIGHTEENTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Robert S. Bailey, dated August 16, 1833, for which letters patent were issued to George G. Irwin (in trust), dated April 21, 1873, enrolled in Patent Book Volume "H", number 71, page 688, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof; thence East two hundred forty-nine and nine-tenths (249.9) perches to a white pine; thence South 27° West three hundred (300) perches to a yellow pine; thence West one hundred sixty-nine and five-tenths (169.5) perches to a post; thence South forty-one (41) perches to a post; thence West seventy (70) perches to a post; thence North 27° East three hundred forty-five (345) perches to the place of beginning.

CONTAINING originally four hundred twenty-one (421) acres and one hundred twenty-three (123) perches and now containing, less interferences, one hundred fifty-one (151) acres and eighty-three (83) perches.

NINETEENTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Abel Fairwell, dated April 8, 1841, for which letters patent were issued to the warrantee, dated April 21, 1841, enrolled in Volume "K", number 43, page 432, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof, thence South 60° East ninety-four (94) perches to a white oak; thence South 30° West three hundred twenty-one (321) perches to a post; thence South 61° West sixty-three (63) perches to a hemlock; thence South 86° West eighty-eight (88) perches to a

259

Addendum A
Conversion Site #3

birch; thence South 82° West twenty-two (22) perches to a hemlock; thence South 41° West one hundred five (105) perches to a lynn; thence South 27° West seventy-five (75) perches to a post; thence North 58° West one hundred (100) perches to stones; thence North 27° East one hundred three (103) perches to post; thence North 41° East one hundred one (101) perches to post; thence North 82° East seventeen (17) perches to post; thence North 36° East eighty-eight (88) perches to post; thence North 62° East sixty-three (63) perches to a white pine; thence North 30° East three hundred twenty-one (321) perches to the place of beginning.

CONTAINING originally three hundred eighty-seven (387) acres and sixteen (16) perches, but, owing to interferences and previous conveyances, now contains three hundred eighty-four (384) acres and forty (40) perches.

TWENTIETH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to William Gallagher, dated August 18, 1830, and letters patent issued to George Crane, dated January 30, 1841, enrolled in patent book Volume "H", number 43, page 299, bounded and described as follows:

BEGINNING at a hemlock, the northwest corner hereof, thence East one hundred seventy-seven (177) perches to a chestnut oak; thence South two hundred fifty (250) perches to a locust; thence South 65° West two hundred forty-eight (248) perches to a white pine; thence West ninety-five (95) perches to a post; thence North 22° East three hundred eighty-two (382) perches to the place of beginning.

CONTAINING four hundred forty (440) acres.

TWENTY-FIRST: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Bernard Hubley, number 476, dated May 17, 1785, upon which letters patent were

issued to E. S. Johnson and others, June 19, 1870, enrolled in patent book Volume "H", number 64, page 546, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof, thence South 68° East two hundred fifteen (215) perches to a post; thence South 22° East three hundred (300) perches to a white pine; thence North 68° West two hundred fifteen (215) perches to a chestnut oak; thence North 22° East three hundred (300) perches to the place of beginning.

CONTAINING three hundred eighty (380) acres and thirty-two (32) perches.

TWENTY-SECOND: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to D. K. Jackman, dated November 11, 1852, for which letters patent were granted to the warrantee, dated October 23, 1856, enrolled in patent book Volume "H", number 54, page 13, bounded and described as follows:

BEGINNING at a post, thence South 89° East three hundred twenty (320) perches to a chestnut oak; thence South 1° West one hundred thirty-six (136) perches to a post; thence North 89° West three hundred twenty (320) perches to a post; thence North 1° East one hundred thirty-six (136) perches to a post, the place of beginning.

CONTAINING two hundred fifty-six (256) acres and one hundred two (102) perches.

TWENTY-THIRD: A tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to D. K. Jackman, dated November 11, 1852, for which letters patent were granted to the warrantee, dated October 23, 1856, enrolled in patent book Volume "H", number 54, page 11, bounded and described as follows:

BEGINNING at stones, the northwest corner hereof,

261

Addendum A
Conversion Site #3

thence North 66½° East three hundred thirty-one and one-tenth (331.1) perches to a yellow pine; thence South 60° East sixty-nine (69) perches to a post; thence South 45° East two hundred fifty-seven (257) perches to a post; thence South 20° West two hundred (200) perches to a yellow pine; thence North 60° West one hundred ninety-six (196) perches to a post; thence South 13½° East one hundred twenty-six (126) perches to a post; thence North 74° West three hundred thirty-two and one-tenth (332.1) perches to a pine; thence North 8½° West three hundred twenty (320) perches to the place of beginning.

CONTAINING nine hundred one (901) acres and thirteen (13) perches.

TWENTY-FOURTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to D. K. Jackman, dated November 11, 1853, for which letters patent were issued to the warrantee, dated October 28, 1856, enrolled in patent book Volume "H", number 54, page 15, bounded and described as follows:

BEGINNING at a pitch pine, thence North 80° 7' East one hundred thirty (130) perches to a yellow pine; thence South 88° East six hundred forty-nine and three-tenths (649.3) perches to stones; thence South three hundred sixty-eight and four-tenths (368.4) perches to a post; thence West twenty-six (26) perches to a post; thence North 14° West eighty-eight (88) perches to a post; thence South 60° West seventy-three (73) perches to a yellow pine; thence North 60° West one hundred one (101) perches to a yellow pine; thence North 10° East seventy (70) perches to a yellow pine; thence North 63° West thirty-four (34) perches to a white pine; thence South 30° West fifty-two (52) perches to a chestnut oak; thence North 68° West eighty-eight (88) perches to a white oak; thence South 30° East seventy-eight (78) perches to a yellow pine; thence South 66½° West three hundred thirty-one and one-tenth (331.1) perches to stones; thence South 82° West one hundred

262

Addendum A
Conversion Site #3

(100) perches to stones; thence North one hundred forty (140) perches to the place of beginning.

CONTAINING seven hundred (700) acres.

TWENTY-FIFTH: A portion of a tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Leroy and Linckleen, numbered 3068, dated December 13, 1792, for which letters patent were granted to John F. Ohl, July 18, 1850, enrolled in patent book Volume "H", number 47, page 558, bounded and described as follows:

BEGINNING at stones, the northwest corner hereof, thence South 89° East one hundred ninety-seven (197) perches to a point in the center of the Coudersport and Jersey Shore turnpike; thence by the center of the said turnpike, by its various courses and distances, along lands of the Commonwealth of Pennsylvania to a post in the center of said highway; thence South 1° West two hundred eighty (280) perches to a chestnut oak; thence North 89° West three hundred twenty (320) perches to a post; thence North 1° East four hundred seventy-seven (477) perches to the place of beginning.

CONTAINING seven hundred ninety-three (793) acres and twenty-eight (28) perches.

TWENTY-SIXTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Nancy Haffett, dated March 5, 1830, for which letters patent were granted to John A. Gamble and others, dated December 17, 1855, enrolled in patent book Volume "H", number 52, page 431, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof, thence East one hundred sixty-nine and five-tenths (169.5) perches to a post; thence South four hundred ninety-nine and six-tenths (499.6) perches to a yellow pine; thence West one hundred twenty

263

Addendum A
Conversion Site #3

(120) perches to the East Branch of the Susquehanna River; thence by the said River, northward by its various courses and distances, to a post corner of land now, or formerly, of James Hayes; thence North two hundred seventy-one and four-tenths (271.4) perches to the place of beginning.

CONTAINING three hundred fifty-seven (357) acres, but owing to interferences and one-fourth (¼) interest claimed by the Hansell Estate, now containing two hundred thirty (230) acres and one hundred twelve (112) perches.

TWENTY-SEVENTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Asher Davidson, dated August 18, 1830, for which letters patent were issued to George Crane and others, dated January 24, 1842, recorded in patent book Volume "H", number 42, page 494, bounded and described as follows:

BEGINNING at a white pine, the northwest corner hereof, thence North 65° East two hundred forty-eight (248) perches to a locust; thence South 27° West one hundred seventy (170) perches to a chestnut oak; thence South two hundred twenty (220) perches to a chestnut oak; thence North thirty-one (31) perches to a yellow pine; thence West three hundred fourteen (314) perches to a chestnut; thence East thirty-two (32) perches to a yellow pine; thence North 36½° East two hundred seventy-three (273) perches to the place of beginning.

CONTAINING originally four hundred (400) acres, but by reason of commissioners' sale, dated June 14, 1926, to W. E. Shaffer for one hundred eighty (180) acres and one hundred thirty-one (131) perches, now contains two hundred nineteen (219) acres and twenty-nine (29) perches.

TWENTY-EIGHTH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to James Dumont, dated May 10,

264

Addendum A
Conversion Site #3

1851, on which a patent was issued to John F. Cowan, August 1, 1854, enrolled in patent book Volume "H", number 51, page 218, bounded and described as follows:

BEGINNING at a white oak, the northwest corner hereof, thence South 68° East eighty-eight (88) perches to a chestnut oak; thence North 30° East fifty-two (52) perches to a white pine; thence South 85° East thirty-four (34) perches to a yellow pine; thence South 10° West seventy (70) perches to a yellow pine; thence South 80° East one hundred one (101) perches to a yellow pine; thence North 60° East seventy-three (73) perches to a white pine; thence South 14° East eighty-eight (88) perches to a white oak; thence South 85° East twenty-six (26) perches to a hemlock; thence South four hundred four and three-tenths (404.3) perches to a post; thence West sixty (60) perches to a white pine; thence North 68° West two hundred fifteen (215) perches to a post; thence North 15½° West one hundred twenty-six (126) perches to a post; thence South 80° East one hundred ninety-six (196) perches to a post; thence North 20° East two hundred (200) perches to a white oak; thence North 46° West two hundred fifty-seven (257) perches to a yellow pine; thence North 60° West sixty-seven (67) perches to a yellow pine; thence North 30° West seventy-eight (78) perches to the place of beginning.

CONTAINING four hundred forty (440) acres.

<u>TWENTY-NINTH</u>: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to Isaac Latcha, dated November 18, 1850, for which letters patent were issued to James Wilson, June 10, 1853, recorded in patent book Volume "H", number 33, page 400, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof, thence East one hundred fifty-eight (158) perches to a post; thence South 10½° East five hundred sixteen (516) perches to stones

265

Addendum A
Conversion Site #3

thence West one hundred fifty-eight (158) perches to a white pine; thence North 19¾° West five hundred sixteen (516) perches to the place of beginning.

CONTAINING four hundred twenty (420) acres and one hundred fifty-two (152) perches.

THIRTIETH: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to John F. Cowan, dated November 15, 1851, for which letters patent were issued to the warrantee, dated August 1, 1854, enrolled in patent book Volume "H", number 21, page 216, bounded and described as follows:

BEGINNING at a white oak, the northwest corner hereof, thence East twenty-six (26) perches to a yellow pine; thence South 5° East fifty-six perches (56) to a white oak; thence East twenty-six (26) perches to a yellow pine; thence North 1° East one hundred sixty (160) perches to a yellow pine; thence North 18° East ninety (90) perches to a yellow pine; thence North 80° East twenty-three (23) perches to stones; thence South 1¾° West three hundred twenty-two (322) perches to a white oak; thence South 89° East one hundred fifty-seven (157) perches to a chestnut oak; thence South 1° West six hundred five and six-tenths (605.6) perches to a yellow pine; thence South 88½° West one hundred forty-nine (149) perches to a yellow pine; thence South 1° West eighty (80) perches to a yellow pine; thence West ninety-nine (99) perches to a post; thence North seven hundred-ninety-seven and seven-tenths (797.7) perches to place of beginning.

CONTAINING eleven hundred (1100) acres.

4. The title to the above tracts, numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 17, 18, 21, 22, 23, 24, 25, 26 and 27, became vested in S. V. Williams by deed from the Fidelity Trust Company, et al., dated October 10, 1903, recorded in deed book number 69,

266

Addendum A
Conversion Site #3

page 67, and deed from William C. Weaver and wife, dated June 20, 1904, recorded in deed book number 73, page 36.

B. The title to tracts, numbers 11, 12, 13, 14, 15, 16, 19, 20, 28, 29 and 30, became vested in S. N. Williams and Seth T. Foreman from Isaac Underwood and wife, by deed dated August 14, 1883, recorded in deed bool. Volume 34, page 696, and deed from Seth T. Foreman and wife to S. N. Williams, dated March 28, 1905, recorded in deed book number 90, page 218.

THIRTY-FIRST: Tract of land situate in Chapman Township, Clinton County, surveyed on a warrant granted to John Bausman and others, numbered 569, dated March 17, 1785, for which no patent has been issued, bounded and described as follows:

BEGINNING at a hemlock, the north corner hereof, thence South 37½° East one hundred eight (108) perches to a hemlock; thence South 22° West three hundred eighty-two (382) perches to a post; thence West one hundred thirty-five (135) perches to a post; thence North 63° West one hundred (100) perches to a white oak; thence North 24° East one hundred five (105) perches to a lynn tree; thence North 41° East one hundred one (101) perches to a sassafras; thence North 32° East twenty-two (22) perches to a pine; thence North 36° East eighty-eight (88) perches to a pine; thence North 62° East sixty-three (63) perches to a pine; thence North 30° East one hundred twenty-seven (127) perches to the place of beginning.

CONTAINING originally three hundred ninety-six (396) acres and eighty (80) perches, but owing to interferences of other surveys, contains only ninety-seven (97) acres and eighty (80) perches.

The title to the John Bausman warrant becomes vested

267

Addendum A
Conversion Site #3

in the O. N. Williams Estate by continual possession and payment of taxes for over thirty (30) years.

B E I N G the same thirty-one tracts of land which were owned by O. N. Williams at the time of his death, June 6, 1911, and which tracts became vested in the Grantors herein as heirs at law of said O. N. Williams, deceased, as devisees and heirs at law of deceased heirs of said O. N. Williams, deceased, and as Grantees in various conveyances from heirs at law of said decedent.

A N D the said Grantors do hereby covenant and agree to and with the said Grantee, that they, the Grantors, their heirs, executors and administrators, SHALL AND WILL GENERALLY WARRANT AND FOREVER DEFEND the herein above described premises, with the hereditaments and appurtenances, unto the said Grantee, its successors and assigns, against the said Grantors and against every other person lawfully claiming or who shall hereafter claim the same or any part thereof.

I N W I T N E S S W H E R E O F, said Grantors have hereunto set their hands and seals the day and year first above written.

WITNESSES: -

M E Haggerty

Mary Blake

Martha M Brown (SEAL)

Janice B Haupt (SEAL)

David K Haupt (SEAL)

Wilson T. Thomas (SEAL)

Nettie L. O. Thomas (SEAL)

Ella D Houser (SEAL)

268

Addendum A
Conversion Site #3

Joseph R. Williams (SEAL)

Sarah C. Williams (SEAL)

Mary C. Williams (SEAL)

Lavinia Williams (SEAL)

Geo. Worrell Ames (SEAL)

Lula Williams (SEAL)

Wm. A. Pool (SEAL)

Virginia W. Pool (SEAL)

Sarah M. Hutchinson (SEAL)

Hiram A. Pool (SEAL)

Lavenia Pool (SEAL)

Jennie A. Williams (SEAL)

Mary W. Levy (SEAL)

David E. Levy (SEAL)

Adelaide W. De Lugo (SEAL)

Angela M. De Lugo (SEAL)

By Agnes W. Bennett (SEAL)
Their Attorney in Fact.

Agnes W. Bennett (SEAL)

James B. Haupt (SEAL)
Executrices of the last Will and Testament of Rachel S. Bennett, deceased.

Agnes W. Bennett (SEAL)

269

Addendum A
Conversion Site #3

Com Exp Mch 11 1929

Com Exp Mch 11 1929

Com Exp Mch 11 1929

270

Addendum A
Conversion Site #3

[redacted]

COMMONWEALTH OF PENNSYLVANIA :
: ss
COUNTY OF CLINTON :

Recorded in the office for the recording of Deeds in and for said County this 19th day of October A?D.1928 in Deed Book No 108 page 687.

Witness my hand and the seal of said office the day and year aforesaid.

Robert W. Bullock.
Recorder of Deeds.

271

CLINTON COUNTY
CHAPMAN & GALLAHER TWPS.

LANDS OF S. N. WILLIAMS EST.
Sd June & August 1928 for Area
by T. O. Bietsch.
Scale 1" = 100 rods.

—W. E. SHAFFER—
Deed dated — 11-7-28
Recorded — 11-7-28
V-108 P-708
Acreage 1808 131E
Date Cert. 11-7-28

—S. N. WILLIAMS—
Deed dated — 10-19-28
Recorded — 10-19-28
V-108 P-687
Acreage — 13975 & 24E
Date Cert. — 10-19-28

1475

Addendum A
Conversion Site #3

Tract ID 324
Vol 171 PG 569
Wt # 5361
Map # B-16-A
Title Brief S-95-369

T H I S I N D E N T U R E

MADE this seventh day of January in the year of our Lord one thousand nine hundred and nine,

BETWEEN the Dents Run Coal Company, a corporation created by and existing under the laws of the Commonwealth of Pennsylvania, having its domicile in the City of Philadelphia, and State of Pennsylvania, party of the first part,

A N D

The Commonwealth of Pennsylvania, party of the second part.

WITNESSETH That the said party of the first part, for and in consideration of the sum of Nine thousand one hundred and seventy-one ($9171.00) Dollars, lawful money of the United States of America, unto it well and truly paid by the said party of the second part, at or before the sealing and delivery of these presents, the receipt whereof is hereby acknowledged, hath granted, bargained, sold, aliened, enfeoffed, released, conveyed and confirmed, and by these presents doth grant, bargain, sell, alien, enfeoff, release, convey and confirm unto the said party of the second part, its successors and assigns forever,

ALL those four certain tracts or pieces of land

485
116-117

S-95-369 - 53 of 477

situate, lying and being in the County of Clearfield and State of Pennsylvania, and separately bounded and described as follows, viz

FIRST. A certain tract of land called "ACTON", situate in the Township of Girard, County and State aforesaid, which was surveyed in pursuance of warrant No. 5362 granted to George Meade, dated March 3, 1794, to whom Letters Patent were granted dated June 7, 1794, enrolled at Harrisburg in Patent Book P, Vol. 22, page 174, and bounded and described according to said original patent as follows, viz

Beginning at a post; thence by land of Robert Morris, and Company, East three hundred and twenty-eight (328) perches to a post, North sixty-nine (69) perches to a post; East two hundred and fifty-eight (258) perches to a post; South three hundred and thirty-five (335) perches to a Maple; East two hundred and fifty-eight (258) perches to a Gum, thence by other land, North one hundred and fifty-two (152) perches to a post; West one hundred and forty-four (144) perches to a post; North three hundred and twenty (320) perches to a post; West seven hundred (700) perches to a post; and South two hundred and six (206) perches to the place of beginning.

Containing one thousand and forty-five (1045) acres and allowance.

SECOND. A certain tract of land called "HARSHAM" situate in the Township, County and State aforesaid, which was surveyed in pursuance of warrant No. 5361, dated March 3, 1794, granted to George Meade, to whom Letters Patent were

granted dated July 3, 1794, enrolled at Harrisburg in Patent Book P, Vol. 22, page 169, and bounded and described according to said original patent as follows, viz.

Beginning at a post, thence by other land, North three hundred and twenty (320) perches to a post, West five hundred and eighty-three (583) perches to a Chestnut; South three hundred and twenty (320) perches to a Chestnut; and East five hundred and eighty-three (583) perches to the place of beginning.

Containing one thousand one hundred (1100) acres and allowance.

✓THIRD. A certain tract of land called "TERRA", situate in the Township of Goshen, County and State aforesaid, which was surveyed in pursuance of warrant No. 5322, dated March 3, 1794 granted to George Meade, to whom Letters Patent were granted dated July 3, 1794, enrolled at Harrisburg in Patent Book P, Vol. 22, page 170, and bounded and described according to said original patent as follows, viz

Beginning at a Chestnut; thence by other land, North three hundred and twenty (320) perches to a Chestnut; West five hundred and eighty-three (583) perches to a post, South three hundred and twenty (320) perches to a post; and East five hundred and eighty-three (583) perches to the place of beginning.

Containing one thousand one hundred (1100) acres and allowance.

✓FOURTH. A certain tract of land called "THOSEUS", situate in the Township of Goshen, County and State aforesaid, which was surveyed in pursuance of warrant No. 5325,

487

119

5x5-55 - 5555

dated March 3, 1794 granted to George Meade, to whom Letters Patent were granted dated July 3, 1794, enrolled at Harrisburg in Patent Book P, Vol. 21, page 399, and bounded and described according to said original patent as follows, to-wit

Beginning at a Chestnut, thence by other land, North three hundred and twenty (320) perches to a Maple; West five hundred and eighty-three (583) perches to an Ash, South three hundred and twenty (320) perches to a post, and West five hundred and eighty-three (583) perches to the place of beginning.

Containing one thousand one hundred (1100) acres and allowance.

EXCEPTING AND RESERVING out of the said last described tract of land the portion thereof containing two hundred and twelve (212) acres described in a certain deed from Robert Smith, Assignee of James Yard, to John Peter Rider, dated ---- -- ----, of record in Clearfield County in Deed Book Vol. F, page 114. page 416

ALSO a portion thereof containing fifty-seven (57) acres which is located within the lines of a certain tract of land containing two hundred and seventy-seven (277) acres and sixty (60) perches, described and conveyed in a certain deed from Anson G. Phelps and wife to William Koons and John Koons, dated Sept. 24, 1851, of record in Clearfield County in Deed Book Vol. N, page 237. page 417 The said tract being composed of portions of warrants Nos. 5325 and 5358.

The title to the said described four tracts of land herein conveyed having become vested in the Dents Run

428

120

33565-25-66-33565

Coal Company, the grantor herein, by virtue of deed from the Deer Creek Coal Company, dated July 25, 1902, of record in Clearfield County in Deed Book Vol. 131, page 473.

This conveyance being executed and delivered by the proper officers of the Dents Run Coal Company in pursuance of a resolution passed at a special meeting of the stockholders of the Dents Run Coal Company held on Oct. 28, 1908 at the office of the Company, of which meeting due legal notice had been given authorizing and empowering the Board of Directors of said Dents Run Coal Company to make sale of the real estate herein described and conveyed.

AND ALSO in pursuance of a resolution passed at a meeting of the Board of Directors of the Dents Run Coal Company, held on Oct. 28, 1908, duly authorizing this conveyance.

AND the said Dents Run Coal Company doth hereby constitute and appoint William S. Wallace to be its Attorney for it and in its names, and as and for its corporate act and deed, to acknowledge this Indenture before any person having authority by the laws of the Commonwealth of Pennsylvania to take such acknowledgment, to the intent that the same may be recorded.

TOGETHER with all and singular the improvements, ways, waters, water-courses, rights, liberties, privileges, hereditaments and appurtenances whatsoever thereunto belonging, or in anywise appertaining, and the reversions and remainders, rents, issues and profits thereof; and all the estate, right, title, interest, property, claim and demand

489

121

whatsoever, of the said party of the first part, in law, equity or otherwise howsoever, of, in and to the same and every part thereof.

TO HAVE AND TO HOLD the said described four tracts of land with the hereditaments and premises hereby granted, or mentioned and intended so to be, with the appurtenances, unto the said party of the second part, its successors and assigns, to and for the only proper use and behoof of the said party of the second part, its successors and assigns FOREVER.

AND the said party of the first part, for itself, its successors and assigns, doth by these presents covenant, grant and agree to and with the said party of the second part, its successors and assigns, that it, the said party of the first part, its successors and assigns, all and singular the hereditaments and premises hereinabove described and granted, or mentioned and intended so to be, with the appurtenances, unto the said party of the second part, its successors and assigns, against it, the said party of the first part, its successors and assigns, and against all and every other person or persons whomsoever lawfully claiming or to claim the same or any part thereof, by, from, through or under it, SHALL AND WILL WARRANT AND FOREVER DEFEND.

IN WITNESS WHEREOF, the corporate seal of the said Dents Run Coal Company has been hereunto attached, attested by its President and Secretary

490

122

the day and year first above written.

Dents Run Coal Company

Signed, sealed and delivered in the presence of H. R. Nicely

BY William Emery,
President

Corporate Seal.

Attest:

William J. Wallace,
Secretary

491

123

STATE OF PENNSYLVANIA.)
) SS
COUNTY OF PHILADELPHIA.)

I hereby certify that on this eleventh day of January, in the year of our Lord one thousand nine hundred and nine, before me, the subscriber, a Notary Public in and for said County and State, personally appeared William S. Wallace, the Attorney named in the foregoing Indenture, and by virtue and in pursuance of the power therein conferred upon him, acknowledged the said Indenture to be the act and deed of the said Dents Run Coal Company.

WITNESS my hand and notarial seal the day and year aforesaid.

Edward Fell Lukens (SEAL)
Notary Public

My commission expires January 16, 1909. (SEAL)

COMMONWEALTH OF PENNSYLVANIA.)
) SS
COUNTY OF CLEARFIELD.)

RECORDED on this 15th day of January A. D. 1909, in the Recorder's Office of the said County, in Deed Book Vol. 171 page 569.

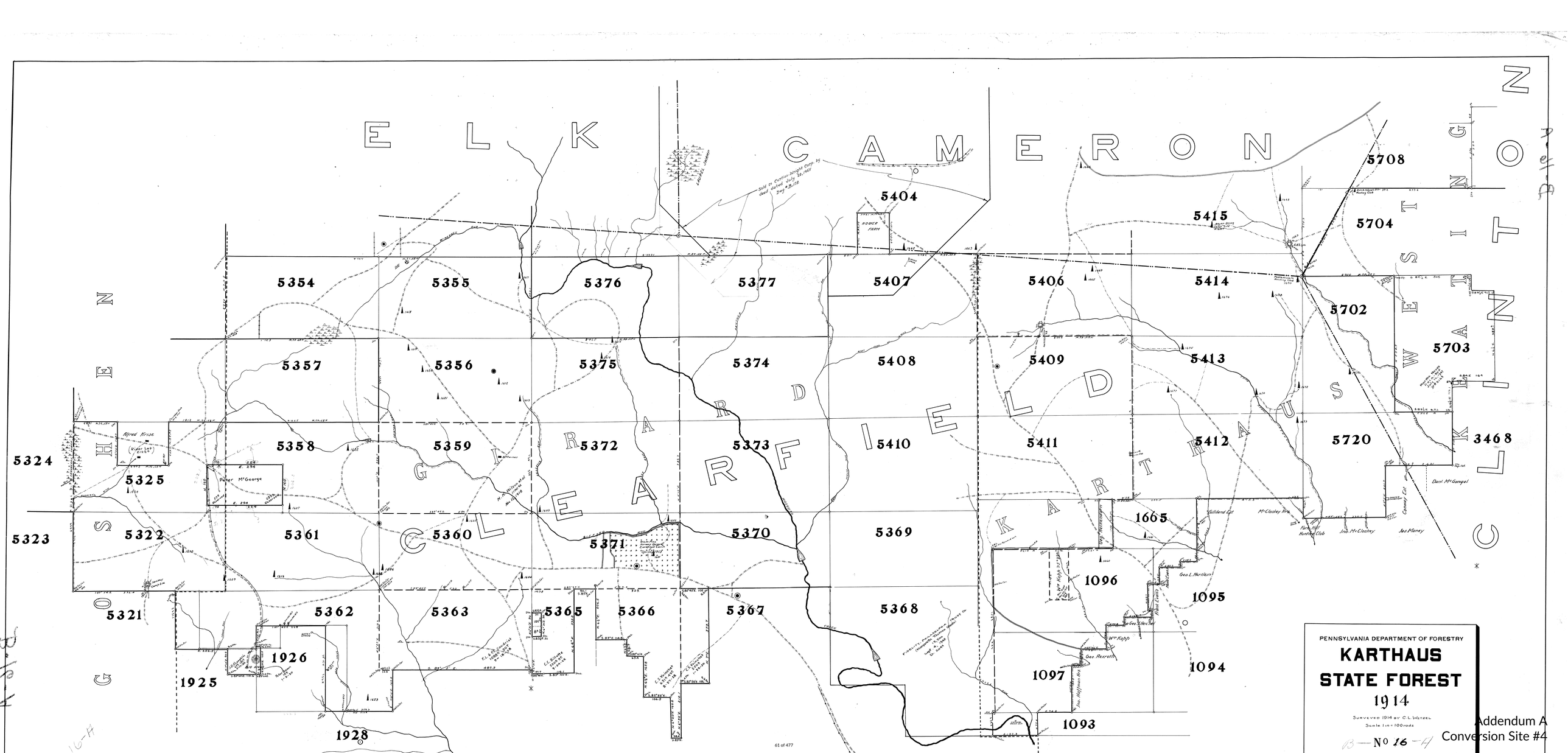
GIVEN under my hand and the seal of the said Office the day and year aforesaid.

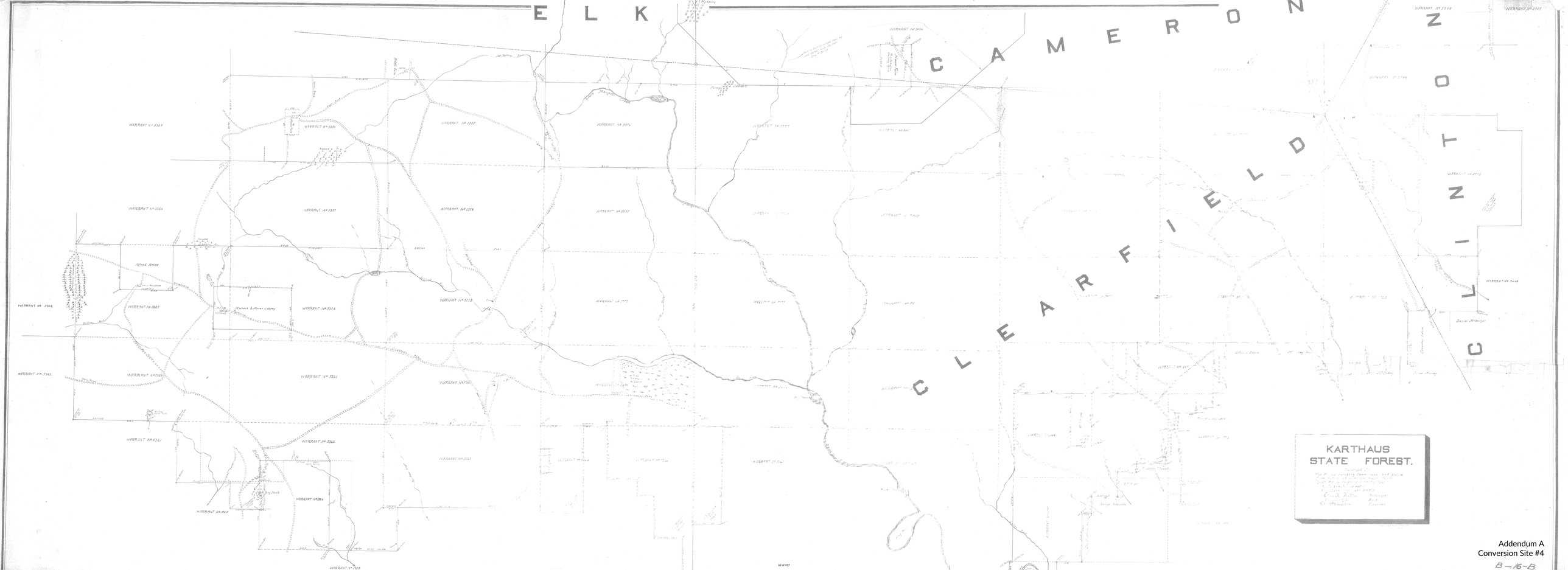
W. T. De Haas
M.H. Recorder.

492

60 of 477

EXCLUSIVE 88282


ELK
CAMERON
CLEARFIELD
McKEAN
5404
5415
5708
5704
5354
5355
5376
5377
5407
5406
5414
5702
5357
5356
5375
5374
5408
5409
5413
5703
5358
5359
5372
5373
5410
5411
5412
5720
3468
5324
5325
5323
5322
5361
5360
5371
5370
5369
1665
1096
1095
5321
5362
5363
5365
5366
5367
5368
1926
1925
1928
1097
1094
1093
Alfred Hirsh
Peter McGeorge
Geo L. Herlihan
Wm Kapp
Geo Hexroth
Jno Hillman
Jno McCloskey
Jas Maney
Park Hill Hunting Club
Daniel McGarigal
Chauncey Lot
Gilliland Lot
McCloskey Tract
Hower Farm
Big Run
Sold to Penna. Water Supply Co. by deed dated July 29, 1965 Dwg. # 8-135
PENNSYLVANIA DEPARTMENT OF FORESTRY
KARTHAUS
STATE FOREST
1914
Surveyed 1914 by C.L. Wetzel
Scale 1 in = 100 rods
B — No 16 — H
Addendum A
Conversion Site #4
61 of 477



Addendum A
Conversion Site #4
B-16-B

Tract ID[100] Pad N

Vol 204 PG 85

wt James Strawbridge

A-23-125 #5669

map # 663-1

title Brief

S-89-176

George W. Hoover, and Elizabeth Ann Hoover, his wife, and Charles Bartles and Mary Esther Bartles, his wife, and Asher D. Updegraff and Carrie B. Updegraff, his wife, to The Commonwealth of Pennsylvania.	General Warranty Deed. Dated Nov. 6, 1908. Ack. Nov. 10, 1908 by Asher D. Updegraff, et ux in Lycoming Co. before Elbert A. Porter, N.P. Com. exp. Jan. 16, 1909. Ack. Nov. 27, 1908 by Charles Bartles et ux before same Notary. Ack.Nov. 10, 1908 by George W. Hoover et ux before same Notary. Recorded Nov. 30, 1908 Lycoming Co. in Deed Book Vol. 204, page 85. Consid. $6433.99.

Conveys all those certain tracts or pieces of land situate, lying and being in the Township of Lewis, County of Lycoming, and State of Pennsylvania, and separately bounded and described as follows, namely:

First: All that certain tract of land called "Greenwich" which was surveyed in pursuance of a warrant No. 5669 dated Sept. 6, 1794, granted to James Strawbridge, to whom Letters Patent, were granted dated Mar. 8, 1796, enrolled at Harrisburg, in Patent Book "P" Vol. 27, page 403, and bounded and described according to said original Patent as follows, namely:

448

Beginning at a post, thence by other land West 342 per. to a dead chestnut, S. 583 per. to a small chestnut, thence by vacant land E. 292 per. to a hemlock, N. 255 per. to a hemlock, E. 50 per. to a post and N. 328 per. the place of beginning.

Containing 1100 acres.

Second: All that certain tract of land being composed of two original warrants, the one being warrant No. 5663, dated Sept. 6, 1794, granted to the said James Strawbridge, to whom Letters Patent were granted dated Mar. 8, 1796, enrolled at Harrisburg in Patent Book "P" Vol. 27, page 401, and the other warrant No. 5664, dated Sept. 6, 1794, also granted to the said James Strawbridge to whom Letters Patent were granted, dated Mar. 9, 1796, enrolled at Harrisburgh in Patent Book "P" Vol. 27, page 399. The said portion of the said two original warrants being bounded and described according to an actual survey thereof made by E. J. Eldfed as follows, namely:

Beginning at a pile of stones at corner common to warrants Nos. 5667, 5668 and 5664, thence along the line dividing said warrants Nos. 5664, and 5669, N. 85° E. 320 per. to stones at the dividing line between warrants Nos. 5664, and 5663; thence continuing along the dividing line between warrants Nos. 5663 and 5664 from warrants Nos. 5785, and 5669 S. 85° E. 300 per. to stones, thence through said warrant No. 5663, and by the portion thereof conveyed to the Commonwealth of Pennsylvania, by deed from John L. Hall, bearing even date herewith, the following twenty courses and distances, namely:

66-66 - 25-XXXXXX

N. 50 1/2° W. 23 per. to stones; N. 20 1/2° W. 15 per. to a post; N. 67 1/4° W. 15 per. to stones; N. 67 3/4° W. 28 per. to a post; N. 36 1/2° W. 38 per. to stones; N. 30 1/2° W. 74 per. to stones; N. 59 3/4° W. 22 per. to a post; N. 76 3/4° W. 20.8 per. to a post; N. 42 1/2° W. 30 per. to a dead pine; N. 77° W. 13 per. to a post; N. 41 1/2° W. 27.6 per. to a post; N. 16° W. 6 per. to a post; N. 14° E. 24 per. to stones; N. 2 1/2° W. 65 per. to a post, N. 56° E. 22 per. to a post; N. 42° E. 43 per. to a post, N. 54 1/4° W. 37 per. to stones; N. 39 1/2° W. 37 per. to a post; N. 40 1/2° W. 41 per. to a post, and S. 70° W. 20.5 per. to stones on the dividing line between said warrants Nos. 5663 and 5664, thence along said dividing lineS. 5° W. 24.6 per. to stones; thence through said warrant N.5664 the five following courses and distances, namely

N. 85° W. 80 per, to a hemlock stump; thence by portion of said warrant No. 5664, next hereinafter described, N. 83° W. 82 per. to a post; S. 50° W. 37 per. to a post; N. 55° W. 68 per. to a post; thence by the said portion of saidwarrant No. 5664, next hereinafter described and by another portion of said warrant N. 28 1/2° E. 214 per. to a post and stones on the dividing line between warrants Nos. 5664 and 5667, thence along said last mentioned dividing line N. 85° W. 170 per. to a post at the corner common to warrants Nos. 5664, and 5667 and thence along the line dividing the said warrants Nos. 5664, and 5667, S. 5° W. 584 per. to stones at the place of beginning.

The said above describedportion of warrant No. 5663 containing 258 acres and 106 perches, strict measure, and the said above described portion of warrant No. 5664, containing 915 acres and 109 perches, strict measure.

450

25-XXXXIII - 88427

The title to the above described tract of land having become vested in said George W. Hoover, Charles Bartles, and Carrie B. Updegraff, three of the first parties herein by virtue of the following conveyances:

Deed Poll from W. G. Miller, Treasurer of Lycoming County to A. D. Updegraff, dated June 9, 1902, duly acknowledged in Open Court and of record in the Prothonotary's Office of Lycoming County in Sheriff's Deed Book "J" page 389, conveying the said portion of warrant No. 5663.

Deed Poll from W. G. Miller, Treasurer of Lycoming County, to A. D. Updegraff, dated June 9, 1902, duly acknowledged in Open Court and of record in the Prothonotary's Office of Lycoming County in Sheriff's Deed Book "J" page 389, conveying the said warrant No. 5664.

Deed Poll from W. G. Miller, Treasurer of Lycoming County to A. D. Updegraff, dated June 9, 1902, duly acknowledged in Open Court and recorded in the Prothonotary's Office of Lycoming County in Sheriff's Deed Book "J" page 389, conveying said warrant No. 5669.

Deed from the Commissioners of Lycoming County to A.D. Updegraff, dated Jan. 4, 1904, of record in the Recorder's Office of Lycoming County in Deed Book Vol. 187, page 573, conveying the above described portion of warrant No. 5663.

Deed from Asher D. Updegraff, and Carrie B.Updegraff, his wife, toW.G.Miller, dated June 23, 1902 recorded in Lycoming Co. in Deed Book Vol.175, page 526, conveying the undivided one half interest in the above described three tracts of land.

Deed from W.G. Miller and Annie E. Miller, his wife, to C.Bartles and George W.Hoover, dated June 20,1904, recorded in Lycoming County in Deed Book Vol.188, page 347, conveying all interest in above described three tracts of land.

451

Deed from George W. Hoover and Elizabeth A. Hoover, his wife, and C. Bartles, and Mary E. Bartles, his wife, to the said Carrie B. Updegraff, dated July 18, 1904, and of record in Lycoming County, in Deed Book Vol. 188, page 348, conveying all interest in the above described three tracts of land.

Deed from A. D. Updegraff, to Carrie B. Updegraff, dated June 16, 1904, of record in Lycoming County in Deed Book Vol. 188, page 346, conveying the undivided one half interest in the above described three tracts of land.

Deed from Asher D. Updegraff, and Carrie B. Updegraff, his wife, to the said George W. Hoover and C. Bartles dated July 13, 1904, and of record in Lycoming County, in Deed Book Vol. 189, page 259, conveying the undivided one-fourth interest in the above described three tracts of land.

The above described three tracts of land having been also soldat Tax Sale on June 8, 1908, to the said Asher D. Updegraff, one of the grantors herein.

Third: All the following portion of the said warrant No. 5664 above described:

Beginning at a hemlock stump in the middle of the public road a short distance East of Hagerman's Run, in the line of land now or formerly of Murray Packard; thence along said public road N. 61 per. to a post; thence by land of Willard Apker, N. 82 1/2° W. 138 per. to a post in line of land formerly ofSamuel Caldwell, now the portion of warrant No. 5664, hereinabove described; thence by the line of hereinbefore describedportion of warrant No. 5664, the following four courses and distances, namely:

S. 28 1/2° W. 63 per. to an oak or post;thence S. 55° E. 68 per. to a pine or post; thence N. 48° E. 37 per.

452

to a dead hemlock, or post and thence S. 85° E. 82 perches to the place of beginning.

Containing 65 acres and 46 perches.

And being the same tract of land which George M. Sones and Clara Spnes,his wife, by their deed dated July 13, 1908, and to be recorded in Lycoming County, granted and conveyed to the said Asher D. Updegraff, one of the first parties hereto.

It being the intention of this Indenture to vest in the Commonwealth of Pennsylvania, the entire right, title, and interest in fee simple, of, in and to all of the above described tracts of land.

---oee:O:ooo---

453

65-68 - 65-453

STATE FOREST

GRAYS RUN DIVISION

1914

A.B. WELLS, FORESTER

SURVEYED 1912 BY ECKEL & MOORE

TRACED BY JOHN W. KELLER

SCALE 1 INCH = 60 RODS

Corrected to 3-10-34. J.D. Checked J.D.S.

5656 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 15, 1794 A111-297

5657 Jas. Strawbridge 1098 a Wt Sep 6, 1794 Sd Oct 15, 1794 A-11-298

5658 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 16, 1794 A-11-299

5659 Jas. Strawbridge 1098½ a Wt Sep 6 1794 Sd Oct 16, 1794 A111-300

5660 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 16, 1794 S-210

5661 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 S-215

5662 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-123

5663 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-122

5664 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-11-302

5667 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 1794 A-11-301

5668 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-121

5669 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 17, 1794 A-23-125

5752 Jas. Strawbridge 408 a Wt Dec 31, 1794 Sd Nov 6, 1795 C-194-135

5785 Martin Point Robert Martin 95 a Wt Mar 29 1797 Sd May 7, 1800 138-292

Addendum A
Nº 46
Conversion sites #5, 6, & 12

PENNA DEPT. OF FORESTRY

GRAYS RUN LAND

LYCOMING CO.

FINAL SURVEY 1912. SCALE 1"=60 RODS.

No 17.

5668
Jhs. STRAWBRIDGE
1100*
Wt Sch. 6,1794
Sd Oct. 16,1794
R-23-134

5669
Jhs. STRAWBRIDGE
1100*
Wt Sch. 6,1794
Sd Oct. 17,1794
R-23-125

5785
Robt. MARTIN
952½*
Wt Mar. 29,1797
Sd May 7,1800
C-138-299

5752
Jhs. STRAWBRIDGE
408*
Wt Dec. 31,1794
Sd May 6,1795
C-194-135

5662
Jhs. STRAWBRIDGE
1100*
Wt Sch. 6,1794
Sd Oct. 16,1794
R-23-123

5663
Jhs. STRAWBRIDGE
1100*
Wt Sch. 6,1794
Sd Oct. 16,1794
R-23-122

5664
Jhs. STRAWBRIDGE
1100*
Wt Sch. 6,1794
Sd Oct. 16,1794
R-11-302

5667
Jhs. STRAWBRIDGE
1100*
Wt Sch. 6,1794
Sd Oct. 1794
R-11-301

5661
Jhs. STRAWBRIDGE
1100*
Wt Sch. 6,1794
Sd Oct. 16,1794
S-215

5660
Jhs. STRAWBRIDGE
1098½*
Wt Sch. 6,1794
Sd Oct. 16,1794
S-210

5659
Jhs. STRAWBRIDGE
1098½*
Wt Sch. 6,1794
Sd Oct. 16,1794
R11-300

5658
Jhs. STRAWBRIDGE
1098½*
Wt Sch. 6,1794
Sd Oct. 16,1794
R-11-299

5657
Jhs. STRAWBRIDGE
1098½*
Wt Sch. 6,1794
Sd Oct. 15,1794
R11-298

5656
Jhs. STRAWBRIDGE
1098½*
Wt Sch. 6, 1794
Sd Oct. 15,1794
R11-297

Addendum A
Conversion Sites #5, 6 & 12

Tract ID 100 Hagerman Compressor & Pond

Bk 555 Pg 719 BOOK 555 PAGE 719

wt James Strawbridge

A-11-302 #5664

Map # 2738
434
663-1

01101

THIS INDENTURE

Made the 17th day of April in the year of Our Lord One Thousand Nine Hundred and ~~Sixty-nine~~ Seventy (A. D. ~~1969~~ 1970).

BETWEEN: JOHN G. NEWMAN, single, of the Borough of Moscow, Lackawanna County, Pennsylvania, hereinafter referred to as the Grantor,

and

COMMONWEALTH OF PENNSYLVANIA, hereinafter referred to as the Grantee.

WITNESSETH that the said party of the first part, for and in consideration of the sum of Twenty-two Thousand ($22,000.00) Dollars lawful money of the United States of America, unto him well and truly paid by the said party of the second part, at or before the sealing and delivery of these presents, the receipt whereof is hereby acknowledged, has granted, bargained, sold, aliened, enfeoffed, released, conveyed and confirmed, and by these presents does grant, bargain, sell, alien, enfeoff, release, convey and confirm, unto the said party of the second part, its successors and assigns forever,

ALL those certain pieces, parcels or lots of land situate in Lewis Township, Lycoming County, Pennsylvania, bounded and described as follows, to-wit:

PARCEL NO. 1

BEGINNING at a post at the southwest corner of lands sold by Josephine E. Allen to the Commonwealth of Pennsylvania; thence along said lands south 66 degrees east, 101.6 rods to a post; thence north 63 degrees east, 48.7 rods to a post; thence south 38 degrees east, 35.5 rods to a post; thence south 52 degrees west, 24.8 rods to a post; thence south 45 3/4 degrees east, 119 rods to a post on the warrant line; thence south 6 1/2 degrees west along the warrant line 21.2 rods to a post; thence north 65 1/4 degrees west, along lands formerly of Rana Jenkins and Mary Jenkins, 158 rods to a point; thence south 32 degrees west, 25 rods to a point; thence along land formerly of Mary Jenkins south 10 1/2 degrees west, 25 rods to the Oak Log Road; thence up the Oak Log Road the following courses and distances north 70 degrees west, 12.2 rods, north 43 degrees west, 8.1 rods; north 56 degrees west, 12.1 rods; north 70 degrees west, 14.2 rods; north 53 degrees west, 8.1 rods; north 58 3/4 degrees west, 16.3 rods; north 32 degrees west, 14.1 rods; north 51 3/4 degrees west, 15.1 rods; north 62 degrees west, 26.2 rods; north 74 degrees west, 10.1 rods and north 69 degrees west, 14.8 rods to lands of Luther T. Newman; thence along lands of L. T. Newman north 53 1/4 degrees east, 49 rods to the township road; and thence north 33 1/2 degrees east, 48 rods to the place of beginning.

PARCEL NO. 2

BEGINNING at a hemlock at the southeast corner of tract of land of John Apker; thence north 2 11/100 perches to a white pine, thence south 87 1/4 degrees east, 298 perches to a post; thence south 2 3/4 degrees west, 152 perches to a post; thence south 60 1/4 degrees east, 10 perches; thence south 68 1/4 degrees east, 15 perches; thence south 54 3/4 degrees east, 10 perches; thence south 64 degrees east, 12 perches; thence south 35 1/4 degrees east, 13 perches; thence south 53 1/4 degrees east, 13 perches; thence south 63 degrees east, 18 perches thence south 70 1/2 degrees east, 16 perches; thence south 71 1/2 degrees east, 13 perches; thence south 61 1/4 degrees east, 16 perches; thence south 70 1/2 degrees east, 36 perches; thence south 71 1/2 degrees east, 13 perches; thence south 61 1/4 degrees east, 16 perches; thence south 70 1/2 degrees east, 36 perches; thence south 81 1/2 degrees east, 12 perches; thence south 82 1/2 degrees east, 13 7/10 perches; north 81 3/4 degrees east, 16 perches; thence north 88 1/2 degrees east, 8.9 perches; thence south 19 perches south 81 1/2 degrees east, 30 perches; thence north 50 3/4 degrees east, 4 2/10 perches to an oak stump; thence north 25 degrees west, 66 perches; thence north 58 1/2 degrees west, 24 perches to a Red Oak Stump; thence north 42 1/2 degrees west, 31 perches to a post; thence north 2 3/4 degrees east, 24.6 perches to a post and stones; thence south 87 1/4 degrees east, eighty perches to the place of beginning.

EXCEPTING AND RESERVING from the above-described tract, three tracts granted and conveyed therefrom by Watson Kelley, as an examination of the chain of title to this tract will more fully reveal.

BEING the same premises granted and conveyed unto Luther E. Newman and Gilbert A. Newman by Mertie Newman, a widow, by her deed dated March 29, 1928 and recorded in the office of the Recorder of Deeds in and for Lycoming County in Deed Book No. 270 at page 272.

PARCEL NO. 3

BEGINNING at a white pine stump in line of land of F. R. Weed, thence north 88 degrees west, 70 perches to a chestnut in line of land of other land of said Weed and Samuel Caldwell; thence by said Samuel Caldwell, south 26 1/2 degrees west, 151 perches to a post in line of lands of Willis R. Apker; thence by said land south 82 1/4 degrees east, 138 perches to a post at the public road; thence west 150 perches to the place of beginning.

PARCEL NO. 4

BEGINNING at a hemlock on the southeast corner of land of Walter Apker; thence along land of said Apker, north 211 rods to a white pine; thence along lands of F. R. Weed, south 87 1/4 degrees east, 86 rods to a post on the north side of the public road; thence along lands of Walter Kelly south 12 degrees west, 237 rods to a post; thence south 50 degrees west, 28 rods; thence 27 1/4 degrees west, 252 rods to a post; thence along land of F. R. Weed, north 89 degrees west, 42 rods; thence south 50 3/4 degrees west, 4.2 rods to an oak stump; thence south 25 1/2 degrees east, 24 rods to a red oak; thence south 42 1/2 degrees east, 31 rods to a post; thence along lands of Samuel Caldwell, south 67 degrees west, 20 1/2 rods to a post; thence south 2 3/4 degrees west, 24.6 rods to a post and stone; thence along lands of Packard, north 87 1/4 degrees west, 80 rods to the place of beginning.

BEING the same premises granted and conveyed unto Luther E. Newman and Gilbert A. Newman by Mertie Newman, a widow, by her deed dated April 14, 1928 and recorded in the office of the Recorder of Deeds in and for Lycoming County in Deed Book No. 270 at page 273.

AND these four parcels of land are contiguous to one another, forming one tract of land being purchased by the grantee herein, which single tract is bounded and described as follows, in accordance with a survey by H. F. Hartman of the Department of Forests and Waters of the Commonwealth of Pennsylvania, dated December 2, 1969, a print of which is attached hereto and intended to be recorded herewith, to-wit:

BEGINNING at an old stones corner, said corner lying within the James Strawbridge Warrant #5664 and being common to lands herein described and lands of the Commonwealth of Pennsylvania; thence by lands last mentioned through the James Strawbridge Warrant #5664 North 30 degrees and 40 minutes East 166.56 rods to a stones corner, lying on the common line of the James Strawbridge Warrant #5664 and #5657 and also being common to lands last mentioned; thence along a line common to the James Strawbridge Warrant #5664 and #5657 by lands last mentioned South 83 degrees and 17 minutes East 222.20 rods to an old stones corner, said corner being common to the James Strawbridge Warrant #5657, 5657, 5664 and 5663, said corner also being common to lands last mentioned; thence continuing by a line common to the James Staawbridge Warrants #5658 and #5663, and lands last mentioned, South 84 degrees and 00 minutes East 106.00 rods to a stones corner, common to Warrants and lands last mentioned; thence through the James Strawbridge Warrant #5663 the following six (6) courses and distances:

1. South 34 degrees and 40 minutes West 41.00 rods to a witnessed point

2. South 65 degrees and 42 minutes East 103.72 rods to a stake

3. North 64 degrees and 36 minutes East 48.48 rods to old stones

4. South 35 degrees and 32 minutes East 36.56 rods to old stones

5. South 52 degrees and 40 minutes West 24.08 rods to a witnessed point

6. South 43 degrees and 40 minutes East 121.40 rods to an old stones corner, said corner lying along a line common to the James Strawbridge Warrant #5663 and #5663. also being common to lands last mentioned; thence along a line common to warrants and lands last mentioned; South 7 degrees and 22 minutes 28.08 rods to a stone corner, being common to warrants and lands last mentioned and lands of Chester Bobst; thence through the James Strawbridge Warrant #5663 by lands herein described and lands of Chester Bobst, lands now or formerly of John F. Emig, and lands of Joseph J. DeVictor North 64 degrees and 00 minutes West 161.68 rods to a stones corner, said corner lying within the James Strawbridge Warrant #5663 and being common to lands herein described and lands of Joseph J. DeVictor; thence through the James Strawbridge Warrant by lands herein described and lands of Joseph J. DeVictor the following two (2) courses and distances:

1. South 34 degrees and 30 minutes West 23.76 rods to an iron pin

2. South 13 degrees and 00 minutes West 23.12 rods to a point in the old log road, said corner lying within the James Strawbridge Warrant #5663 and being common to lands herein described, lands of Joseph J. DeVictor, and lands of the Commonwealth of Pennsylvania; thence through the James Strawbridge Warrant #5663 and #5664 by lands of the Commonwealth of Pennsylvania and lands herein described in and along the Old Log Road, the following twenty-two (22) courses and distances:

1. North 68 degrees and 04 minutes West 13.12 rods to a point in Old Log Road

2. North 40 degrees and 00 minutes West 11.00 rods to a point in Old Log Road

3. North 57 degrees and 45 minutes West 10.40 rods to a point in Old Log Road

4. North 67 degrees and 00 minutes West 14.00 rods to a point in Old Log Road

5. North 49 degrees and 30 minutes West 8.00 rods to a point in Old Log Road

6. North 56 degrees and 00 minutes West 16.00 rods to a point in Old Log Road

7. North 25 degrees and 00 minutes West 14.00 rods to a point in Old Log Road

8. North 56 degrees and 30 minutes West 28.00 rods to a point in Old Log Road

9. North 64 degrees and 00 minutes West 16.00 rods to a point in Old Log Road

10. North 70 degrees and 00 minutes West 10.00 rods to a point in Old Log Road

11. North 66 degrees and 30 minutes West 14.00 rods to a point in Old Log Road

12. North 53 degrees and 30 minutes West 12.00 rods to a point in Old Log Road

13. North 64 degrees and 00 minutes West 12.00 rods to a point in Old Log Road

14. North 42 degrees and 00 minutes West 4.00 rods to a point in Old Log Road

15. North 67 degrees and 00 minutes West 15.00 rods to a point in Old Log Road

16. North 79 degrees and 00 minutes West 7.00 rods to a point in Old Log Road

17. South 83 degrees and 00 minutes West 13.00 rods to a point in Old Log Road

18. North 77 degrees and 00 minutes West 12.00 rods to a point in Old Log Road

19. South 83 degrees and 00 minutes West 12.00 rods to a point in Old Log Road

20. North 87 degrees and 30 minutes West 14.00 rods to a point in Old Log Road

21. North 63 degrees and 30 minutes West 12.00 rods to a point in Old Log Road

22. North 69 degrees and 00 minutes West 14.00 rods to a point in the center of the Old Log Road; said corner lying within the James Strawbridge Warrant #5664 and being common to lands herein described and lands of the Commonwealth of Pennsylvania; thence continuing by warrant and lands last mentioned the following eight (8) courses and distances:

1. South 53 degrees and 15 minutes West 4.92 rods to a stones corner

2. South 14 degrees and 38 minutes East 65.88 rods to a stones corner

3. South 39 degrees and 30 minutes East 47.28 rods to a stones corner

4. South 71 degrees and 37 minutes West 23.52 rods to a stones corner

5. South 8 degrees and 25 minutes West 24.84 rods to a stones corner

6. North 82 degrees and 36 minutes West 79.00 rods to a stones corner

7. North 1 degree and 05 minutes East 61.56 rods to a stones corner

8. North 79 degrees and 30 minutes West 140.68 rods to a stones corner, place of beginning.

EXCEPTING AND RESERVING therefrom a 1.51 acre tract granted and conveyed unto Charles L. Hessler and Evelyn L. Hessler, his wife, by Luther E. Newman and Gilbert A. Newman, et ux, by their deed dated October 26, 1961, and recorded in Lycoming County Deed Book No. 486 at page 1,128, which tract is shown on the attached print. Taking into account this exception, the quantity of land being conveyed hereby is 443.84 acres, strict measure.

AND the said Luther E. Newman died testate May 14, 1962. Item Three of his Last Will and Testament, which is recorded in Lycoming County Will Book No. 35 at page 371, provides: "All of my real estate, being the land commonly known as the Marion Kelly place, Watson Kelly place, and the Allen farm, which I am one half owner with my Brother Gilbert A. Newman of Moscow, Lackawanna County, Pennsylvania, I give, and devise unto my Brother Gilbert A. Newman."

AND the said Gilbert A. Newman died testate February 9, 1969. Item One of his Last Will and Testament, recorded in Lackawanna County Will Book No. 123 at page 572, provides: "All of my real estate, being the land commlnly known as the Newman property, situate in Lewis Township, Pennsylvania, I give and devise unto my son, John Gilbert Newman", and that John Gilbert Newman is the grantor herein.

TOGETHER with all and singular the improvements, ways, waters, water-courses, rights, liberties, privileges, hereditaments and appurtenances whatsoever thereunto belonging or in anywise appertaining, and the reversion and remainders, rents, issues and profits thereof; and all the estate, right, title, interest, property, claim and demand whatsoever of the said party of the first part, in law, equity or otherwise, howsoever, in and to the same and every part thereof.

TO HAVE AND TO HOLD the said pieces, parcels or lots of land, hereditaments and premises hereby granted, or mentioned, and intended so to be, with the appurtenances, unto the said party of the second part, its successors and assigns, to and for the only proper use and behoof of the said party of the second part, its successors and assigns

FOREVER

AND JOHN G. NEWMAN, single,

the said party of the first part, for himself and his heirs, executors and administrators, does by these presents covenant, grant and agree to and with the said party of the second part, its successors and assigns, that he, the said party of the first part, his heirs all and singular the hereditaments and premises herein above described and granted, or mentioned, and intended so to be, with the appurtenances, unto the said party of the second part, its successors and assigns, against him the said party of the first part, and his heirs, and against all and every other person or persons whomsoever, lawfully claiming or to claim the same of any part thereof,

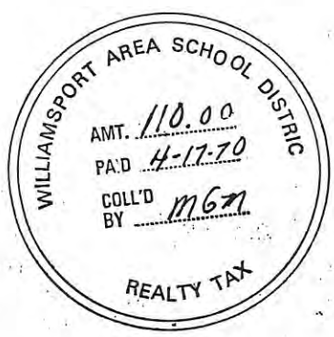
SHALL AND WILL WARRANT AND FOREVER DEFEND

IN WITNESS WHEREOF, the said Grantor has hereunto set his hand and seal the day and year first above written.

Signed, sealed and de-
livered in the presence of:

Geo. E. Davis, Jr.

John G. Newman (SEAL)
John G. Newman, Single



COMMONWEALTH OF PENNSYLVANIA

COUNTY OF LYCOMING

On this 17th day of April A. D. ~~1969,~~ 1970 before me the undersigned officer, personally appeared JOHN G. NEWMAN, known to me to be the person whose name is subscribed to the within instrument, and acknowledged that they executed the same for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

HELEN E. HETZEL NOTARY PUBLIC COMMONWEALTH OF PENNSYLVANIA MY COMMISSION EXPIRES

Helen E Hetzel
NOTARY PUBLIC

HELEN E. HETZEL, Notary Public
Williamsport, Lycoming Co., Pa.
My Commission Expires December 23, 1970

I HEREBY CERTIFY that the principal place of business of the Grantee in the within indenture is Main Capitol Building, Harrisburg, County of Dauphin, Pennsylvania.

Robert J. Traer
Attorney for Grantee

Approved as to form and
proposed manner of execution:

Robert J. Traer
Assistant Attorney General

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF LYCOMING

RECORDED in the Office for Recording of Deeds, Mortgages, etc., in and for the County of Lycoming in Deed Book Volume 555 Page 719

WITNESS my hand and seal of office this 17th day of Apr. A. D. ~~1969.~~ 1970

Mary G. Mosser
Recorder

Recorded in Lyc. Co. Apr 17 1970
at 2:56 P.M.
Mary G. Mosser, Recorder

See Map Book 20 Page 89

2738

STATE FOREST LANDS

N

MAG. 1969

WARRANT 5657
JAMES STRAWBRIDGE

WARRANT 5658
JAMES STRAWBRIDGE

WARRANT 5664
JAMES STRAWBRIDGE
1100 Acres
Wt. September 6, 1794
Sur. October 16, 1794
A - 11 - 302

WARRANT 5663
JAMES STRAWBRIDGE
1100 Acres
Wt. September 6, 1794
Sur. October 16, 1794
A - 23 - 122

WARRANT 5662
JAMES STRAWBRIDGE

OLD STOS. S. 83° 17' E. 222.20 OLD STOS. S. 84° 00' E. 106.00 OLD STOS.

OLD ROAD 60.00

BROOKS RUN ROAD 175.60

OLD STOS. N. 30° 40' E. 166.56

82.00

45.00

POOR MAN'S RUN

OLD STOS. S. 79° 30' E. 140.68

OLD STONES

61.56

NARROW MTN. TRAIL 20.00

HARRISBURG MTN. ROAD

N. 1° 05' E.

OLD STONES S. 82° 36' E. 19.00 OLD STONES

N. 8° 25' E. 24.84

N. 71° 37' E. 23.52 OLD STOS.

S. 39° 30' E. 41.28 OLD STOS.

S. 14° 38' E. 65.88 OLD STOS.

POINT IN OLD LOG RD.

N. 58° 15' E. 4.92 B. & W. STOS.

S. 63° 30' E. 12.00

S. 69° 00' E. 14.00

S. 81° 30' E. 14.00

N. 83° 00' E. 12.00

S. 77° 00' E. 12.00

N. 83° 00' E. 13.00

S. 79° 00' E. 7.00

S. 67° 00' E. 15.00

S. 47° 00' E. 4.00

S. 8° 00' E. 17.00

S. 53° 30' E. 12.00

S. 64° 30' E. 14.00

S. 70° 00' E. 10.00

S. 64° 00' E. 16.00

S. 56° 30' E. 28.00

S. 25° 00' E. 14.00

S. 56° 00' E. 16.00

S. 49° 30' E. 8.00

S. 67° 00' E. 14.00

S. 57° 45' E. 10.40

S. 60° 00' E. 11.00

S. 68° 04' E. 13.12

(ALL POINTS IN OLD ROAD)

OLD LOG ROAD

POINT IN OLD LOG ROAD

OLD STOS. 20.88 N. 34° 40' E. 41.00

N. 63° 30' E. 12.00 WITNESSED POINT

S. 65° 42' E. 103.72 STAKE

N. 64° 30' E. 48.48 OLD STOS.

S. 35° 30' E. 36.56 OLD STOS.

N. 52° 40' E. 24.08 WITNESSED POINT

S. 43° 40' E. 121.40

OLD STOS.

N. 7° 22' E. 28.08

IRON PIN 182.24

B. & W. STOS.

161.68

Lands of Chester Bobst

66.96

24.04

GREY RUN ROAD

N. 7° 22' E.

OLD LOG ROAD

OLD STOS.

PT. IN ROAD

L 50° 30' E. 100.77

N 57° 45' E. 23.80

Bridge 30.00

14" OLD MAPLE

N 38° 47' E. 11.17

L 72° 28' E. 11.50

L 52° 40' E. 10.32

1.54 acs.

GREY RUN ROAD

N. 34° 30' E. 23.76

B. & W. STOS.

10.20

8.85

OLD IRON PIN

N. 13° 00' E. 23.12

IRON PIN

OLD LOG ROAD

POINT IN OLD LOG ROAD

S. 64° 00' E.

Lands of Joseph J. DeVictor

Lands now or formerly of John F. Emig

Deed dated: April 17, 1970
Deed recorded: April 17, 1970
Deed Book Vol. 555 page 719
Area: 443 acres 134 perches.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF FORESTS AND WATERS
HARRISBURG

LYCOMING COUNTY — LEWIS TOWNSHIP

THE JOHN G. NEWMAN PURCHASE

Surveyed and plotted by H.F. Hartman, R.S. # 10,800 — December 2, 1969
Drawn by G.B.C. — Checked by — Scale: 1" = 30 rods

2738
Addendum A
Conversion Sites # 7 & 11

Po. S85W 170 Po&stones EAST 320 Po. East 320 Po.

N28½E 214

Wm Afker

Po S82½E 138 Po

Sones Tract

No3 Deed Nov6-1908 G.W.Hoover 65a46r.

63 Oak Po

S55E 68 Po

Pine N50E 37

Po Hem. S83E 82 Ham Stump S85E 80 Stones

North 61 Pub Road Murray Packard

N50¾E 4.2 W10 S85¼E 30 S71E 19. N81¾E 8.8 S81¾E 16 S82½E 13.7 S81½E 12 S70½E 36. S61¼E 16 S71½E 13.8 S70½E 16. S63E 18. S63½E 13 S55¼E 13 S54E 12 S54¾E 10 S68¾E 15 S60½E 20 S71½E 23. S63¾E 36 S59½E 10. S64E 18. S57½E 17. S64¾E 19

22 M½ S2½W M2½ S2½W M1½ S2½W Red Ox 46 L8 M7½E N. 81 Stones N70E 20.5 Stones N5E 24

JAMES STRAWBRIDGE
Nº 5663.
Wt Sept 6th 1794
Sd Oct 16 1794.

JAMES STRAWBRIDGE
Nº 5664
Wt Sept 6-1794
Sd Oct 16-1794.

N 5° E 584

N 5 E 373.

S 2½ W 379

No2 Deed Nov 6-1908 Geo W. Hoover 915 a 109 r.

No2. Deed Nov 6-1908 Geo W. Hoover 258 a 106 r.

Deed Nov 6-1908 John L. Hall 635 a 79 r.

Stones Stones Stones Post 20

S 85 E 320 S 85 E 300

434

LYCOMING Co. McINTYRE & LEWIS TWPS.
See Map 8-A-17.
Scale 1" = 50 perch.
S.T.M.

Addendum A
University Notes #1 & #2
434

STATE FOREST

GRAYS RUN DIVISION

1914

A.B. WELLS, FORESTER

SURVEYED 1912 BY ECKEL & MOORE

TRACED BY JOHN W. KELLER

SCALE 1 INCH = 60 RODS

Corrected to 3-10-34. D. Checked J.D.S.

5656 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 15, 1794 A111-297

5657 Jas. Strawbridge 1098 a Wt Sep 6, 1794 Sd Oct 15, 1794 A-11-298

5658 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 16, 1794 A-11-299

5659 Jas. Strawbridge 1098½ a Wt Sep 6 1794 Sd Oct 16, 1794 A111-300

5660 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 16, 1794 S-210

5661 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 S-215

5662 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A23-123

5663 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-122

5664 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-11-302

5667 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 1794 A-11-301

5668 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-121

5669 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 17, 1794 A-23-125

5752 Jas. Strawbridge 408 a Wt Dec 31, 1794 Sd Nov 6, 1795 C-194-135

5785 Robert Martin 952 a Wt Mar 29 1797 Sd May 7, 1800 138-292

Cochran Mountain · Boundary Trail · Elm Ridge · Elm Knob · Laurel Ridge · Elk Ridge · Four Mile Run · Skunk Hollow · Long Run Road · Kinney Ridge · Brown Road · Round Top · Watson Kelly Oak Log · Josephine Allen · Township Road · Mary Jenkins · R. Jennings · Luther Newman · Bodine Mountain · Turntable Point · Turntable Hollow · Gray's Run Road · Chestnut Point · Warm Run Hollow · Pine Point · Hemlock Point · Splash Dam Hollow · Heilman Hollow · Bartoff Hollow · Bartoff Point · House Rock · Bottle Hollow Run · Pennsdale Point · Shriver Ridge · Elisha and H.O.S. Trouble · Martin Point · Marsh Hill · Steven's Hollow · Fields Sta. · Gray's Sta. · Clyde Stable · Sarah E. Runyan · John Fields · Mahaffey Rocks · Kitchen's Rocks · Porcupine Hollow · Rocky Hollow · Stoney Hollow · Dry Hollow · Elbow Hollow · Cotton Hollow · Birch Hollow · Pine Hollow · Mouse Hollow · Narrow Place Hollow · Grouse Hollow · Rabbit Hollow · Minx Hollow · Shallow Hollow · Weasel Hollow · Wild Cat Hollow · Low Place Hollow · Radnet Hollow · Brown Hollow · Black Bill Hollow · Lahr Point · Lahr Ridge Road · Sugar Camp Hollow · Bear Hollow · Deer Run · Four Mile Run · Lycoming Creek · Penna. R.R. · Bodine · Askinville Company · Township Road No. 14 (Colerain) · State Highway Route No. 14 · Eckel's Line · Moore's Line · Jno. L. Hall 1098½ a Nov 6, 1908 · Geo. W. Hoover No 1 1100 a Nov 6, 1908 · Geo. W. Hoover No 2 1100 a Nov 6, 1908 · J.H. Cochran Nov 6 1908 1420 a · J.L. Hall Nov 6, 1908 632 a · J.L. Hall Nov 6, 1908 1110 a · M.W. Mahaffey 329 a Nov. 6, 1908 · Game Commission 74 A 96 P May 5, 1948 Dr. 2219 · Fred E. Lehman 1864 9-21 Dr. 423 · C.P.L. Co #10 #1842 · N.C.R.R.

Addendum A
Conversion Sites # 7 & 11.

Tract ID 100 Pad G

COPY

Vol 356 PG 168
Wt James Strowbridge
5658 A-11-299

Map # 2219
Title Brief
S-286-382

THIS INDENTURE

MADE this 5th day of May in the year of our Lord, One Thousand Nine Hundred and Forty-Eight (1948),

BETWEEN COMMONWEALTH OF PENNSYLVANIA, acting by and through Pennsylvania Game Commission, party of the first part, (hereinafter called the Grantor),

AND

COMMONWEALTH OF PENNSYLVANIA, party of the second part, (Herinafter called the Grantee).

WHEREAS, under the authority of and in conformity with Section 904 of the Game Law of June 3, 1937, P. L. 1225, as amended, the exchange of land hereinafter recited was deemed for the best interests of the wildlife by resolution of the Pennsylvania Game Commission unanimously adopted at a meeting held in Harrisburg on January 8, 1948, at which meeting a majority of its members were present and voting, therefore,

THIS INDENTURE, WITNESSETH, that the said Grantor, for and in consideration of the simultaneous conveyance to the Grantor by the Grantee herein, acting by the through the Department of Forests and Waters, of two tracts of land, the one containing 436 acres, 53 perches, situate in Penn Forest Township, Carbon County, Pennsylvania, and the other containing 411 acres, 40 perches, situate in Hillsgrove Township, Sullivan County, Pennsylvania, does grant and convey unto the said Grantee, its successors and assigns

ALL that certain tract of land situate in McIntyre Township, Lycoming County, Pennsylvania, bounded and described according to survey prepared by the Pennsylvania Game Commission, as follows, to wit

S286-382 - 00446

Addendum A
Conversion Site #8

BEGINNING at a point in the northern line of Warrant No. 5663, the southwestern corner of the tract herein described, thence along line separating Warrants Nos. 5657 and 5658, by land of the Commonwealth's Forestry Department, Due North, crossing Long Run, Long Run Road and partially paralleling an improved public road, sixty-seven hundred thirty-five and five tenths (6735.5) feet to post and stones in said warrant division line, thence into Warrant No. 5658, by land of Grays Run Club, of which the land here conveyed was formerly a part, the following four courses and distances. South sixty-one (61) degrees, thirty (30) minutes East, eight hundred and seventy-nine (879.0) feet to post and stone, South seventy-nine (79) degrees, no (00) minutes East, twelve hundred and seventy-six (1276.0) feet to post and stones, North eighty-nine degrees, forty-five (45) minutes East, sixteen hundred(1600.0) feet to post and stones and South sixty-eight (68) degrees, no (00) minutes East, nineteem hundred and forty-eight (1948.0) feet to post and stones in the line separating Warrants Nos. 5658 and 5659, thence along said warrant division line by land of the Commonwealth's Forestry Department, South no (0) degrees thirty (30) minutes West crossing the aforesaid Run and Long Run Road, fifty-two hundred and five (5205.0) feet to point in the northern line of Warrant No. 5662, thence along said line and the line separating Warrants Nos. 5658 and 5663, by land the Commonwealth's Forestry Department and land of Watson Kelley, South eighty-nine (89) degrees, fifteen (15) minutes West, fifty-three hundred seventy-seven and five tenths (5377.5 feet to point at place of beginning.

CONTAINING, by actual survey, 741.6 acres and being part of Warrant No. 5658, issued in the name of James Strawbridge.

BEING the same tract conveyed to the Grantor herein by deed from Grays Run Club, a Pennsylvania corporation, dated November 21, 1936, recorded in Lycoming County Deed Book 298, page 114.

TOGETHER with all and singular the rights, liberties, privileges, hereditaments and appurtenances whatsoever thereunto belonging, or in anywise appertaining, and the reversions and remainders, rents, issues, and profits thereof, and also all the estate, right, title, interest, property, claim and demand whatsoever of the said Grantor, its successors and assigns, in law, equity, or otherwise howsoever, of, in, to or out of the same and every part thereof.

TO HAVE AND TO HOLD the premises hereby granted, or mentioned, or intended so to be, subject nevertheless to the exceptions reservations and restrictions, if any, in former deeds and this present conveyance contained, with the appurtenances unto the said Grantee, its successors and assigns, to and for the only proper use and benoof of the said Grantee, its successors and assigns.

U28-328 - REM - 1 - 0004-1

Addendum A
Conversion Site #8

IN WITNESS WHEREOF, the said COMMONWEALTH, acting by and through the Pennsylvania Game Commission, has caused this Indenture to be signed on its behalf by the President of said Commission, and its seal to be herunto affixed, duly attested, the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA,
Acting by and through Pennsylvania
Game Commission

Attest:
(S E A L)

/S/ Seth Gordon
Executive Director

By /S/ Ross Leffler
President of Commission

COMMONWEALTH OF PENNSYLVANIA)
) SS
COUNTY OF DAUPHIN)

On the 5th day of May in the year of our Lord, One Thousand Nine hundred and Forty-Eight (1948), before me, the subscriber, a Notary Public for the Commonwealth of Pennsylvania, residing in Harrisburg, personally appeared Ross L. Leffler, President of the Pennsylvania Game Commission, and in due for of law acknowledged the above Indenture to be his act and deed of the COMMONWEALTH OF PENNSYLVANIA, acting by and through Pennsylvania Game Commission.

WITNESS my hand and notarial seal, the day and year first above written.

/S/ Lucille A Stroup
Notary Public

(S E A L)

My Commission expires Mar. 5, 1951.

U235-DEH-00443

Addendum A
Conversion Site #8

I hereby certify that the precise residence of the within named Grantee is State Capitol, Harrisburg, Pennsylvania

For Grantee

Approved as to form and legality.

/S/ Raymond C Miller
Deputy Attorney General

RECORDED at WILLIAMSPORT in the Offices for the Recording of Deeds in and for the County of LYCOMING, Commonwealth of Pennsylvania in Deed Book _____, Volume, 356, Page 168.

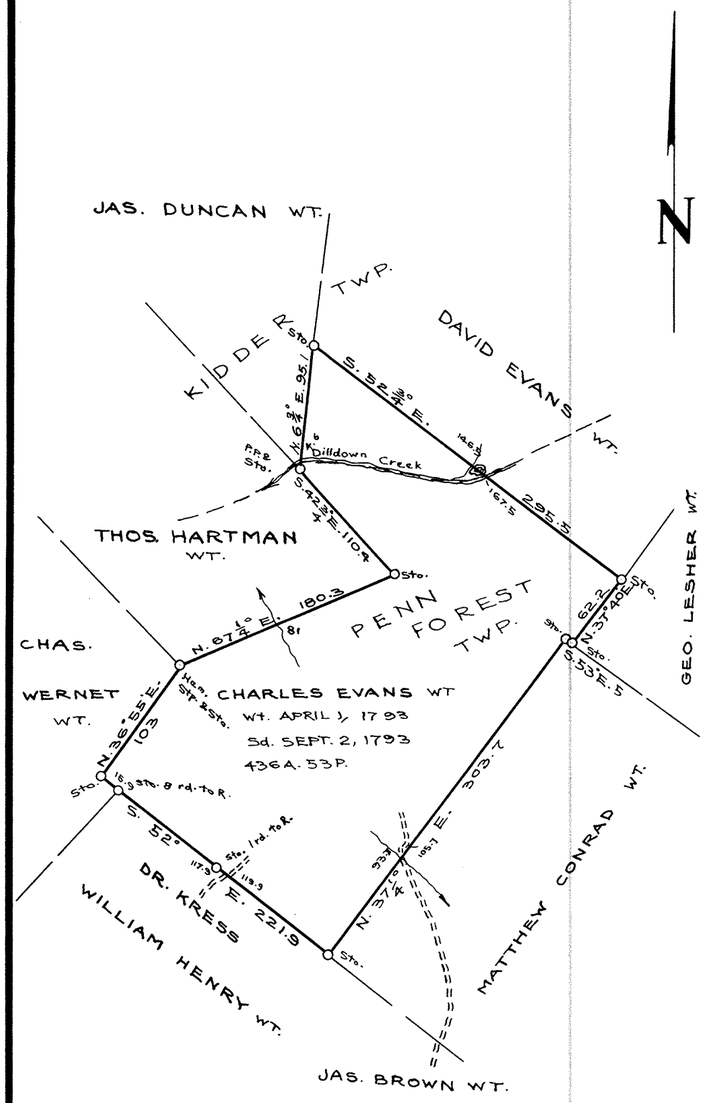
WITNESS my hand and seal of office this 28 day of May, Anno Domini, 1948.

Signed Verna M Kress
Recorder

B236-PFR - 50449

Addendum A
Conversion Site #8

6122

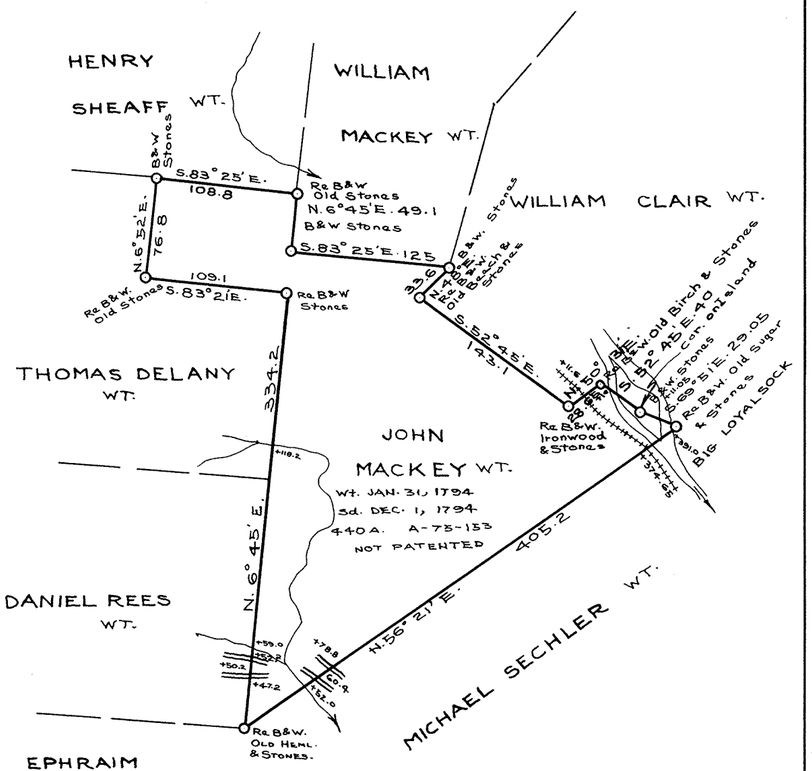


LAND GIVEN TO GAME COMMISSION IN EXCHANGE

CARBON COUNTY KIDDER & PENN FOREST TWPS.

SURVEYED BY: T.O.B. 1927

FRITZ HEIRS
DEED DATED 12-17-23
RECORDED 1-26-24, V96, P635

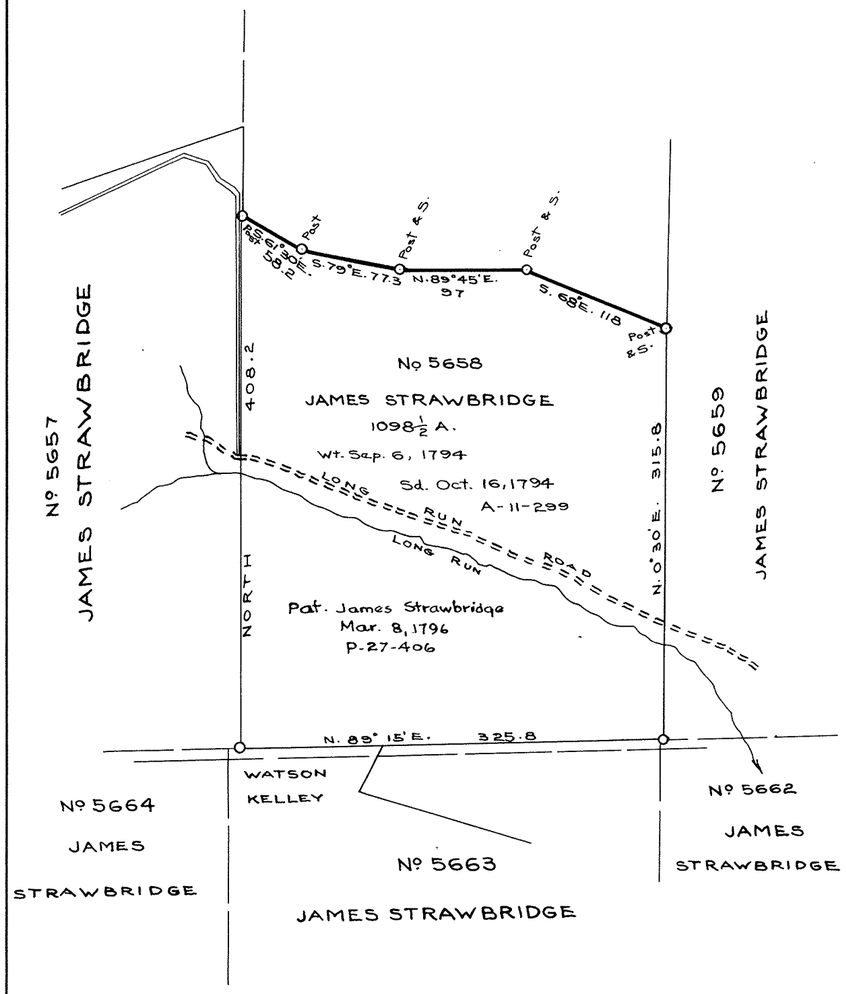


LAND GIVEN TO GAME COMMISSION IN EXCHANGE

SULLIVAN COUNTY HILLSGROVE TOWNSHIP

SURVEYED BY: H.F.B. 1930

C.P.L. Co. CONT. #7
DEED DATED 8-31-31
RECORDED 9-1-31, V-47, P480



LAND ACQUIRED FROM GAME COMMISSION IN EXCHANGE

LYCOMING COUNTY Mc INTYRE TOWNSHIP

SURVEYED BY: W.H.A. 1936

Deed dated May 5, 1948
Recorded May 28, 1948
Deed Book Vol. 356, page 168
741 As. 96 Ps.

COMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF FORESTS & WATERS

HARRISBURG

LYCOMING CO. Mc INTYRE TWP. { SULLIVAN CO. HILLSGROVE TWP. / CARBON CO. PENN FOREST-KIDDER TWP.

GAME COMMISSION EXCHANGE

SURVEYED BY: W.H.A. H.F.B. T.O.B.	TRACED BY: H.D. LILLY	DATE: 25 MAY '48
	CHECKED BY: F.W.H.	SCALE: 1" = 100 RODS

2219

Addendum A
Conversion Site #8

Tract ID 100 Pad P

Vol 254 Pg 418
wt Robert Martin
5785
C-138-299

Map # 663-1 & 1015
title Brief
S-165

Thomas B. Albert and Mary A. Albert, his wife, to Commonwealth of Pennsylvania.	General Warranty Deed. Dated Sept. 24, 1924. Ack. Oct. 8, 1924 before John F. Kerr, J. of P., Lycoming County. Commission expires first Monday in January 1926. Recorded Nov. 25, 1924 in Lycoming County in Deed Book Vol. 254, page 418. Consideration $730.01. U. S. Revenue Stamps $1.00.

Conveys all that certain tract or parcel of land situate, lying and being in the Township of Lewis, County of Lycoming and State of Pennsylvania, being the Northwesterly part of a tract originally surveyed on warrant No. 5785, dated March 29, 1797, granted to Robert Martin, for which Letters Patent were granted to Richard Martin et.al. dated January 11, 1802, enrolled at Harrisburg in Patent Book H, Vol. 47, page 74, and more particularly bounded and described as follows, viz:

Beginning at a point located N. 76° W. fifty (50) perches from an old Linn corner; thence from said point, N. 64° W. three hundred forty-two (342) perches to a post corner on the division line between the warrants Robert Martin,

67.

Addendum A
Conversion Site # 9

No. 5785, and James Strawbridge, No. 5669; thence along said division line, N. 6° E. sixty-one and five tenths (61.5) perches to stones; thence along the Northern line of warrant No. 5785, S. 84° E. three hundred twenty (320) perches to corner of land lately purchased by Albert R. Spicer at Treasurer's Sale; thence along said Spicer's land, S. 2° W. one hundred seventy-eight (178) perches to the place of beginning.

Containing two hundred and forty-three (243) acres and fifty-three and nine tenths (53.9) perches.

AND being the same tract of land which was assessed on the unseated list of said Lewis Township for the years 1920 and 1921 in the name of T. B. Albert, and the same tract which was sold by the Treasurer of said Lycoming County at Treasurer's Sale for the year 1922 to Link Albert. And being the same tract of land conveyed to said Thomas B. Albert, one of the grantors herein, by the said Link Albert and wife, by their deed dated Aug. 18, 1924, intended to be recorded herewith.

WCLXG-SR - 00052

Tract ID 100 Pad P

Vol 204 Pg 85

wt James Strawbridge
5663
A-23-122

Map # 434
663-1

Title Brief
5-89-176

George W. Hoover, and Elizabeth Ann Hoover, his wife, and Charles Bartles and Mary Esther Bartles, his wife, and Asher D. Updegraff and Carrie B. Updegraff, his wife, to The Commonwealth of Pennsylvania.	:	General Warranty Deed. Dated Nov. 6, 1908. Ack. Nov. 10, 1908 by Asher D. Updegraff, et ux in Lycoming Co. before Elbert A. Porter, N.P. Com. exp. Jan. 16, 1909. Ack. Nov. 27, 1908 by Charles Bartles et ux before same Notary. Ack. Nov. 10, 1908 by George W. Hoover et ux before same Notary. Recorded Nov. 30, 1908 Lycoming Co. in Deed Book Vol. 204, page 85. Consid. $6433.99.

Conveys all those certain tracts or pieces of land situate, lying and being in the Township of Lewis, County of Lycoming, and State of Pennsylvania, and separately bounded and described as follows, namely:

First: All that certain tract of land called "Greenwich" which was surveyed in pursuance of a warrant No. 5669 dated Sept. 6, 1794, granted to James Strawbridge, to whom Letters Patent, were granted dated Mar. 8, 1796, enrolled at Harrisburg, in Patent Book "P" Vol. 27, page 403, and bounded and described according to said original Patent as follows, namely:

448

Addendum A
Conversion Site # 9

Beginning at a post, thence by other land West 342 per. to a dead chestnut, S. 583 per. to a small chestnut, thence by vacant land E. 292 per. to a hemlock, N. 255 per. to a hemlock, E. 50 per. to a post and N. 328 per. the place of beginning.

Containing 1100 acres.

Second: All that certain tract of land being composed of two original warrants, the one being warrant No. 5663, dated Sept. 6, 1794, granted to the said James Strawbridge, to whom Letters Patent were granted dated Mar. 8, 1796, entolled at Harrisburg in Patent Book "P" Vol. 27, page 401, and the other warrant No. 5664, dated Sept. 6, 1794, also granted to the said James Strawbridge to whom Letters Patent were granted, dated Mar. 9, 1796, enrolled at Harrisburgh in Patent Book "P" Vol. 27, page 399. The said portion of the said two original warrants being bounded and described according to an actual survey thereof made by E. J. Eldred as follows, namely:

Beginning at a pile of stones at corner common to warrants Nos. 5667, 5668 and 5664, thence along the line dividing said warrants Nos. 5664, and 5669, N. 85° E. 320 per. to stones at the dividing line between warrants Nos. 5664, and 5663; thence continuing along the dividing line between warrants Nos. 5663 and 5664 from warrants Nos. 5785, and 5669 S. 85° E. 300 per. to stones, thence through said warrant No. 5663, and by the portion thereof conveyed to the Commonwealth of Pennsylvania, by deed from John L. Hall, bearing even date herewith, the following twenty courses and distances, namely:

Addendum A
Conversion Site # 9

N. 50 1/2° W. 23 per. to stones; N. 20 1/2° W. 15 per. to a post; N. 67 1/4° W. 15 per. to stones; N. 67 3/4° W. 28 per. to a post; N. 36 1/2° W. 38 per. to stones; N. 30 1/2° W. 74 per. to stones; N. 59 3/4° W. 22 per. to a post; N. 76 3/4° W. 20.8 per. to a post; N. 42 1/2° W. 30 per. to a dead pine; N. 77° W. 13 per. to a post; N. 41 1/2° W. 27.6 per. to a post; N. 16° W. 6 per. to a post; N. 14° E. 24 per. to stones; N. 2 1/2° W. 65 per. to a post, N. 56° E. 22 per. to a post; N. 42° E. 43 per. to a post, N. 54 1/4° W. 37 per. to stones; N. 39 1/2° W. 37 per. to a post; N. 40 1/2° W. 41 per. to a post, and S. 70° W. 20.5 per. to stones on the dividing line between said warrants Nos. 5663 and 5664, thence along said dividing lineS. 5° W. 24.6 per. to stones; thence through said warrant N.5664 the five following courses and distances, namely

N. 85° W. 80 per, to a hemlock stump; thence by portion of said warrant No. 5664, next hereinafter described, N. 83° W. 82 per. to a post; S. 50° W. 37 per. to a post; N. 55° W. 68 per. to a post; thence by the said portion of saidwarrant No. 5664, next hereinafter described and by another portion of said warrant N. 28 1/2° E. 214 per. to a post and stones on the dividing line between warrants Nos. 5664 and 5667, thence along said last mentioned dividing line N. 85° W. 170 per. to a post at the corner common to warrants Nos. 5664, and 5667 and thence along the line dividing the said warrants Nos. 5664, and 5667, S. 5° W. 584 per. to stones at the place of beginning.

The said above describedportion of warrant No. 5663 containing 258 acres and 106 perches, strict measure, and the said above described portion of warrant No. 5664, containing 915 acres and 109 perches, strict measure.

450

Addendum A
Conversion Site # 9

The title to the above described tract of land having become vested in said George W. Hoover, Charles Bartles, and Carrie B. Updegraff, three of the first parties herein by virtue of the following conveyances:

Deed Poll from W. G. Miller, Treasurer of Lycoming County to A. D. Updegraff, dated June 9, 1902, duly acknowledged in Open Court and of record in the Prothonotary's Office of Lycoming County in Sheriff's Deed Book "J" page 389, conveying the said portion of warrant No. 5663.

Deed Poll from W. G. Miller, Treasurer of Lycoming County, to A. D. Updegraff, dated June 9, 1902, duly acknowledged in Open Court and of record in the Prothonotary's Office of Lycoming County in Sheriff's Deed Book "J" page 389, conveying the said warrant No. 5664.

Deed Poll from W. G. Miller, Treasurer of Lycoming County to A. D. Updegraff, dated June 9, 1902, duly acknowledged in Open Court and recorded in the Prothonotary's Office of Lycoming County in Sheriff's Deed Book "J" page 389, conveying said warrant No. 5669.

Deed from the Commissioners of Lycoming County to A.D. Updegraff, dated Jan. 4, 1904, of record in the Recorder's Office of Lycoming County in Deed Book Vol. 187, page 573, conveying the above described portion of warrant No. 5663.

Deed from Asher D. Updegraff, and Carrie B.Updegraff, his wife, toW.G.Miller, dated June 23, 1902 recorded in Lycoming Co. in Deed Book Vol.175, page 526, conveying the undivided one half interest in the above described three tracts of land.

Deed from W.G. Miller and Annie E. Miller, his wife, to C.Bartles and George W.Hoover, dated June 20,1904, recorded in Lycoming County in Deed Book Vol.188, page 347, conveying all interest in above described three tracts of land.

451

Addendum A
Conversion Site # 9

Deed from George W. Hoover and Elizabeth A. Hoover, his wife, and C. Bartles, and Mary E. Bartles, his wife, to the said Carrie B. Updegraff, dated July 18, 1904, and of record in Lycoming County, in Deed Book Vol. 188, page 348, conveying all interest in the above described three tracts of land.

Deed from A. D. Updegraff, to Carrie B. Updegraff, dated June 16, 1904, of record in Lycoming County in Deed Book Vol. 188, page 346, conveying the undivided one half interest in the above described three tracts of land.

Deed from Asher D. Updegraff, and Carrie B. Updegraff, his wife, to the said George W. Hoover and C. Bartles dated July 13, 1904, and of record in Lycoming County, in Deed Book Vol. 189, page 259, conveying the undivided one-fourth interest in the above described three tracts of land.

The above described three tracts of land having been also soldat Tax Sale on June 8, 1908, to the said Asher D. Updegraff, one of the grantors herein.

Third: All the following portion of the said warrant No. 5664 above described:

Beginning at a hemlock stump in the middle of the public road a short distance East of Hagerman's Run, in the line of land now or formerly of Murray Packard; thence along said public road N. 61 per. to a post; thence by land of Willard Apker, N. 82 1/2° W. 138 per. to a post in line of land formerly ofSamuel Caldwell, now the portion of warrant No. 5664, hereinabove described; thence by the line of hereinbefore describedportion of warrant No. 5664, the following four courses and distances, namely:

S. 28 1/2° W. 63 per. to an oak or post;thence S. 55° E. 68 per. to a pine or post; thence N. 48° E. 37 per.

452

Addendum A
Conversion Site # 9

to a dead hemlock, or post and thence S. 85° E. 82 perches to the place of beginning.

Containing 65 acres and 46 perches.

And being the same tract of land which George M. Sones and Clara Spnes,his wife, by their deed dated July 13, 1908, and to be recorded in Lycoming County, granted and conveyed to the said Asher D. Updegraff, one of the first parties hereto.

It being the intention of this Indenture to vest in the Commonwealth of Pennsylvania, the entire right, title, and interest in fee simple, of, in and to all of the above described tracts of land.

---oee:O:ooo---

ESSES - 35-XXXXX-1

Tract ID 100 Pad P

Vol 204 Pg 279

wt Robert Martin

5785

C-138-299

Map # 663-1

T. He Brief

S-89-176

May W. Mahaffey, and	General Warranty Deed.
Delos S. Mahaffey, her	Dated Nov. 6, 1908.
husband,	Ack. Nov. 27, 1908 before
to	Elbert A. Porter, N. P. in
The Commonwealth of Penna.	Lycoming Co. Com. ex. Jan. 15, 1909. Recorded April 28, 1909 Deed Book Vol. 204 page 279 in Lycoming County. Consid. $734.50.

Conveys all the undivided five-sixths interest of, in and to, a certain tract of land located in Lewis Township, Lycoming County, Pennsylvania, being a portion of a tract of land which was surveyed in pursuance of warrant No. 5785, dated Mar. 29, 1797, granted to one Robert Martin, for which Letters Patent were granted to Thomas Martin and Richard Martin, Trustees, dated Jan. 11, 1802, enrolled at Harrisburg in Patent Book P, Vol. 47, page 74, the said portion of said tract of land being bounded and described according to an actual survey thereof made by E. J. Eldred, C. E. on Sept. 7, 1908, as follows, to-wit:

Beginning at a post on Lycoming Creek, on the westerly line of said warrant No. 5785, near a hemlock stump, an original corner of said warrant; thence by said westerly line of said warrant N. 5 1/2° E. 235 per. to a post; thence by the line dividing warrant No. 5785, from warrant No. 5669, S. 84 1/2° E. 50 per. to a post; and N. 5 1/2° E. 287 per. to a post, thence through said warrant No. 5785, S. 64 3/4° E. 384 per. to a post on the easterly line of said warrant; thence along said easterly line and crossing a run, S. 5 1/2° E. 12 per. to a post; thence through said warrant

-61

Addendum A
Conversion Site # 9

No. 5785, the following nineteen (19) courses and distances, viz: S. 70° W. 35 per. to a post; S. 66 3/4° W. 18 per. to a post; thence crossing a Run, N. 44 1/2° W. 34 per. to a post; N. 83° W. 26 per. to a post; South 77 3/4° W. 44 per., to a post; S. 65° W. 23 per. to a post; S. 53 1/2° W. 43 per. to a post; thence S. 87° W. 37.8 per. to a post; S. 41° W. 23 per. to a post; S. 67° W. 26.8 per. to a post; S. 51 1/2° W. 33 per. to a post; S. 67° W. 10 per. to a post; S. 48 1/2° W. 15 per. to a post; S. 67° W. 44.6 per. to a post; S. 73° W. 20.2 per. to a post; S. 55° W. 18 per. to a post; S. 70° W. 20 per. to a post at a Run, S. 61° W. 20 per. to a post and S. 12° E. 72 per. to a post on Lycoming Creek and thence along said Lycoming Creek S. 19° W. 50 per. to a post and S. 11 1/2° W. 72 per. to a post at the place of beginning.

Containing 320 acres and 84 perches strict measure.

And being a portion of the same tract of land which Thomas M. Rathwell, Administrator of the estate of Samuel Caldwell, dec'd., conveyed to George W. Lentz, by deed dated June 16, 1888 of record in Lycoming County in Deed Book Vol. 115, page 502.

And being also a portion of the same property of which the said George W. Lentz, died seized, intestate, leaving to survive him as his only heirs and legal representatives, Harry W. Lentz, and May W. Mahaffey, one of the grantors herein.

The said Harry W. Lentz, with Sadie, his wife, having conveyed all his interest in the above described tract of land to the said May W. Mahaffey by deed dated Aug. 22, 1895, of record in Lycoming County, in Deed Book Vol. 191, page 129.

462

Addendum A
Conversion Site # 9

Tract ID 100 Pad P

Vol 223 Pg 475
wt Robert Martin
5785
C-138-299

Map # 663-1
title Brief
S-126-204

Asher D. Updegraff and	:	General Warranty Deed.
Carrie B. Updegraff, his wife,	:	Dated Nov. 21, 1916.
to	:	Ack. Nov. 29, 1916 before
Commonwealth of Pennsylvania.		L. R. Drake, N.P., Marl-
	:	boro County, S. C.
	:	Recorded Feb. 28, 1917
	:	in Lycoming County, in
	:	Deed Book Vol. 223, page
	:	475.
	:	Consideration $146.90.

Conveys - All the undivided one-sixth interest of, in and to a certain tract of land located in Lewis Township, Lycoming County, Pennsylvania, being a portion of a tract of land which was surveyed in pursuance of warrant No. 5785, dated March 29, 1797, granted to one Robert Martin, for which Letters Patent were granted to Thomas Martin and Richard Martin, Trustees, dated Jan. 11, 1802, enrolled at Harrisburg in Patent Book P, Vol. 47, page 74, the said portion of said tract of land being bounded and described according to an actual survey thereof made by E. J. Eldred, C. E., on Sept. 7, 1908, as follows, to-wit:

Beginning at a post on Lycoming Creek, on the westerly line of said warrant No. 5785, near a hemlock stump, an original corner of said warrant, thence by said westerly line of said warrant, N. 5 1/2° E. 235 perches to a post; thence by the line dividing warrant No. 5785 from warrant No. 5669, S. 84 1/2° E. 50 perches to a post, and N. 5 1/2° E. 287

221
17.

Addendum A
Conversion Site # 9

perches to a post; thence through said warrant No. 5785, S. 64 3/4° E. 384 perches to a post on the easterly line of said warrant, thence along said easterly line and crossing a Run, S. 5 1/2° E. 12 perches to a post; thence through said warrant No. 5785, the following 19 courses and distances, viz S. 70° W. 35 perches; S. 66 3/4° W. 18 perches to a post; thence crossing a Run, N. 44 1/2° W. 34 perches to a post, N. 83° W. 26 perches to a post, S. 77 3/4° W. 44 perches to a post, S. 65° W. 23 perches to a post; S. 53 1/2° W. 43 perches to a post; thence S. 87° W. 37.8 perches to a post, S. 41° W. 23 perches to a post, S. 67° W. 26.8 perches to a post, S. 51 1/2° W. 33 perches to a post, S. 67° W. 10 perches to a post, S. 48 1/2° W. 15 perches to a post, S. 67° W. 44.6 perches to a post; S. 73° W. 20.2 perches to a post; S. 55° W. 18 perches to a post, S. 70° W. 20 perches to a post at a Run, S. 61° W. 20 perches to a post, and S. 12° E 72 perches to a post on Lycoming Creek, and thence along said Lycoming Creek, S. 19° W. 50 perches to a post, and S. 11 1/2° W. 72 perches to a post, at the place of beginning.

Containing 320 acres and 84 perches, strict measure.

And being the same undivided one-sixth (1/6) interest in the said tract of land which the Treasurer of Lycoming County, by Deed Poll dated June 8, 1914, to be recorded, in the Recorder's Office of Lycoming County, granted and conveyed to the said A. D. Updegraff, one of the grantors herein.

COXXE-ESS-I-SS223

212

Addendum A
Conversion Site # 9

STATE FOREST

GRAYS RUN DIVISION

1914

A.B. WELLS, FORESTER

SURVEYED 1912 BY ECKEL & MOORE

TRACED BY JOHN W. KELLER

SCALE 1 INCH = 60 RODS

Corrected to 3-10-34. B. Checked J.D.S.

5656 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 15, 1794 A111-297

5657 Jas. Strawbridge 1098 a Wt Sep 6, 1794 Sd Oct 15, 1794 A-11-298

5658 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 16, 1794 A-11-299

5659 Jas. Strawbridge 1098½ a Wt Sep 6 1794 Sd Oct 16, 1794 A111-300

5660 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 16, 1794 S-210

5661 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 S-215

5662 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-123

5663 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-122

5664 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-11-302

5667 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 1794 A-11-301

5668 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-121

5669 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 17, 1794 A-23-125

5752 Jas. Strawbridge 408 a Wt Dec 31, 1794 Sd Nov 6, 1795 C-194-135

5785 Martin Point Robert Martin 952 a Wt Mar 29 1797 Sd May 7, 1800 138-292

Cochran Mountain

Bodine Mountain

Turntable Point

Chestnut Point

Pine Point

Hemlock Point

Pennsdale Point

Bartoff Point

Martin Point

Laurel Ridge

Elk Ridge

Elm Ridge

Kinney Ridge

Shriver Ridge

Marsh Hill

Boundary Trail

Long Run Road

Brown Road

Round Top Road

Watson Kelly Oak Log Road

Josephine Allen Township Road

Mary Jenkins R. Jenkins Dry Run Road

New Grays Run Road

Bartoff Hollow Road

Lahr Ridge Road

Sugar Camp Trail

Ridge Trail

Fodding Hollow Trail

Eckel's Line

Grays Run

Four Mile Run

Skunk Hollow Run

Elk Ridge Run

Dry Run

Bottle Hollow Run

Sawmill Run

Deer Run

Cotton Hollow

Rocky Hollow

Stoney Hollow

Elbow Hollow

Birch Hollow

Pine Hollow

Mouse Hollow

Narrow Place Hollow

Porcupine Hollow

Wild Cat Hollow

Kitchen's Rocks

Mahaffey Rocks

House Rock

Old Maiden Chute Hollow

Heilman Hollow

Warm Run Hollow

Splash Dam Hollow

Lahr Point

Black Bill Point

Shriver Ridge

Sarah E. Runyan

John Fields

Fields Sta.

Gray's Sta.

Clyde Stouble

Fred E. Lehman 1884 P. 21 Dr. 423.4

Jno. L. Hall 1098 a Nov 6, 1908

J.H. Cochran Nov 6 1908 1420 a

J.L. Hall Nov 6, 1908 632 a

J.L. Hall Nov 6, 1908 1109 a

Geo. W. Hoover No 1 1100 a Nov 6, 1908

Geo. W. Hoover No 2 Nov 6, 1908 958 a

Geo. W. Hoover No 2 Nov 6, 1908 919 a

M.W. Mahaffey 329 a Nov 6, 1908

Elisha & H.O.S. Trouble

H.O. & Olive Elisha Strouble

Game Commission 74 A 96 P May 5, 1948 Dr. 2219

N.C.R.R.

Lycoming

Penn. R.R.

Bodine

Askinville Company

Steven St. Place

Township Road No. 14 (Cogan House)

State Highway Route No. 14

C.P.L. Co #10 #1842

Addendum A
Conversion Site # 9.

STATE FOREST LAND

East 320 North Line of #5785 as shown on ground — Fire Lane

320 — North Line of warrant as originally returned — 819 — West — 320

North 644

E & H. Oliver Struble

Tim Grays Run

Trout Spring Run

Susan Striver

Lynn

School

Geo. Read & Robert Gray

J. Gilbert et al. Deed Mch 30-1868 to Elizabeth Moore #55 pg 164

Joel Jervis Deed Oct 14-1881 to D.S. Taylor #91 pg 20 49a 47p

N 52 E 100

N 70 E 180

N 88 E 134

N 85 E 70

N 60 E 174

N 13 E 62

N 26 E 162

N 50 E 150

N 87 E 67

N 30½ E 71

South 328

South 255

West 50

JAMES STRAWBRIDGE No 5669

243 a 53 p

H.G. Eisenminger Treas. Deed Oct 20-1923 to Link Albert Treas Sale June 12-1922 Rec Val

Link Albert & Wife to Thomas B. Albert Deed Aug 18-1924 Rec Vol.

L. Edwards & J & D Gilbert deed May 29-1867 #53 pg 679, 68a

H.G. Eisenminger Treas to Albert R. Spicer Treas. Sale June 12-1922 Deed Oct 22-1923 Rec Nov 7-1923 No 251 pg 43 75a

J.C. Hill Trustee Deed Mar 24-1897 #453 pg 449 to L.M. Gray et al.

L.M. Gray et al. Deed Aug 2 1901 #472 pg 322 39a 33p to John & H.W. Lahr

J & H.W. Lahr 9a 70p to Susan Striver

L. Edwards Heirs Deed 1825-1897 #479 pg 257 6a 22p

Road to Pennsdale

Beech

Birch

Hem

Lycoming Creek as shown by E.J. Eldreds survey of 1908

D.A. Fessler to Clyde Struble Deed Apr 1-1910 #207 pg 372 371a

571a Edw. d. Burd to Thos Biddle May 11-1826 to Thos Rathmell to Geo. W. Lentz June 16-1888 (115/pg 502) to H.W. Lentz to M.W. Mahaffey Aug 22-1895 (191 :: 129) to State Nov 6-1908

320 a 94 p M.W. Mahaffey to State

Lewis Township
Lycoming Co.

ROBERT MARTIN Wt. No 5785

Wt dated March 29-1797. 952½ Acs Allow.
Surv'd – – – – –
Resurveyed – – – – by order of Board of Property dated Jany 9-1802. Minute Book No 5-pg 413
Patent to Richard Martin et al. Jan 11. 1802. Enrol. "L" Vol 47 pg 74
Draft copied in "C" No 138-pg 299.
Susq. Res. Vol 89-pg 233.

NOTE: This draft shows the Two Locations of Lycoming Creek, one as returned on the original survey, and the other by surveys of E.J. Eldred. Also the two locations for the North Line of the warrant

PENNSYLVANIA
DEPARTMENT OF FORESTS & WATERS
HARRISBURG

LYCOMING CO.

LEWIS TOWNSHIP

Grays Run Lands.
Aug 1924.

Scale 1" = 40 per. S.T.M.

Addendum A
Component Site # 9
1015

Tract ID 100 Pad T

Vol 204 Pg 71

wt James Strawbridge
5663
A-23-122

Map # 434
663-1

Title Brief
S-89-176

John L. Hall, unmarried,	:	Special Warranty Deed.
to	:	Dated Nov. 6, 1908.
The Commonwealth of Penna.	:	Ack. Nov. 21, 1908 before Hugh Gilmore, N. P. Com. exp. Jan. 21, 1911.
	·	Recorded Nov. 27, 1908 in Lycoming County in Deed
	·	Book Vol. 204, page 71.
	·	Consid. $7793.48.

Conveys all those certain tracts or pieces of land situate in Lycoming County and State of Pennsylvania, more particularly described as follows:

1. All that certain tract of unseated land, situate in the Township of McIntyre, County of Lycoming and State of Penna. surveyed in the warrantee name of James Strawbridge, being number 5,659; containing 1,098 1/2 acres more or less.

2. All that certain tract of unseated land situate in the Township of Lewis, County of Lycoming, and State of Pennsylvania, surveyed on warrant No. 5,662 in the warrantee name of James Strawbridge, containing 1,100 acres more or less.

3. All that certain tract of unseated land, situate in the Township of Lewis, County of Lycoming, and State of Penna. being part of the tract surveyed in warrantee name of James Strawbridge, being No. 5,663, bounded and described as follows, viz:

Beginning at a post; thence N. 87 1/2° W. 20 per. to a stone heap; thence N. 53° W. 23 per. to a corner, thence N. 83° W. 15 per., thence N. 69 3/4° W. 15 per.

4522

Addendum A
Conversion Site # 10

Tract ID 100 Pad T

Vol 204 Pg 69
Wt James Strawbridge
#5663
A-23-122

Map # 434
663-1
Title Brief
S-89-176

J. Henry Cochran, and Avis A. Cochran, his wife, Eugene R. Payne, unmarried, Elias Deemer, and Henrietta Deemer, his wife, and Joseph W. Cochran and Mary Cochran, his wife,

to

The Commonwealth of Penna.

: General Warranty Deed.
: Dated Nov. 6, 1908.
: Ack. Nov. 27, 1908 by Eugene R. Payne, before Elbert A. Porter, N. P. Lycoming Co. and also Ack'd. eo die by Elias Deemer and Henrietta, his wife, before same Notary in same County.
Com. exp. Jan. 15, 1909.
: Ack'd. Nov. 16, 1908 by Joseph W. Cochran and Mary, his wife, before Geo. F. Merrill, N.P. Ashland Co., Wis.
: Com. exp. Feb. 27, 1910.
: Certificate of Clerk of Courts attached.
: Ack. Nov. 12, 1908 by J. Henry Cochran, and Avis A. Cochran, his wife, before H. Leroy Beaver, N. P. Com. exp. Feb. 13, 1911. Lycoming Co.

Recorded Nov. 27, 1908 in Lycoming County, in Deed Book Vol. 204, page 69.

Consid. $3,906.48.

Conveys all that certain tract or piece of land situate, lying and being in the Townships of Lewis, McIntyre and Cogan House, in Lycoming County, and State of Pennsylvania, being composed of portions of two original warrants, viz:--

Warrant No. 5657, dated Sept. 6, 1794, granted to James Strawbridge, to whom Letters Patent were granted, and

458

Addendum A
Conversion Site # 10

ed Mar. 8, 1796, enrolled at Harrisburg, in Patent Book "P" Vol. 27, page 402, and warrant No. 5656, dated Sept. 6, 1794, granted to James Strawbridge, to whom Letters Patent were granted dated Mar. 7, 1796, enrolled at Harrisburg in Patent Book "P" Vol. 27, page 397, the said portion of the two said warrants being bounded and described as follows, viz:--

Beginning at a Fallen Hemlock corner, being the southwest corner of said Warrant No. 5656; thence N. 5 1/2° E. 367 per. to a chestnut; thence through said warrants Nos. 5656 and 5657, N. 63 1/2° E. 48 per. to a chestnut; thence S. 74° E. 144 per. to a post; thence S. 20° E. 20 per. to a post; thence S. 84 1/2° E. 112 per. to a white pine; thence N. 82° E. 81 per. to a dead pine; thence N. 70 1/2° E. 265 per. to a post; the line dividing said warrants Nos. 5657 and 5658, thence along said dividing line S. 5 1/2° W. 474 per. to a post at the corner common to said warrants Nos. 5657 and 5658, and thence along the southerly line of said warrants Nos. 5657 and 5656 N. 84 1/2° W. 645 per. to a Fallen Hemlock, at the place of beginning.

Containing 1420 acres and 86 perches.

The title to the said described tract of land having become vested in the grantors herein by virtue of the following deeds, viz:--

Deed from J. C. Hill, Trustee to Payne, Cochran and Company and Elias Deemer, dated Feb. 1, 1896, of record in the Recorder's Office of Lycoming County in Deed Book Vol. 156, page 1.

Deed from J. C. Hill, Trustee, to Payne, Cochran and Company, and Elias Deemer, dated Dec. 8, 1896 of record

459

Addendum A
Conversion Site # 10

as aforesaid in Deed Book Vol. 156, page 10.

Deed from the Elk Tanning Company to Payne, Cochran and Company, and Elias Deemer, dated Dec. 29, 1896, of record as aforesaid, in Deed Book Vol. 156, page 13.

Deed Poll from S. G. Updegraff, Treasurer of Lycoming County to J. C. Hill, Trustee, dated June 8, 1896 of record as aforesaid in Deed Book Vol. 156, page 32.

Deed from J. C. Hill, Trustee, to Payne Cochran and Company, and Elias Deemer, dated Jan. 6, 1897 of record as aforesaid in Deed Book Vol. 156, page 35.

Deed Poll from S. G. Updegraff, Treasurer of Lycoming County to J. C. Hill, Trustee, dated June 8, 1896, of record as aforesaid in Deed Book Vol. 156, page 24, and Deed from J. C. Hill, Trustee to Payne Cochran and Company, and Elias Deemer, dated Jan. 6, 1897, of record as aforesaid, in Deed Book Vol. 156, page 27.

The said J. Henry Cochran, Eugene R. Payne, and Joseph W. Cochran, parties of the first part hereto being all the members of the firm of Payne Cochran and Company.

Also all the right, title and interest of the parties of the first part, herein, of, in and to warrants Nos. 5659, 5662 and the portion of warrant No. 5663, described and conveyed in a certain deed from the parties of the first part herein to John L. Hall, dated Apr. 30, 1900, of record in Lycoming County, in Deed Book Vol. 169, page 340, which said recited deed contained certain reservations which are hereby fully released and conveyed to the party of the second part herein.

460

---oo^{v} 0·000---

Addendum A
Conversion Site # 10

EAST 320

Po. S85W 170 Po&stones

N28½E 214

Wm Afker

Po S82½E 138

Sones Tract

No3 Deed Nov6-1908 G.W.Hoover 65a46r.

Oak 63

Po S55E 68

Pine N50E 37

Po Hem. S83E 82

North 61 Pub Road Murray Packard

Ham&Stump S85E 80 Stones

N5°E 584

JAMES STRAWBRIDGE
No 5664
Wt Sept 6-1794
Sd Oct 16-1794.

No2 Deed Nov6-1908 Geo W. Hoover 915a109r.

Stones

S 85 E 320

N50¾E 4.2

S85¼E 30

S71E 19.

N81¾E 8.8

N81¾E 16

S82½E 13.7

S81½E 12

S70½E 36.

S61¼E 16

S71½E 13.8

S70½E 16.

S63E 18.

S63½E 13

S55¼E 13

S54E 12

S54¾E 10

S68¾E 15

S60½E 20

S71½E 23.

S63¾E 36

S59½E 10.

S64E 18.

S57½E 17

S64¾E 19

S 2½W 379

22 M½SW

M½RSN Rock 46

L8 M7½E N1

N5E 70 Stones 24 20.5

NSE

JAMES STRAWBRIDGE
No 5663.
Wt Sept 6th 1794
Sd Oct 16 1794.

N 5° E 373.

Deed Nov 6-1908 John L. Hall 635a79r.

No2. Deed Nov 6-1908 Geo W. Hoover 268a106r

Stones

S 85 E 300

Stones Post 20

LYCOMING Co.
See Map 8-A-17.
McINTYRE & LEWIS TWPS.

Scale 1" = 50 perch.
S.T.M.

434

Addendum A
Condition Sheet #10
434

STATE FOREST

GRAYS RUN DIVISION

1914

A.B. WELLS, FORESTER

SURVEYED 1912 BY ECKEL & MOORE

TRACED BY JOHN W. KELLER

SCALE 1 INCH = 60 RODS

Corrected to 3-10-34. D. Checked J.D.S.

5656 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 15, 1794 A111-297

5657 Jas. Strawbridge 1098 a Wt Sep 6, 1794 Sd Oct 15, 1794 A-11-298

5658 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 16, 1794 A-11-299

5659 Jas. Strawbridge 1098½ a Wt Sep 6 1794 Sd Oct 16, 1794 A111-300

5660 Jas. Strawbridge 1098½ a Wt Sep 6, 1794 Sd Oct 16, 1794 S-210

5661 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 S-215

5662 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-123

5663 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-122

5664 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-11-302

5667 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 1794 A-11-301

5668 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 16, 1794 A-23-121

5669 Jas. Strawbridge 1100 a Wt Sep 6, 1794 Sd Oct 17, 1794 A-23-125

5752 Jas. Strawbridge 408 a Wt Dec 31, 1794 Sd Nov 6, 1795 C-194-135

5785 Martin Point Robert Martin 95 a Wt Mar 29 1797 Sd May 7, 1800 138-292

Cochran Mountain

Bodine Mountain

Turntable Point

Chestnut Point

Pine Point

Hemlock Point

Penns Dale Point

Bartoff Point

House Rock

Rocky Point

Elk Ridge

Kinney Ridge

Laurel Ridge

Laurel Hill

Elisha and H.O.S. Trouble

Watson Kelly Oak Log

Josephine Allen

Luther Newman

Boundary Trail

Township Road

Gray's Run Road

New Gray's Run Road

Old Gray's Run Road

Eckel's Line

Lycoming Creek

Four Mile Run

Long Run

Warm Run Hollow

Splash Dam Hollow

Heilman Hollow

Bartoff Hollow

Bottle Hollow Run

Brown Road

Round Top Road

Lahr Ridge Road

Sugar Camp Trail

Shriver Ridge

Fagney Hollow

Birch Hollow

Cotton Hollow

Rocky Hollow

Stoney Hollow

Dry Hollow

Elbow Hollow

Pine Hollow

Mouse Hollow

Narrow Place Hollow

Porcupine Hollow

Wild Cat Hollow

Skunk Hollow

Mink Hollow

Rabbit Hollow

Grouse Hollow

Squirrel Hollow

Boundary Hollow

Weasel Hollow

Black Bill Hollow

Browns Hollow

Sugar Camp Hollow

Dead Horse Hollow

Sarah E. Runyan

John Fields

Fields Sta.

Clyde Stauble

Gray's Sta.

Pennsdale

Jno. L. Hall 1098½ a Nov 6, 1908

J.H. Cochran Nov 6 1908 1420 a

Geo. W. Hoover No 2 Nov 6, 1908 258 a

Geo. W. Hoover No 2 Nov 6, 1908 515 a

Geo. W. Hoover No 1 1100 a Nov 6, 1908

J.L. Hall Nov 6, 1908 632 a

J.L. Hall Nov 6, 1908 1109 a

M.W. Mahaffey 329 a Nov 6, 1908

Game Commission 74 a May 5, 1948 Dr. 2219

N.C.R.R.

Lycoming

Penna. R.R.

Bodine

Askinville Company

Fred E. Lehman 1864 9-21 Dr. 423

McIntyre and Lewis

Keagan House

Addendum A
Conversion Site # 10.

105 of 477

Tract ID 154

Vol 108 Pg 186

wt Wilhelm Willink # 4753 A-50-60

Map # 1145

Title Brief 180A & 180B

Copied 2/21/19

THIS DEED made this FIRST day of FEBRUARY, 1929 by and between

EMPORIUM LUMBER COMPANY, a corporation organized and existing under the laws of the Commonwealth of Pennsylvania, - - -GRANTOR

AND

THE COMMONWEALTH OF PENNSYLVANIA - - -GRANTEE.

WITNESSETH: that in consideration of the sum of SEVENTY ONE THOUSAND THREE HUNDRED SIXTY FIVE and no/100 - DOLLARS in hand paid, the receipt whereof is hereby acknowledged, the said grantor does hereby grant and convey to the said grantee:

ALL those certain pieces, parcels or tracts of land situate, lying and being in the TOWNSHIPS of WHARTON and EAST FORK DISTRICT, COUNTY of POTTER and STATE of PENNSYLVANIA, bounded and described as follows:

First: Tract of land warranted to Wilhelm Willinck and others, Number 4766, bounded as follows:

BEGINNING at a post, the northwestern corner hereof and the southwestern corner of No.4753; thence east along said Warrant No.4753 five hundred twenty-four and seven tenths (524.7) perches to a post with white paint, the northeastern corner hereof and the northwestern corner of No.4767; thence south along Warrant No.4767, three hundred twenty (320) rods to a post, the southeast corner hereof and the northeast corner of No. 4769; thence west along the northern line of No. 4769, five hundred twenty four and seven-tenths (524.7) perches to an ironwood, southwest corner of No.4766 and southeast corner of No.4765; thence north along the eastern line of No.4765, three hundred twenty (320) perches to the place of beginning.

Said Warrant was patented to Isaac Wharton and others, July 22, 1800, enrolled in Patent Book "P", Number 44, page 86.

Addendum A
Conversion Sites # 13-15

Second & Fourth: Tract of land being portions of Warrants Nos. 4767 and 4768, bounded and described according to an actual survey as follows:

BEGINNING at a post and stones on the western line of No. 4767, said post being ninety-two (92) rods south of the northwest corner of No. 4767; thence from said corner and through Warrant No. 4767 north 73° east seventy and five tenths (70.5) perches to stones; thence south 5° east one hundred five and five tenths (105.5) perches to stones; south 85° east about two hundred fifty-seven (257) perches to stones; south 29° east fifty five (55) perches to stones; south 6 ¾° east forty-three and five tenths (43.5) perches to stones; south 38¾° east forty-five (45) perches to stones in Warrant No. 4768; thence through said Warrant No. 4768, south 60¾ ° east twenty five (25) perches to stones; south 53½° east sixty-five and five tenths (65.5) perches to stones; south 11¾° east about seventy-seven (77) perches to stones on the eastern line of Warrant 4768 and being the northeast corner of the land of the Commonwealth; thence along said land of the Commonwealth west about four hundred eighty five (485) perches to stones on the west line of Warrant 4768 and east line of Warrant 4769, thence along east line of Warrant 4769 and 4766 about three hundred sixty five (365) perches to the place of beginning.

Said Warrants, No. 4767 being patented to Isaac Wharton and others July 22, 1800, enrolled in Patent Book "P", Number 44, page 87 AND No. 4768 being patented to the same July 22, 1800, enrolled in Patent Book "P", Number 44, page 85.

Third: Tract of land warranted to Wilhelm Willinck and others, Number 4769, bounded and described as follows:

Addendum A
Conversion Sites # 13-15

BEGINNING at an ironwood, the northwest corner hereof and the southwest corner of No. 4766; thence east five hundred twenty-four and seven tenths (524.7) perches to a post, being the northeast corner of Warrant 4769; thence along said east line of No. 4769, south three hundred twenty (320) perches to a post, the northeast corner of Warrant 4697; thence along the north line of No. 4697 west five hundred twenty four and seven tenths (524.7) perches to a post, the southeast corner of No. 4770; thence along east line of No. 4770 north three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and otner July 22, 1800, enrolled in Patent Book "P", Number 44, page 84.

Fifth: Tract of land warranted to Wilhelm Willinck and others No. 4770, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof and the southwest corner of Warrant 4765; thence along the south line of No. 4765 east five hundred twenty four and seven tenths (524.7) perches to an ironwood, the northwest corner of Warrant No.4769; thence along the west line of No. 4769 south three hundred twenty (320) perches to a post, the southeast corner hereof and the northeast corner of Warrant No. 4696; thence along the north line of No. 4696 west five hundred twenty four and seven tenths (524.7) perches to a post, the southeast corner of Warrant No. 4771; thence along the east line of No. 4771 North three hundred twenty (320) rods to the place of beginning.

Said Warrant being patented to Isaac Wharton and others July 27, 1800, enrolled in Patent Book, Volume "P", Number 44, page 57.

Sixth: Tract of land warranted to Wilhelm Willinck and others, Number 4754, bounded and described as follows:

Addendum A
Conversion Sites # 13-15

BEGINNING at stones, old witness, the northwestern corner hereof, being located on the south line of Warrant No.2152, now the Commonwealth; thence along said Commonwealth line east five hundred twenty-four and seven tenths (524.7) perches to a post; the northeast corner hereof on the south line of Warrant 2106 and being the northwestern corner of Warrant No. 4753; thence along the western line of No.4753 south three hundred twenty (320) perches to a post, the southeast corner hereof and the northeast corner of Warrant No. 4765; thence along the north line of Warrant No.4765 west five hundred twenty four and seven tenths (524.7) perches to a post, the southeast corner of Warrant No. 4755; thence north along the east line of No. 4755, three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and others July 22, 1800, and enrolled in Patent Book "P", Number 44, page 76.

Seventh: Being the southern half of Warrant No. 4698 granted to Wilhelm Willinok and Company, bounded and described as follows:

BEGINNING at stones on the eastern line of Warrant 4697, said stones being south one hundred sixty (160) rods from the northeast corner of said Warrant No.4697; thence from said corner east along line of the portion of said Warrant, now owned by the Commonwealth five hundred twenty-four and seven tenths (524.7) perches to stones on the eastern line of Warrant No.4698; thence by said east line of No.4698 on the west line of No. 4720, now Commonwealth of Pennsylvania, south one hundred sixty (160) perches to stones, formerly a beech, the northeast corner of Warrant No. 4699; thence along said north line of Warrant 4699 west five hundred twenty four and seven tenths (524.7) perches to a post, the southeast corner of Warrant No. 4697 and the northeast corner of No.4703 thence along said Warrant 4697 north one hundred sixty (160) perches to the place of beginning.

Addendum A
Conversion Sites # 13-15

Said Warrant being patented to Isaac Wharton and others September 3, 1800, and enrolled in Patent Book "P", Number 44, page 149.

Eighth: Tract of land warranted to Wilhelm Willinck and others, Number 4699, bounded and described as follows:

BEGINNING at a post the northwest corner hereof and the southwest corner of Warrant No.4698; thence along the south line of No.4698 east five hundred twenty four and seven tenths (524.7) perches to a beech on the western line of Warrant 4732, now the Commonwealth; thence along said western line of No.4731 and said Commonwealth south three hundred twenty (320) perches to a beech and sugar, southeastern corner hereof and northeastern corner of No.5923; thence by the north line of Warrant 5923, now the Commonwealth, west five hundred twenty four and seven tenths (524.7) perches to a sugar, the southwest corner hereof and the southeast corner of Warrant No.4703; thence north along said east line of No.4703, three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and others July 3, 1800, enrolled in Patent Book "P", Number 44, page 109.

Ninth: Tract of land warranted to Wilhelm Willinck and others, No. 4701, bounded and described as follows:

BEGINNING at a hemlock, ~~the~~ stump northwestern corner heref and the southwestern corner of No.4704; thence east alonghhe south line of No. 4704 five hundred twenty four and seven tenths (524.7) perches to a sugar, the northeast corner hereof and the northwest corner of Warrant 5917; thence south along the west line of said Warrant 5917, south three hundred twenty (320) perches to a hemlock, the northeastern corner of Warrant No.4715; thence west

Addendum A
Conversion Sites # 13-15

along the northern line of No. 4715 five hundred twenty four and seven tenths (524.7) perches to a post, the northeastern corner of No. 4724 and the southeastern corner of No. 4700; thence north along the eastern line of No. 4700 three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and others July 3, 1800, enrolled in Patent Book "P", Number 44, page 117.

Tenth: Tract of land warranted to Wilhelm Willinck and others, Number 4703, beginning at a post the northwest corner hereof and the southwest corner of No. 4697; thence along the southern line of No. 4697 east five hundred twenty four and seven tenths (524.7) perches to a post, the northeastern corner hereof and the northwestern corner of No. 4699; thence south along the western line of No. 4699 three hundred twenty (320) perches to a Sugar, the southeastern corner hereof and the northeast corner of No. 5917; thence west along the northern line of No. 5917 five hundred twenty-four and seven tenths (524.7) perches to a sugar, the southwestern corner hereof and the southeastern corner of No. 4704; thence north along the eastern line of No. 4704 three hundred twenty (320) perches to the place of beginning.

Said warrant being patented to Isaac Wharton and others July 3, 1800, enrolled in Patent Book "P", Number 44, page 131.

Eleventh: Tract of land warranted to Wilhelm Willinck and others, No. 4704.

BEGINNING at a post, Beech witness, the northwestern corner hereof and the southwestern corner of No. 4696; thence east along the southern line of No. 4696 five hundred twenty four and seven-tenths (524.7) perches to a post, the northeastern corner hereof and the northwest corner of No. 4703; thence south by

Addendum A
Conversion Sites # 13-15

western line of No. 4703 three hundred twenty (320) perches to a Sugar, the southeastern corner hereof and the northeastern corner of No. 4701; thence west along north line of No. 4701 five hundred twenty four and seven tenths (524.7) perches to a hemlock stump, the southwestern corner hereof and the southeastern corner of No. 4705; thence north along the eastern line of No. 4705 three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and others and enrolled in Patent Book "P", Number 44, page 132.

Twelfth: Warrant issued to Wilhelm Willinck and others, No. 4715 bounded and described as follows.

BEGINNING at a post, the northwestern corner hereof and the southwestern corner of No. 4701; thence east five hundred twenty-four and seven tenths (524.7) perches to an hemlock on the western line of No. 5917 and the northeastern corner of Warrant 4715; thence along the western line of No. 5917 and Warrant 5920 south three hundred twenty (320) perches to a beech, the southeastern corner hereof and the northeastern corner of No. 5908, now the Commonwealth; thence west along the northern line of No. 5908, now the Commonwealth five hundred twenty four and seven tenths (524.7) perches to a post painted blue, being the southwestern corner hereof and the southeastern corner of No. 4724, thence along the eastern line of No. 4724 north three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and others July 3, 1800, and enrolled in Patent Book, Volume "P", Number 44, page 120.

Addendum A
Conversion Sites # 13-15

Thirteenth: Tract of land warranted to Wilhelm Willinck and Company, No. 4765

BEGINNING at a post, the northwestern corner hereof and the southwestern corner of No.4754; thence along the south line of No.4754 East five hundred twenty four and seven tenths (524.7) perches to a post, being the northeast corner hereof and the northwest corner of No.4766; thence along the western line of No.4766 south three hundred twenty (320) perches to an ironwood, the southeastern corner hereof and the northeastern corner of No.4770; thence along the northern line of Warrant 4770, west five hundred twenty four and seven tenths (524.7) perches to a post, the southwestern corner hereof and the southeastern corner of No.4764; thence along the eastern line of No.4764, north three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and others July 22, 1800, enrolled in Volume "P", Number 44, page 58.

Fourteenth: Warrant No.4696 issued to Wilhelm Willinck and others, bounded and described as follows:

BEGINNING at a post, the northwestern corner hereof and the southwest corner of No.4770; thence along the south line of No.4770, east five hundred twenty four and seven tenths (524.7) perches to a post, the northeast corner hereof and the northwest corner of No.4697; thence along the western line of No.4697 south three hundred twenty (320) perches to a post, the southeast corner hereof and the northeast corner of No. 4704; thence along the north line of No.4704 west five hundred twenty four and seven tenths (524.7) perches to a post, the southwestern corner hereof and the southeastern corner of Warrant 4696, now the Commonwealth;

Addendum A
Conversion Sites # 13-15

thence along the eastern line of 4695, now the Commonwealth, north three hundred twenty (320) perches to the place of beginning.

Said warrant being patented to Isaac Wharton and others July 3, 1800, and enrolled in Patent Book, Volume "P", Number 44, page 147.

Fifteenth: Tract of land warranted to Wilhelm Willinck and Company, No.4697, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof and the southwest corner of No.4769; thence along the south line of No.4769 east five hundred twenty four and seven tenths (524.7) perches to a post, the northeast corner hereof and the northwest corner of No.4698; thence along the east line of No.4697 and the west line of No.4698, part of which is now the Commonwealth, south three hundred twenty (320) perches to a post, the southeast corner hereof and the northeast corner of Warrent 4703; thence along the north line of No.4703, west five hundred twenty-four and seven tenths (524.7) perches to a post, the southwest corner hereof and the southeast corner of No.4696; thence along the east line of No14696 north three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and others July 3, 1800, and enrolled in Patent Book, Volume "P", Number 44, page 107.

Sixteenth: Being portion of Warrant granted to Henry Drinker No.5154, being all of that Warrant situate in Potter County, bounded and described as follows:

BEGINNING at stones, formerly old ironwood corner, being the southwest corner of Warrant 5148 and the southeast corner of Ives No.4, and the northwest corner hereof; thence along the south line of Warrant No.5148 east five hundred twenty four and seven

Addendum A
Conversion Sites # 13-15

tenths (524.7) perches to a post, the northeast corner hereof and the southeast corner of No. 5148 and the northwest corner of No. 5152, thence along the western line of No. 5152 south one hundred sixty-three and four tenths (163.4) perches to a post on the County line between Potter and Clinton Counties; thence along said County line and land of the Commonwealth west five hundred twenty four and seven tenths (524.7) perches to an old pine stub, painted red, being the southwest corner hereof as located on the east line of No. 4943; thence along the east line of No. 4943 north one hundred sixty-three and four tenths (163.4) perches to the north eastern corner of said Warrant and the place of beginning.

Said Warrant No. 5154 having been patented to Henry Drinker by patent enrolled in Patent Book Volume "P", No. 31, page 283. Included also in the above description is the land patented to Nelson Clark Sept. 29, 1852, by patent enrolled in Patent Book, Volume "H", No. 49, page 191.

Seventeenth: Tract of land warranted to Nicklin and Griffith No. 5920, bounded and described as follows.

BEGINNING at a post, the northwest corner hereof and the southwest corner of Warrant 5917; thence along the south line of Warrant 5917 north 85½° east five hundred nineteen and seven tenths (519.7) perches to hemlock, the northeast corner hereof and southeast corner of No. 5917 on western line of No. 5924; thence along said western line of 5924 south three hundred thirty (330) perches to hemlock, the southeast corner hereof and north corner of Ives Warrant No. 6; thence along the north line of Ives No. 6, south 80° west five hundred twenty- five and five tenths (525.5) perches to a post on eastern line of Warrant 5908, now the Commonwealth; thence along said Commonwealth Warrant 5908 and Warrant 4715, north three hundred eighty one and nine tenths (381.9) perches to the place of beginning.

Addendum A
Conversion Sites # 13-15

Said Warrant being patented to William Brockette, enrolled in Patent Book, Volume "H", Number 49, page 133.

Eighteenth: Being a portion of Warrant granted to Nicklin and Griffith, No. 5923, bounded and described as follows.

BEGINNING at a beech, the northwest corner hereof and the southwest corner of Warrant 4699; thence along the south line of 4699 east about one hundred eighty (180) perches to stones on the northern line of No. 5923, being also the northwest corner of land of that portion of 5923 now owned by the Commonwealth; thence through said Warrant and along the line of said Commonwealth south 1½° east about two hundred twenty six (226) perches to stones and south 21° east sixty three perches to stones on the north line of Warrant 5924, thence along the north line of No. 5924 north 86¾° west about two hundred ten (210) perches to a hemlock, the southwest corner of Warrant No. 5923 and the southeast corner of 5917; thence along the east line of Warrant No. 5917 north three hundred forty (340) perches to the place of beginning.

Said Warrant being patented to John F. Cowen and enrolled in Patent Book, Volume "H", Number 51, page 210.

Nineteenth: A tract of land being a portion of Warrant granted to Nicklin and Griffith, No. 5924, bounded and described as follows:

BEGINNING at a hemlock, the northwest corner of No. 5924 and the southwest corner of No. 5923; thence along the south line of No. 5923, south 86¾° east two hundred ten (210) perches to a post, the northeast corner hereof and the northwest corner of the portion of said warrant now the Commonwealth, thence along lands of the Commonwealth south one hundred sixty (160) perches to a post; south 30° east ninety eight (98) perches to a post; south 50° west eighty (80) perches to a post and south 20° east fifty (50) perches to a post on the north line of Ives Warrant

Addendum A
Conversion Sites # 13-15

No. 7; thence along said Ives Warrant No. 7 and Ives Warrant No. 6, north 83½° west about two hundred twenty (220) rods to a hemlock, the southwest corner of Warrant No. 5924 and the southeast corner of Warrant 5920; thence along the east line of Warrant No. 5920 north three hundred thirty (330) perches to the place of beginning.

Said Warrant being patented to John F. Cowden and enrolled in Patent Book Volume "H", Number 51, page 212.

Twentieth: Being a Warrant known as Ives No. 4, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof and a corner of Ives No. 3; thence along the said Ives No. 3 east ninety-two (92) perches to a hemlock, the southwest corner of No. 5912, on the Bell's Branch of Hammersley Fork; thence along the south line of No. 5912, east five hundred thirty (530) perches to a beech, being the southeast corner of No. 5912 and the northeast corner hereof on the west line of No. 5148; thence along the west line of No. 5148 south two hundred fifty six (256) perches to the stone recognized as the old ironwood corner, being the northeast corner of Warrant No. 4943; thence along the north line of No. 4943 west six hundred twenty-two (622) perches to a chestnut, the southwest corner of Ives No. 4 and the southeast corner of Ives No. 3, thence along said east line of Ives No. 3 north two hundred fifty six (256) perches to the place of beginning.

Said warrant being issued to Timothy Ives and others and enrolled in Patent Book, Volume "H", Number 51, page 23.

Twenty-first: Being Warrant Known as Timothy Ives No. 5, bounded and described as follows:

BEGINNING at a birch, the northwestern corner hereof and the southwestern corner of Ives No. 6, thence along the south line of Ives No. 6, east five hundred forty six (546) perches to a post, the northeastern corner hereof and the western corner of Ives No. 7

Addendum A
Conversion Sites # 13-15

thence along the west line of Ives No. 7, south one hundred sixty (160) perches to a post on the north line of the William McDougal Warrant; thence along north line of said McDougal west eighty (80) perches to stones, the northwest corner of said McDougal Warrant; thence by the western line of said McDougal Warrant south 38°52' west one hundred ninety seven and six tenths (197.6) perches to stones the south-east corner of Ives No. 6; thence along the South line of Ives No. 6 west three hundred fifty (350) perches to a Black Birch on the east line of Warrant No. 5912; thence by said east line of Warrant 5912, north three hundred twenty (320) perches to the place of beginning.

Said warrant being patented to Timothy Ives and other and enrolled in Patent Book, Volume "H", Number 51, page 24.

Twenty-second: Tract of land warranted to Timothy Ives No. 6, beginning at a post, the northwest corner hereof and the southwest corner of Warrant No. 5920; thence along the south line of 5920, north 80° east five hundred twenty-five and five tenths (525.5) perches to a hemlock, the southeast corner of Warrant No. 5920 and the southwest corner of No. 5924; thence along the south line of No. 5924, south 83½° east one hundred forty (140) perches to a post, the northwestern corner of Timothy Ives No. 7; thence along said Timothy Ives No. 7, south two hundred fifty two (252) perches to a post, the southeastern corner hereof; thence along the Timothy Ives No. 7 and Timothy Ives No. 5, west six hundred fifty-eight and eighty-eight hundredths (658.88) perches to a birch, the southwest corner hereof and the northwest corner of Ives No. 5, and on the east line of Warrant No. 5908, now the Commonwealth; thence by said east line of No. 5908, north one hundred seventy eight (178) perches to the place of beginning.

Addendum A
Conversion Sites # 13-15

Said Warrant being patented to John M. Bickle and others and enrolled in Patent Book, Volume "H", Number 50, page 671.

Twenty-third: Being a portion of a tract of land warranted to Timothy Ives, No. 7, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof on the south line of No. 5924, thenceby said south line of No. 5924 south 89° 22' east about eighty (80) perches to a post on the south line of No. 5924, being the northwest corner of the portion of Ives No. 7 warrant now the Commonwealth; thence by said Commonwealth line South forty (40) perches to a post; thence south 45° east one hundred sixty-six (166) perches to a post; and south 15° east two hundred forty eight (248) perches to stones on the north line of the William McDougal Warrant; thence along the north line of said McDougal Warrant west about three hundred seventy-two (372) perches to a post, the southwest corner of Ives No. 7 and the eastern corner of Ives No. 5; thence along said Ives No. 5 Warrant north one hundred sixty (160) perches to a post on the south line of Ives No. 6 Warrant; thence along said Ives No. 6 Warrant east one hundred twelve and eighty-eight hundredths (112.88) perches to a post, the southeast corner of said Ives No. 6; thence along the east line of said Ives No. 6, north two hundred fifty-two (252) perches to the place of beginning.

Said Warrant being patented to John M. Bickle and others and enrolled in Patent Book, Volume "H", Number 50, page 672.

Twenty-fourth: Tract of land warranted to Nicklin and Griffith No. 5917, bounded and described as follows.

BEGINNING at a sugar, the northwest corner hereof and the southwest corner of No. 4703; thence along the south line of No. 4703, east five hundred twenty-four and seven tenths (524.7) perches

to a sugar, the northeast corner hereof and the northwest corner of Warrant No. 5923, thence along said Warrant No. 5923 south three hundred forty (340) perches to a hemlock, the southeastern corner hereof and the northeastern corner of No. 5920; thence along the north line of No. 5920, south 85½° west five hundred nineteen and seven-tenths (519.7) perches to a post on the east line of No. 4715; thence along the east line of No. 4715 and No. 4701 north three hundred eighty (380) perches to the place of beginning.

Said Warrant being patented to William Brockett and enrolled in Patent Book, Volume "H", Number 49, page 132.

Twenty-fifth: Tract of land warranted to Henry Drinker, No. 5148, bounded and described as follows:

BEGINNING at a maple, the northwest corner hereof; thence along the north line of Warrant No. 5148 east five hundred twenty four and seven tenths (524.7) perches to a post, the northeastern corner hereof and the northwestern corner of No. 5149, thence along the west line of No. 5149 south three hundred twenty (320) perches to a post, the southeastern corner hereof and the Nelson Clark warrants also claimed as the northeastern corner of No. 5154, thence along the north line of No. 5154 west five hundred twenty four and seven tenths (524.7) perches to stones, formerly the original iron wood corner, being the southeast corner of Ives No. 4 Warrant and the southwest corner of 5148, thence along the east line of Ives No. 4 and Warrant No. 5912, north three hundred twenty (320) perches to the place of beginning.

Said warrant being patented to Henry Drinker and enrolled in Patent Book "P", Number 31, page 285.

Twenty-sixth: Tract of land warranted to Nicklin and Griffith, No. 5912, bounded and described as follows:

BEGINNING at a post, the northwest corner hereof and the southwest corner of No. 5908, now the Commonwealth, thence along said Commonwealth line east five hundred thirty (530) perches to a Beech on the western line of Ives No. 5; thence along the western line of Ives No. 5 and Warrant No. 5148, south three hundred fifty-two (352) perches to a beech on the west line of Warrant 5148, the southeastern corner hereof and the northeastern corner of Ives No. 4 Warrant; thence along the north line of Ives No. 4 Warrant west five hundred thirty (530) perches to a hemlock on Bell's Branch; thence along Ives No. 3 Warrant and Ives No. 2 Warrant north three hundred fifty two (352) perches to the place of beginning.

Said Warrant being patented to John F. Cowen and enrolled in Patent Book, Volume "H", Number 51, page 213.

Twenty-seventh: Tract of land warranted to Wilhelm Willink and others, No. 4753.

BEGINNING at a post, the northwestern corner hereof on the southern line of Warrant No. 2106, now the Commonwealth, thence along the line of said Warrant 2106 east five hundred twenty-four and seven tenths (524.7) perches to a post and stones, the northeastern corner hereof and the northwestern corner of No. 4752; thence along the western line of No. 4752 south three hundred twenty six and one-tenth (326.1) perches to a post, the southeastern corner hereof and the northeastern corner of No. 4766; thence along the north line of No. 4766, west five hundred twenty four and seven tenths (524.7) perches to a post, the southwestern corner hereof and the southeastern corner of No. 4754; thence along the eastern line of No. 4754 North three hundred twenty (320) perches to the place of beginning.

Addendum A
Conversion Sites # 13-15

Said Warrant being patented to Isaac Wharton and others July 22, 1800, and enrolled in Patent Book, Volume "P", Number 44, page 74.

Twenty-eighth: A portion of a tract of land warranted to Wilhelm Willinck and others, No. 4714, bounded and described as follows.

BEGINNING at stones on the south line of Warrant No. 4724, being the northeast corner of John Peters' sixty two and one-fourth (62¼) acre lot, thence along the south line of No. 4724, east three hundred sixteen and one tenth (316.1) perches to a post painted blue, the northeast corner hereof and the northwest corner of No. 5908, thence along the west line of No. 5908 south three hundred twenty (320) perches to a post the northeast corner of Ives No. 2; thence along the north line of Ives No. 2, west five hundred twenty four and seven tenths (524.7) perches to a beech, the southwest corner hereof, thence north along Ives No. 1 Warrant, two hundred sixty eight (268) perches to a post, the southwestern corner of the John Peters lot, thence along the John Peters lot and through Warrant No. 4714, east two hundred one and one tenth (201.1) perches to a post; thence by same north fifty (50) perches to the place of beginning.

Said Warrant being patented to Isaac Wharton and others and enrolled in Patent Book, Volume "P", Number 44, page 118.

Twenty-ninth. Tract of land warranted to Timothy Ives, No. 2, bounded and described as follows:

BEGINNING at a beech, the northwest corner hereof and the southwest corner of No. 4714, thence along the south line of No. 4714, east five hundred twenty four and seven tenths (524.7) perches to a post on the western line of No. 5908, now the Commonwealth, thence along said Warrant No. 5908 and Warrant 5912, south three

Addendum A
Conversion Sites # 13-15

hundred twenty (320) perches to a post, the southeast corner hereof and the northeast corner of Ives No. 3 Warrant, thence along the north line of Ives No. 3 Warrant, west five hundred twenty-four and seven tenths (524.7) perches to a Maple, the Southwest corner hereof and southeast corner of Warrant No. 4918, now the Commonwealth, thence along said Commonwealth line North three hundred twenty (320) perches to the place of beginning.

Said Warrant being patented to John M. Bickle and others and enrolled in Volume "H", Number 51, page 21.

Thirtieth: Tract of land warranted to Timothy Ives, No. 3, bounded and described as follows.

BEGINNING at a Maple, the northwest corner hereof the southeast corner of Warrant 4918 and the southwest corner of Ives No. 2 Warrant; thence East along the south line of Ives No. 2 Warrant, five hundred twenty four and seven tenths (524.7) perches to a post on the western line of No. 5912, thence along said Warrant No. 5912 south sixty nine (69) perches to a hemlock on the north line of Ives No. 4 Warrant; thence along the north line of Ives No. 4 Warrant west ninety two (92) perches to a post, the northwest corner of Ives No. 4 Warrant; thence along the western line of Ives No. 4 Warrant south two hundred fifty-six (256) perches to a Chestnut, being the southeast corner hereof and on the north line of Warrant No. 4942; thence along the north line of No. 4942, west four hundred thirty-two and seven tenths (432.7) perches to a post, the southwestern corner hereof and the southeastern corner of Warrant No. 4919, now Commonwealth, thence along said Commonwealth line North three hundred twenty (320) perches to the place of beginning.

1285-B-574 - 8435

Addendum A
Conversion Sites # 13-15

Said Warrant having been patented to Timothy Ives and others and enrolled in Patent Book, Volumbe "H", Number 51, page 22.

SAVING and EXCEPTING from the FIFTH, SIXTH, THIRTEENTH and FOURTEENTH Items, herein described the following.

"A" A tract of eighty-nine (89) acres ninety six (96) perches claimed by H. B. Walker, bounded and described as follows:

Beginning at a point in the center of the B. & S. Railroad; thence south 70½° west nine (9) perches to a point on the right of way to the said Railroad; thence south 49° west twenty-one (21) perches to a point; thence north 23° west forty eight and five tenths (48.5) perches to a Beech; thence north 67½° east twenty-eight and five tenths (28.5) perches to a Beech stump; thence South 42½° east ten and two tenths (10.2) perches to a point in the public road; thence along public road North 67° east sixteen and one tenth(16.1) perches to a point; thence north 2° west fifty-seven and four tenths (57.4) perches; thence east twenty-three and five tenths (23.5) perches to a post; thence north 2° west sixty-seven and seven tenths (67.7) perches to a Beech witness, thence north 67¾° east, crossing Wild Boy Run, thirty one and four tenths (31.4) perches to a Lynn Stump by the public road to Prouty; thence south 22½° east forty-eight (48) perches to a point in said road, thence south 34° east twenty four (24) perches to a post; south 49½° east twenty and one tenth (20.1) perches to a post; north 52¼° east fourteen and three tenths (14.3) perches to an iron pin; thence south 49½° east, crossing Cherry Springs Road, forty-three (43) perches to the right of way of said B. & S. Railroad, thence southward along the right of way of said B. & S. Railroad, by its

Addendum A
Conversion Sites # 13-15

various courses and distances, to the place of beginning. It being the intention to except and reserve all lands conveyed to J. S. Hull by deeds recorded in Deed Book Vol. "S" at pages 89 and 89, Records of Potter County.

"B" Tract of land consisting of one hundred ninety-three (193) acres thirty-two (32) perches, owned or claimed by Minerva McFall, bounded and described as follows:

Beginning at a post, the north corner hereof; thence crossing the B.& S. Railroad and the public road south 50° east one hundred seventeen (117) perches to a post; thence south 24 1/4° west, crossing said Railroad, two hundred seventy-six (276) perches to a post on the right of way of said Railroad; thence north 50° west one hundred sixteen and one-tenth (116.1) perches to a post; thence North 24 1/4° east crossing Stony Run two hundred seventy-six (276) perches to the place of beginning.

"C" Tract of land owned or claimed by Indra Williams, containing one hundred fifteen (115) acres, bounded and described as follows:

Beginning at an old post near the public road; thence crossing the public road and B.& S. Railroad south 50° east one hundred fifty-six and four tenths (156.4) perches to an old post corner; thence south 33° 42' west one hundred sixteen and two-tenths (116.2) perches to a post; thence north 51°50' west, crossing B. & S. Railroad and the public road, one hundred sixty-two and seven-tenths (162.7) perches to small oak; thence north 36 1/2° east one hundred twenty and one tenth (120.1) perches to the place of beginning.

"D" Tract of land owned or claimed by Reuben Ward, containing

Addendum A
Conversion Sites # 13-15

thirty (30) acres, bounded and described as follows:

Beginning at a point on the right of way of the B. & S. Railroad; thence north 51°50' west forty-six (46) perches to a point and south 33°55' west twenty (20) perches to a point in the highway; thence south 23 1/4° west seventeen and six tenths (17.6) perches to a point; thence south 19 1/2° west nine and eight tenths (9.8) perches to a point in the Run; south 23°5' west nine and eight-tenths (9.8) perches to a point in the Run; south 27° 25' west thirteen and seven tenths (13.7) perches to a point; south 23° 20' west fifteen and three tenths (15.3) perches; south 33° west fifteen and six tenths (15.6) perches; south 45° east, crossing the Run, forty and three tenths (40.3) perches to a point on the right of way of the B. & S. Railroad; thence Northward along said right of way, by its various courses and distances, to the place of beginning.

"E" Tract of land owned or claimed by Jane Williams, containing forty seven (47) acres sixty-four (64) perches, bounded and described as follows:

Beginning at a point near the Run; thence following said Run the following ten (10) courses and distances; north 83 3/4°, east twenty eight (28); north 50° east one hundred four and seven-tenths (104.7); north 31° west sixteen (16); north 38° east five and eight tenths (5.8); south 83°20' east seven and nine-tenths (7.9); north 58°20' east three and one-tenth (3.1); north 4°20' east four and five tenths (4.5); north 28 3/4° west nine and two tenths (9.2); north 8 1/2° west three and thee tenths (3.3); to R. Ward's line; thence along Reuben Ward's line north 45° west thirty-eight and four tenths (38.4) perches to stones; thence south 48°23' west one hundred thirty seven (137) perches to an apple tree; thence

Addendum A
Conversion Sites # 13-15

South 12°30' east twenty five and one tenth (25.1) perches to a point in the public road; thence south 32 3/4° east fifteen and three tenths (15.3) perches to the place of beginning.

Making a total of four hundred seventy five (475) acres thirty two (32) perches as the area so excepted and reserved.

"F" SAVING and EXCEPTING from the SIXTEENTH Warrant herein described ONE acre of land heretofore conveyed by U. B. Russell and wife to Ora L. Nichols, excepted and reserved in a certain deed from U. B. Russell and wife to Emporium Lumber Company, dated January 20, 1908, recorded in Deed Book Vol. 66 at page 166, Records of Potter County.

"G" EXCEPTING and RESERVING out of Tracts, Numbers "5" (Warrant 4770), "13" (Warrant 4765), "14" (Warrant 4696) and "27" (Warrant 4753) thirty six acres and twenty perches (36 acres, 20 perches) for right of way of the Buffalo and Susquehanna Railroad as located by the survey.

The grantor herein, however, conveys by this Indenture all its right, title and interest in, to and upon the four tracts cited in this Indenture as tracts "Fifth", "Thirteenth", "Fourteenth" and "Twenty-seventh."

"H" EXCEPTING and RESERVING the oil and gas under all of the lands herein conveyed with the right to drill, bore and prospect for the same; and if found to produce, store and transport the same for and during the term of TWENTY YEARS (20), and if at the expiration of that time oil and/or gas is produced in paying quantities a further term of 20 years is excepted herefrom; TOGETHER with the use of any part of the surface in the operation, development, production

Addendum A
Conversion Sites # 13-15

and transportation of any oil and/or gas therein found according to such rules and regulations as may be, from time to time, adopted by the Secretary of Forest & Waters, but such rules shall at all times be reasonable rules and in harmony with the usual methods of operating and producing oil and/or gas in the Bradford Field.

THE ABOVE TRACTS hereby conveyed CONTAIN Twenty-five Thousand Nine Hundred and Fifty Acres and One Hundred ~~Twenty-six-thousand-four-hundred-sixty-two-acres-and-thirty-eight~~ and Forty-six Perches ~~square-perches~~ (25,950 acres 146 ~~perches~~).

The lands hereby conveyed being the same land conveyed to the grantor; by the Central Pennsylvania Lumber by deeds dated August 1, 1910 and August 1, 1919, recorded in Potter County in Deed Book Vol. 70 at pages 353 and 354 respectively; by the Goodyear Lumber Company by deed dated August 31, 1912, recorded in Potter County in Deed Book Vol. 80 at page 5; by the Norwich Lumber Company by deed dated September 1, 1917, recorded in Potter County in Deed Book Vol. 86 at page 447; by U. B. Russell and wife by deed dated January 20, 1908, recorded in Potter County in Deed Book Vol. 66 at page 166.

The EMPORIUM LUMBER COMPANY doth hereby constitute and appoint - -E. J. JONES- - , to be its attorney for it and in its name and as and for its corporate act and deed to acknowledge this DEED before any person having authority by the laws of the Commonwealth of Pennsylvania to take such acknowledgment, to the intent that the same may be duly recorded.

This deed is made, executed, acknowledged and delivered in pursuance of lawful authority delegated to the officers

Addendum A
Conversion Sites # 13-15

of the grantor executing the same, by proper, lawful and adequate action of the stockholders and directors of the said grantor corporation duly and regularly taken according to law.

AND the said Grantor does hereby warrant GENERALLY the property hereby conveyed.

IN WITNESS WHEREOF the said EMPORIUM LUMBER COMPANY has caused these presents to be executed by its and Secretary, and the corporate seal to be affixed hereto the day and year first above written.

EMPORIUM LUMBER COMPANY

By E J Jones
Its Vice President

ATTEST: W Clyde Sykes
Its Secretary

STATE OF PENNSYLVANIA)
: SS:
COUNTY OF MC KEAN)

I hereby certify that on this 6" day of February, 1929, before me the subscriber a Notary Public in and for said State and County, personally appeared E. J. JONES, the attorney named in the foregoing Deed, and by virtue and in pursuance of the authority therein conferred upon him, acknowledged the said Deed to be the act of the said Emporium Lumber Company.

WITNESS my hand and Notarial Seal, the day and year aforesaid.

Ada P. Duffee
Notary Public

My commission expires Jan 20 1930

Addendum A
Conversion Sites # 13-15

STATE OF PENNSYLVANIA)
SS:
COUNTY OF POTTER)

Recorded on this 23d day of February A.D. 1929, in the Recorder's Office of said County, in DEED BOOK 108, Page 186.

GIVEN under my hand and seal of the said office, the date above written.

Frederick W Clark Recorder

1145

EMPORIUM LUMBER CO.
PURCHASE

EAST FORK TWP., POTTER CO.

SCALE 1" = 100 RDS.

Surveyed by T.O.B. Nov. 1928 — Drawn by T.O.B. & R.C.V. Nov. 13, 1928

Under direction of T.O. Bietsch

Deed dated- 1-1-29
Recorded — 2-23-29
V-108 P-186
Acreage — 25950a 146p
Date Cert. 2-23-29

GAME REFUGE

No. 4754 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 10, 1794 — A-58-62

No. 4753 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 10, 1794 — A-58-60

No. 4765 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July, 15, 1794 — A-58-68

No. 4766 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 15, 1794 — T-83

No. 4767 — Wilh'elm Willink — 990a — Wt Jan. 29, 1794 — Sd July 15, 1794

342a

No. 4770 — Wilhelm Willink — 990a — Wt Jan 29, 1794 — Sd July 24, 1794 — A-12-257

No. 4769 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 16, 1794 — A-58-75

No. 4768 — Wilhelm Willink — 990a — West 475.5 (485) — Wt Jan 29, 1794 — Sd June 16, 1794 — A-58-69

No. 4696 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 24, 1794 — A-58-43

No. 4697 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 24, 1794 — A-58-44

No. 4698 — Wilhelm Willink — 990a — Wt Jan 29, 1794 — Sd July 24, 1792 — A-58-46

No. 4704 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 24, 1794 — A-12-258

No. 4703 — Wilhelm Willink — 990a — Wt Jan. 27, 1794 — Sd July 23, 1794 — A-58-53

No. 4699 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 23, 1794 — A-58-45

No. 4701 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 22, 1794 — A-58-54

No. 5917 — Nicklin & Griffith — 1097a 68p — Wt Mar. 19, 1805 — Sd Sep. 2, 1805 — A-19-95

No. 5923 — Nicklin & Griffith — 1098¼ as — Wt Mar. 19 1805 — Sd Sep. 4 1805 — A-19-101

No. 4715 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd July 23, 1794 — A-58-55

No. 5920 — Nicklin & Griffith — 1084¾a — Wt Mar. 19, 1805 — Sd July 30, 1805 — U-293

No. 5924 — Nicklin & Griffith — 1082¾ as — Wt Mar. 19 1805 — Sd Sep. 4 1805 — A-20-1

No. 4714 — Wilhelm Willink — 990a — Wt Jan. 29, 1794 — Sd Jul. 23, 1794 — Z-2-51

No. 5908 — Nicklin & Griffith — 1100a — Wt Mar. 19, 1805 — Sd Sep. 2, 1805 — A-19-96

Ives No. 6 — 899a 48p — Wt June 20, 1851 — Sd Oct. 28, 1851 — A-64-61

Ives No. 7 — 900a — Wt June 20, 1851 — Sd Oct. 29, 1851 — A-64-63

Ives No. 2 — 990a — Wt June 20, 1851 — Sd Oct. 29, 1851 — A-64-72

No. 5912 — Nicklin & Griffith — 1100a — Wt Mar. 19, 1805 — Sd Sep. 2, 1805 — A-19-89

Ives No. 5 — 900a — Wt June 20, 1851 — Sd Oct. 28, 1851 — A-64-64

Wm McDougal — Wt Oct. 22, 1849.

Ives No. 3 — 851a 21p — Wt. June 20, 1851 — Sd Oct. 29, 1851 — A-64-73

Ives No. 4 — 938a 139p — Wt June 20, 1851 — Sd Oct. 2, 1851 — A-64-62

No. 5148 — Henry Drinker — 990a — Wt Feb. 6, 1794 — Sd July 8, 1794 — R-152

No. 5149 — Henry Drinker — 990a — Wt Feb. 6, 1794 — Sd July 7, 1794 — S-257

No. 4942

No. 4943

Nelson Clark — 131.2a — Wt Nov. 22, 1851 — Sd June 1, 1852

No. 5154

No. 5152 — Henry Drinker — 990a — Wt Feb 6, 1794 — Sd July 8, 1794

"A" — H.B. Walker — 89.6 As

"B" — Minerva McFall — 193.2 as

"C" — Indra Williams — 115 As

"D" — Reuben Ward — 30 as

"E" — Jane Williams — 47.4 As

STATE FORESTS

POTTER COUNTY
CLINTON COUNTY

Survey Book

Tract ID - 997
Vol 196 Pg 1062
wt Wilhelm Willink
#4752 A-58-61
Map # 2370

VOL. 196 PAGE 1062

RECORDED 9 July 1975
Harry C. Palmatier RECORDER

THIS INDENTURE

Made the 22nd day of MAY, in the year of Our Lord One Thousand Nine Hundred and Seventy Five (A. D. 1975).

BETWEEN: MASONITE CORPORATION, a Delaware Corporation, authorized to do business in the Commonwealth of Pennsylvania, having its principal office of business at 29 North Wacker Drive, Chicago, Illinois, hereinafter referred to as the Grantor

A

N

D

COMMONWEALTH OF PENNSYLVANIA, by and through the Department of Environmental Resources, hereinafter referred to as the Grantee.

WITNESSETH, that the said Grantor for and in consideration of the sum of One Dollar ($1.00) lawful money of the United States of America, and other good and valuable consideration, the receipt of which is hereby acknowledged, has granted, bargained, sold, aliened, enfeoffed, released and confirmed, and by these presents does grant, bargain, sell, alien, enfeoff, release and confirm unto the said Grantee and its assigns the following seven (7) tracts of land;

Parcel "A"

ALL that certain tract of land situate in the Township of Eulalia, County of Potter, Commonwealth of Pennsylvania, and being more particularly bounded and described as follows:

> BEGINNING at a stones corner, said corner being common to the Wilhelm Willinck Warrants #4753, #4752, #4694, and Thomas Willing Warrant #2106, said corner being common to lands of the Commonwealth and lands herein described; thence by a line common to the Wilhelm Willinck Warrant #4694 and the Wilhelm Willinck Warrant #4752 by lands of the Commonwealth of Pennsylvania and lands herein described South 82 degrees 47 minutes East 342.06 rods to a stones corner, said corner being common to warrants and lands last mentioned; thence through the Wilhelm Willinck Warrant #4752 by lands last mentioned the following three (3) courses and distances: (1) South 6 degrees 11 minutes West 161.74 rods to a stones corner; (2) South 81 degrees 59 minutes East 99.71 rods to a stones corner; (3) North 8 degrees 04 minutes East 163.28 rods to a stones corner; said corner being common to warrant and land last mentioned

BOOK 85 PAGE 254

Addendum A
Conversion Site # 16

and also common to the Wilhelm Willinch Warrant #4694; thence by a line common the the Wilhelm Willinck Warrants #4694 and #4752, also common to lands last mentioned South 76 degrees 51 minutes East 25.18 rods to a stones corner; said corner being common to warrants last mentioned and the Wilhelm Willinck Warrants #4682 and #4689, also being common to lands last mentioned and lands of others; thence along a line common to the Wilhelm Willinck Warrant #4689 and #4752, by lands herein described and lands of others South 7 degrees 40 minutes West 161.91 rods to a pine stump, said corner being common to lands and warrants last mentioned; thence by warrants last mentioned and by lands herein described and other lands of the Commonwealth South 6 degrees 49 minutes West 160.82 rods to a stones corner, said corner being common to lands and warrants last mentioned and the Wilhelm Willinch Warrants #4708 and #4767; thence along a line common the the Wilhelm Willinck Warrant #4752 and #4767 by lands last mentioned North 83 degrees 09 minutes West 309.69 rods to a stones corner; said corner being common to warrants and lands last mentioned and lands of others; thence by a line common to warrants last mentioned also common to lands herein described and lands of others North 83 degrees 18 minutes West 75.40 rods to a stones corner; said corner being common to warrants and lands last mentioned; thence along a line through the Wilhelm Willinck Warrant #4752 by lands of the Commonwealth of Pennsylvania and lands herein described the following two (2) courses and distances: (1). North 9 degrees 10 minutes East 158.54 rods to a stones corner; (2). North 82 degrees 44 minutes West 95.07 rods to a stones corner, said corner being common to the Wilhelm Willinck Warrants #4752 and #4753, and also common to lands last mentioned; thence by warrants and lands last mentioned North 8 degrees 59 minutes East 170.48 rods to the place of beginning.

CONTAINING 775 Acres 65 perches of land, more or less.

Parcel "B"

ALL that certain tract of land situate in the Township of Shippen, County of Cameron, Commonwealth of Pennsylvania, and being more particularly bounded and described as follows:

BEGINNING at a stones corner, said corner being common to the Wilhelm Willinck Warrants #4994 and #4995, also common to lands of the Commonwealth of Pennsylvania, lands of the Pennsylvania Game Commission and lands herein described and also lying on the Elk-Cameron County line; thence along warrants last mentioned by lands herein described and lands of the Pennsylvania Game Commission North 6 degrees 57 minutes East 193.29 rods to a stake corner being common to lands and warrants last mentioned and also common to the Wilhelm Willinck Warrant #4988;

I hereby certify that the transfer tax of $ 47.00 in the Shippen School District has been paid. Mary C. Palmatier, Recorder

I hereby certify that the transfer tax of $ 47.00 in the Shippen School District has been paid. Mary C. Palmatier, Recorder

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF REVENUE REALTY TRANSFER TAX JUL - 9'75 228.50 83 10172 0 0 4 2 8 0

BOOK 85 PAGE 255

Addendum A
Conversion Site # 16

thence along a line common to the Wilhelm Willinck Warrants #4988 and #4995 by lands last mentioned South 82 degrees 57 minutes East 533.82 rods to a stone corner; said corner being common to lands and warrants last mentioned and the Wilhelm Willinck Warrants #4987 and #4996; thence along a line common to the Wilhelm Willinck Warrants #4987 and #4988, by lands last mentioned North 7 degrees 13 minutes East 165.71 rods to a stones corner, said corner being common to warrants and lands last mentioned and also common to lands of Harry C. Stackpole; thence through the Wilhelm Willinck Warrant #4987 by lands herein described and lands of Harry C. Stackpole South 84 degrees 33 minutes East 326.51 rods to a stones corner, said corner being common to lands last mentioned and lands of the Pennsylvania Game Commission; thence continuing through the Wilhelm Willinck Warrant #4987 by lands herein described and lands of the Pennsylvania Game Commission the following two (2) courses and distances: (1) South 85 degrees 08 minutes East 124.46 rods to a stones corner; (2) North 5 degrees 15 minutes East 144.22 rods to a stone corner, said corner being common to the Wilhelm Willinck Warrants #4980 and #4987, also common to lands herein described and lands of the Pennsylvania Game Commission; thence along a line common to warrants and lands last mentioned South 81 degrees 34 minutes East 116.76 rods to a stones corner; said corner being common to lands and warrants last mentioned and also the Wilhelm Willinck Warrant #4981 and #4986; thence along a line common to the Wilhelm Willinck Warrants #4981 and #4986 by lands herein described and lands of the Pennsylvania Game Commission the following two (2) courses and distances: (1) South 81 degrees 53 minutes East 218.12 rods to a stones corner; (2) South 82 degrees 49 minutes East 77.00 rods to a stones corner; said corner being common to warrants and lands last mentioned; thence through the Wilhelm Willinck Warrant #4986 by lands last mentioned South 7 degrees 30 minutes West 110.43 rods to a stones corner, said corner being common to lands last mentioned and lands of the Fletcher Coleman Estate; thence continuing through the Wilhelm Willinck Warrant #4986 by lands herein described and lands of the Fletcher Coleman Estate the following two (2) courses and distances: (1) North 82 degrees 53 minutes West 78.13 rods to a stones corner; (2) North 82 degrees 22 minutes West 216.73 rods to a stones corner, said corner being common to the Wilhelm Willinck Warrants #4986 and #4987 and also being common to lands last mentioned; thence by a line common to the warrants and lands last mentioned and partially by lands of J. C. Skillman South 6 degrees 35 minutes West 220.21 rods to a stones corner; said corner being common to warrants last mentioned and the Wilhelm Willinck Warrants #4996 and #4997, and also common to lands herein described and lands of J. C. Skillman; thence along a line common to the Wilhelm Willinck Warrants #4986 and #4997, also common to lands herein described and lands of J. C. Skillman and the Fletcher Coleman Estate, South 82 degrees 40 minutes East 527.99 rods to a stones corner, said corner being

common to the warrants last mentioned and the Wilhelm Willinck Warrant #5981, also common to lands last mentioned and lands of Hammermill Paper Company; thence along a line common to the Wilhelm Willinch Warrants #4997 and #5981, by lands herein described and lands of Hammermill Paper Company South 7 degrees 42 minutes West 181.94 rods to a stones corner, said corner being common to warrants and lands last mentioned and also common to the Philip Nicklin and Robert Griffith Warrant and lands of the Commonwealth of Pennsylvania, said corner also lying on the Elk-Cameron County line; thence by a line through the Wilhelm Willinck Warrant #4997 by lands herein described and lands of the Commonwealth of Pennsylvania the following two (2) courses and distances: (1) North 82 degrees 02 minutes West 233.03 rods to a stones corner; (2) North 83 degrees 11 minutes West 310.70 rods to a stones corner; said corner being common to the Wilhelm Willinck Warrant #4996 and #4997 and also common to lands last mentioned; thence through the Wilhelm Willinck Warrant #4996 by lands last mentioned the following two (2) courses and distances: (1) North 82 degrees 55 minutes West 304.48 rods to a stones corner; (2) North 83 degrees 00 minutes West 239.73 rods to a stones corner; said corner being common to the Wilhelm Willinck Warrant #4996 and #4995, and also common to lands last mentioned; thence through the Wilhelm Willinck Warrant #4995 by lands herein described and lands of the Commonwealth of Pennsylvania North 82 degrees 13 minutes West 531.44 rods to the place of beginning.

CONTAINING 2,860.829 Acres of land, more or less.

BEING a portion of those same lands in a deed of conveyance from Westvaco Corporation to Masonite Corporation dated May 22, 1970 and recorded in Cameron County in Deed Book Volume 75, Page 393.

PARCEL "C"

ALL that certain tract of land situate in the Township of Portage and Wharton, County of Potter, Commonwealth of Pennsylvania and being more particularly bounded and described as follows:

BEGINNING at a stones corner, said corner being common to the Wilhelm Willinck Warrants #4934 and #4935 and the George Meade Warrant #5431 and also common to lands herein described, lands of General Refractories and lands of the Commonwealth of Pennsylvania, said corner also lying on the Potter-Cameron County line; thence through the George Meade Warrants #5431 and #5432 by lands of General Refractories and lands herein described and along the Potter-Cameron County line North 31 degrees 10 minutes West 426.87 rods to an iron pin corner; said corner lying within the George Meade Warrant #5432 and being common to lands last mentioned and

lands of the Commonwealth of Pennsylvania, said corner also lying on the Potter-Cameron County line; thence along a line through the George Meade Warrant #5432 by lands herein described and lands of the Commonwealth of Pennsylvania South 80 degrees 57 minutes East 269.96 rods to a stones corner; said corner being common to the George Meade Warrant #5432 and the Wilhelm Willinck Warrant #4933, also common to lands last mentioned; thence along a line common to warrants and lands last mentioned and partially common to the Wilhelm Willinck Warrant #4934 South 8 degrees 03 minutes West 325.99 rods to the place of beginning.

CONTAINING 274 Acres 158 perches of land, more or less.

PARCEL "D"

ALL that certain tract of land situate in the Township of Abbott, County of Potter, Commonwealth of Pennsylvania, and being more particularly bounded and described as follows:

BEGINNING at a stones corner, said corner being common to the Wilhelm Willinck Warrant #4717 and #4722; said corner also common to lands herein described and lands of the Commonwealth of Pennsylvania; thence through the Wilhelm Willinck Warrant #4717 by lands herein described and lands of the Commonwealth of Pennsylvania the following three (3) courses and distances: (1) North 8 degrees 10 minutes East 164.42 rods to a stones corner; (2) South 81 degrees 24 minutes East 152.48 rods to a post corner; (3) North 8 degrees 12 minutes East 159.52 rods to a stones corner; said corner being common to warrants and lands last mentioned and also common to the Wilhelm Willinck Warrant #4710; thence along a line common to the Wilhelm Willinck Warrant #4710 and #4717 by lands last mentioned South 81 degrees 05 minutes East 174.81 rods to a stones corner; said corner being common to warrants last mentioned and the Wilhelm Willinck Warrant #4711, also common to lands last mentioned and lands claimed by Patterson Lumber Company; thence along a line common to the Wilhelm Willinck Warrant #4716 and #4717 also common to lands herein described and lands claimed by Patterson Lumber Company, South 8 degrees 39 minutes West 164.60 rods to a stones corner; said corner being common to warrants and lands last mentioned and lands of the Commonwealth of Pennsylvania; thence by warrants last mentioned, also common to lands herein described and lands of the Commonwealth of Pennsylvania South 8 degrees 21 minutes West 157.83 rods to a stones corner; said corner being common to warrants and lands last mentioned and also common to the Wilhelm Willinck Warrant #4722 and #4723; thence by a line common to the Wilhelm Willinch Warrant #4717 and #4722, also common to lands herein described and lands of the Commonwealth of Pennsylvania North 81 degrees 48 minutes West 325.07 rods to the place of beginning.

CONTAINING 506 Acres 124 perches of land, more or less.

Addendum A
Conversion Site # 16

PARCEL "E"

ALL that certain tract of land situate in the Township of East Fork, County of Potter, Commonwealth of Pennsylvania, and being more particularly bounded and described as follows:

BEGINNING at a stones corner, said corner being common to the Henry Drinker Warrant #5148, #5149, #5152, and the Nelson Clark Warrant; said corner also being common to lands herein described and lands of the Commonwealth of Pennsylvania; thence along a line common to the Henry Drinker Warrant #5149 and #5152 by lands herein described and lands of the Commonwealth of Pennsylvania South 82 degrees 30 minutes East 196.33 rods to a stones corner; said corner being common to warrants and lands last mentioned; thence through the Henry Drinker Warrant #5152 by lands last mentioned the following two (2) courses and distances: (1) South 7 degrees 30 minutes West 26.33 rods to a stones corner; (2) North 82 degrees 30 minutes West 196.33 rods to a stones corner; said corner being common to warrants and lands last mentioned and the Nelson Clark Warrant; thence along a line common to the Nelson Clark Warrant and the Henry Drinker Warrant #5152 by lands herein described North 7 degrees 30 minutes East 26.33 rods to the place of beginning.

CONTAINING 32.25 Acres of land, more or less.

PARCEL "F"

ALL that certain tract of land situate in the Township of East Fork, County of Potter, Commonwealth of Pennsylvania, and being more particularly bounded and described as follows:

BEGINNING at a stones corner, said corner being common to the Timothy Ives Warrant #3 and #4 and the Wilhelm Willinck Warrant #4942 and #4943, said corner also being common to lands herein described and lands of the Commonwealth of Pennsylvania; thence along a line common to the Timothy Ives Warrant #4 and the Wilhelm Willinck Warrant #4943 South 82 degrees 30 minutes East 524.70 rods to a stones corner, said corner being common to warrants and lands last mentioned and the Nelson Clark Warrant; thence along a line common to the Wilhelm Willinck Warrant #4943 and the Nelson Clark Warrant by lands last mentioned South 8 degrees 20 minutes West 164.06 rods to a stones corner, said corner being common to warrants last mentioned and the William Perry Warrant #21, also common to lands last mentioned and lying on the Potter-Clinton County line; thence through the Wilhelm Willinck Warrant #4943 by lands last mentioned and along the Potter-Clinton County line North 82 degrees 09 minutes West 522.30 rods to a stones corner, said corner being common to warrants and lands last

Addendum A
Conversion Site # 16

mentioned and also common to the Wilhelm Willinck Warrant #4942 and on the Potter-Clinton County line; thence along a line common to the Wilhelm Willinck Warrant #4942 and #4943 by lands last mentioned North 7 degrees 30 minutes East 160.80 rods to the place of beginning.

CONTAINING 531.42 Acres of land, more or less.

PARCEL "G"

ALL that certain tract of land situate in the Township of Wharton, County of Potter, Commonwealth of Pennsylvania and being more particularly bounded and described as follows:

BEGINNING at a post corner, said corner being common to the John Barron Jr. Warrant #4623, the Seneca Freeman Warrant, and the George Warner Warrant, said corner also being common to lands of the Commonwealth of Pennsylvania and lands herein described; thence along a line common to the John Barron Jr. Warrant #4623 and the George Warner Warrant, also common to lands last mentioned South 83 degrees 00 minutes [illegible] rods to a post corner, said corner being

SUBJECT NEVERTHELESS to all easements and right of ways affecting the aforedescribed premises which are properly recorded.

EXCEPTING AND RESERVING from this conveyance all oil, gas and minerals.

TOGETHER with all and singular the tenements, hereditaments and appurtenances to the same belonging, or in anywise appertaining and the reversion and reversions, remainder and remainders, rents, issues and profits thereof; AND ALSO all the estate, right, title interest, property claim and demand whatsoever, both in law and equity of the said Grantor, of, in to or out of the said premises and every part and parcel thereof.

TO HAVE AND TO HOLD the said premises, with all and singular the appurtenances unto the said Grantee and its assigns, to and for the only proper use and behoof of the said Grantee and its assigns forever.

AND the said Grantor, for itself, its successors and assigns does by these presents covenant grant and agree to and with the said Grantee and its assigns that it the said Grantor its successors and assigns all and singular the hereditaments and premises hereinabove described and granted or mentioned and intended so to be, with the appurtenances unto the said Grantee, and its assigns, against it the said Grantor and its successors and assigns, and against all and every other person or persons whomsoever,

mentioned and also common to the Wilhelm Willinck Warrant #4942 and on the Potter-Clinton County line; thence along a line common to the Wilhelm Willinck Warrant #4942 and #4943 by lands last mentioned North 7 degrees 30 minutes East 160.80 rods to the place of beginning.

CONTAINING 531.42 Acres of land, more or less.

PARCEL "G"

ALL that certain tract of land situate in the Township of Wharton, County of Potter, Commonwealth of Pennsylvania and being more particularly bounded and described as follows:

BEGINNING at a post corner, said corner being common to the John Barron Jr. Warrant #4623, the Seneca Freeman Warrant, and the George Warner Warrant, said corner also being common to lands of the Commonwealth of Pennsylvania and lands herein described; thence along a line common to the John Barron Jr. Warrant #4623 and the George Warner Warrant, also common to lands last mentioned South 83 degrees 00 minutes East 237.00 rods to a post corner, said corner being common to warrants and lands last mentioned and also common to the Wilhelm Willinck Warrant #4932; thence along a line common to the George Warner Warrant and the Wilhelm Willinck Warrant #4932, also common to the lands last mentioned South 7 degrees 00 minutes West 68.00 rods to a post corner; said corner being common to warrants and lands last mentioned and the George Meade Warrant #5433; thence along a line common to the George Warner Warrant and the George Meade Warrant #5433 North 83 degrees 00 minutes West 237.00 rods to a post corner, said corner being common to warrants and lands last mentioned and the Seneca Freeman Warrant; thence along a line common to the Seneca Freeman Warrant and the George Warner Warrant North 7 degrees 00 minutes East 68.00 rods to the place of beginning.

CONTAINING 100 Acres 116 perches of land, more or less.

PARCEL "A", "C", "D", "E", "F", and "G" being a portion of those same lands in a deed of conveyance from Westvaco Corporation to Masonite Corporation dated May 22, 1970 and recorded in Potter County in Deed Book Volume 183, Page 975.

The description contained hereinbefore of the land conveyed by the within indenture is based upon surveys under the direction of H. F. Hartman, Registered Surveyor #10800-E, in 1974 and 1975, and a print of the plots made as a result of said survey is attached hereto and made a part of this indenture.

Addendum A
Conversion Site # 16

SUBJECT NEVERTHELESS to all easements and right of ways affecting the aforedescribed premises which are properly recorded.

EXCEPTING AND RESERVING from this conveyance all oil, gas and minerals.

TOGETHER with all and singular the tenements, hereditaments and appurtenances to the same belonging, or in anywise appertaining and the reversion and reversions, remainder and remainders, rents, issues and profits thereof; AND ALSO all the estate, right, title interest, property claim and demand whatsoever, both in law and equity of the said Grantor, of, in to or out of the said premises and every part and parcel thereof.

TO HAVE AND TO HOLD the said premises, with all and singular the appurtenances unto the said Grantee and its assigns, to and for the only proper use and behoof of the said Grantee and its assigns forever.

AND the said Grantor, for itself, its successors and assigns does by these presents covenant grant and agree to and with the said Grantee and its assigns that it the said Grantor its successors and assigns all and singular the hereditaments and premises hereinabove described and granted or mentioned and intended so to be, with the appurtenances unto the said Grantee, and its assigns, against it the said Grantor and its successors and assigns, and against all and every other person or persons whomsoever, lawfully claiming or to claim the same or any part thereof, shall and will by these presents WARRANT AND FOREVER DEFEND.

This deed is made under and by virtue of a Resolution of the Board of Directors of Masonite Corporation, Grantor, duly passed at a regular meeting thereof, held on the 22nd day of May, 1975, a full quorum being present authorizing and directing the same to be made and done.

IN WITNESS WHEREOF, the said Grantor has caused its to set hereunto his hand and seal the day and year first written above.

ATTEST:

MASONITE CORPORATION

SECRETARY

PRESIDENT

-8-

BOOK 85 PAGE 261

Addendum A
Conversion Site # 16

VOL. 196 PAGE 1070

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF

On this 23rd day of May, 1975, before me the undersigned officer, personally appeared SAMUEL S. GREELEY who acknowledged himself to be the PRESIDENT of Masonite Corporation, a Delaware Corporation, and that he as such PRESIDENT being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the Corporation by himself as PRESIDENT.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

PATRICIA A. LEITNER NOTARY PUBLIC DAUPHIN COUNTY, PA. MY COMMISSION EXPIRES

Patricia A. Leitner
Notary Public

I HEREBY CERTIFY that the principal place of business of the Grantee in the within deed is Evangelical Press Building, Harrisburg, County of Dauphin, Pennsylvania.

Robert Leaks
Attorney for Grantee

Approved as to Legality and Form

Robert Leaks
Assistant Attorney General

BOOK 85 PAGE 262

Addendum A
Conversion Site # 16

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF POTTER

RECORDED in the Office for Recording of Deeds, Mortgages, etc., in and for the County of Potter, in Deed Book 196 Volume , Page 1062.

WITNESS my hand and seal of office this 9 day of July, A. D. 1975.

Henry C. Palmateer Jr.
Recorder

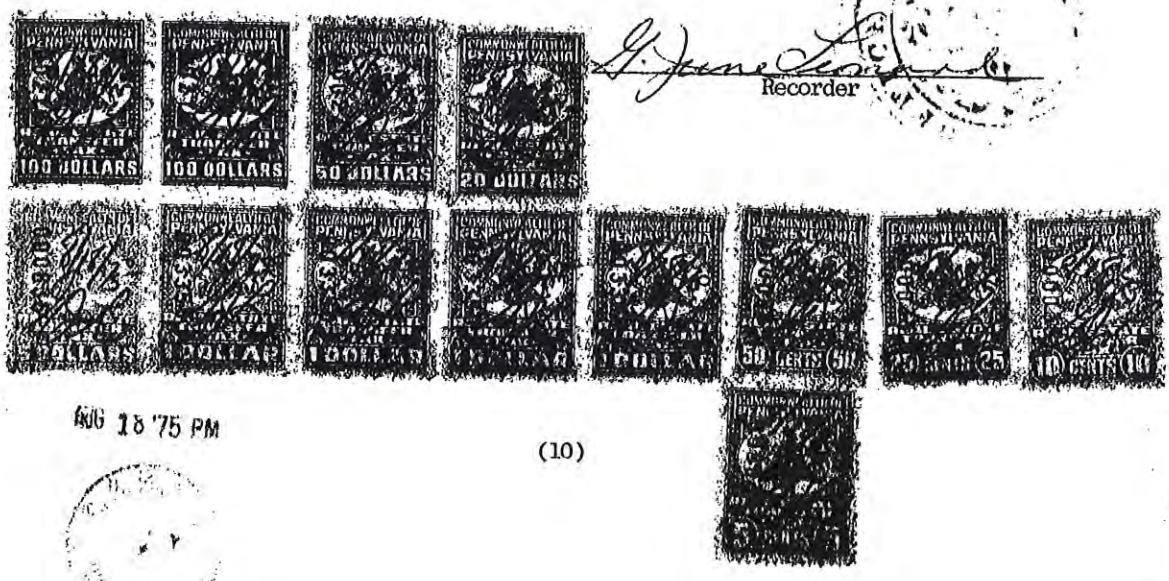
COMMONWEALTH OF PENNSYLVANIA

COUNTY OF CAMERON

RECORDED in the Office for Recording of Deeds, Mortgages, etc., in and for the County of Cameron, in Deed Book Volume 85, Page 254

WITNESS my hand and seal of office this 18th day of August, A. D. 1975.

G. Jane Lovett
Recorder

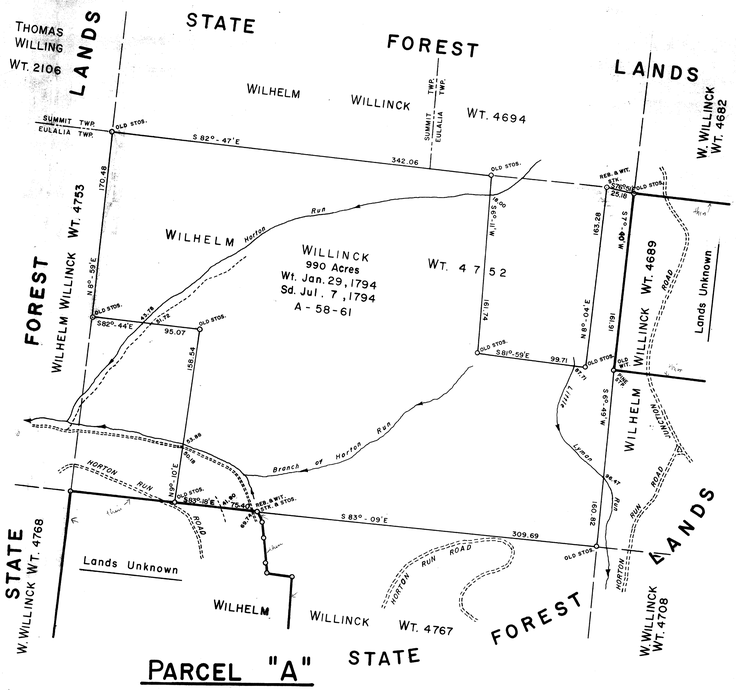


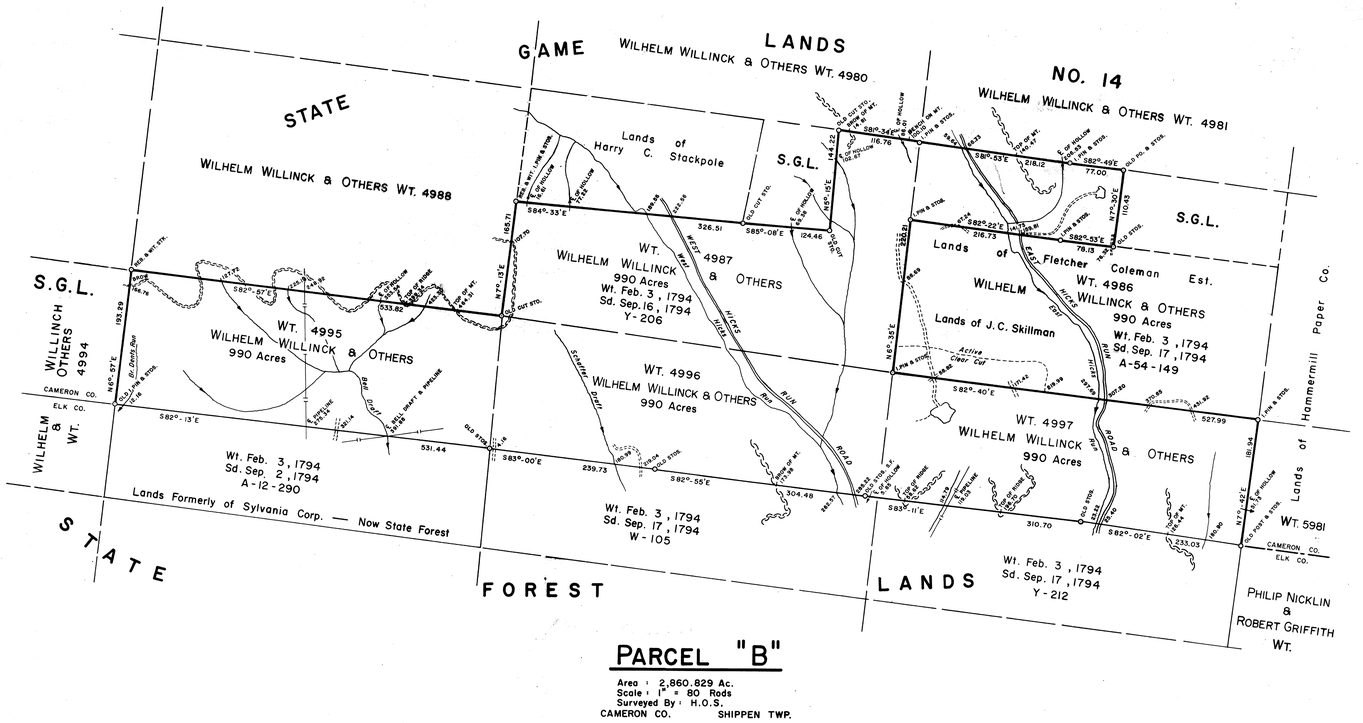
AUG 18 '75 PM

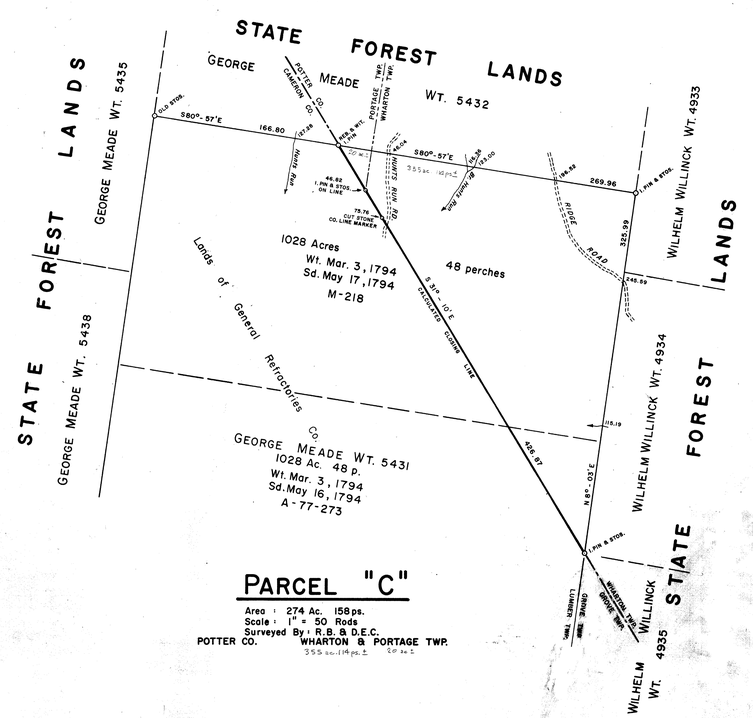
(10)

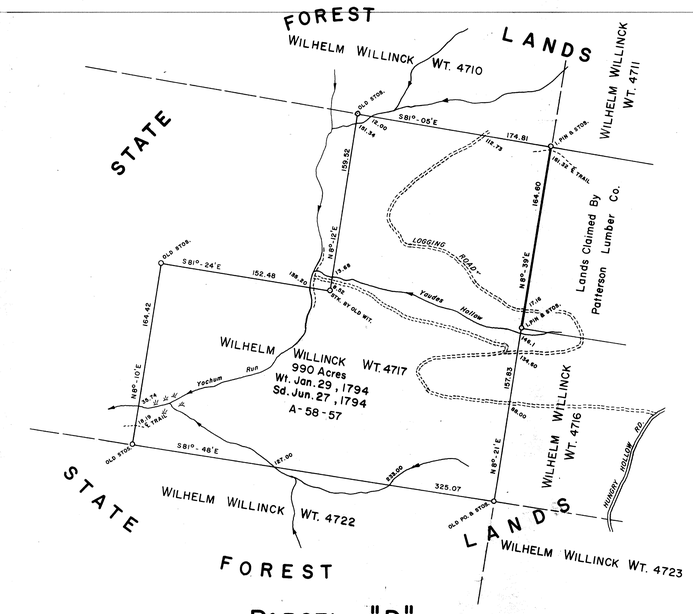
BOOK 85 PAGE 263

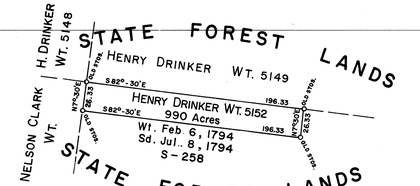
Addendum A
Conversion Site # 16

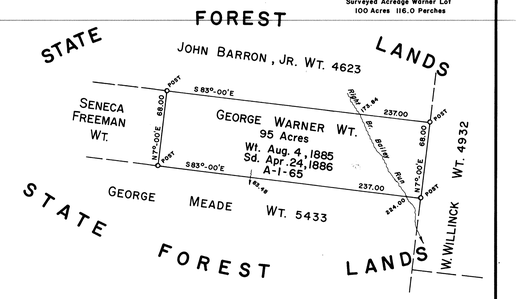


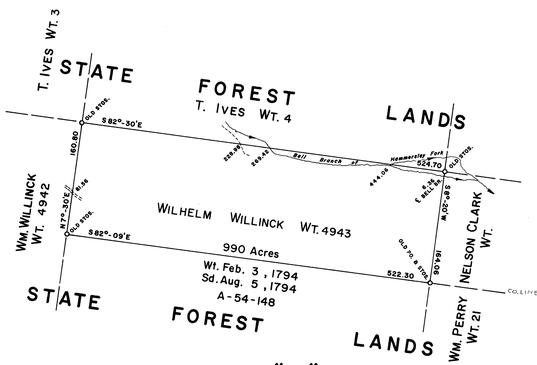












NOTE: All Lands Surrounding Warner Lot, Owned By Commonwealth Of Pennsylvania. Surveyed Acreage Warner Lot 100 Acres 116.0 Perches

To State: Cameron County:
Deed date May 22, 1975
Deed recorded August 18, 1975
Vol. 85 Pg. 254
Area: 2860 ac. 135 ps.

Potter County:
Deed dated May 22, 1975
Deed recorded July 9, 1975
Vol. 196 Pg. 1062
Area: 2221 ac. 90 ps.

To Masonite Corp.
Deed dated June 20, 1975
Deed recorded July 15, 1975
Vol. 196 Pg. 1102
Area: 5586 ac. 125 ps.
(All of Map 2509, 1633, 1672, 1673, 1672)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
HARRISBURG

POTTER AND CAMERON COUNTIES — TWPS. as noted

MASONITE CORPORATION EXCHANGE
(LANDS TO COMMONWEALTH)

Surveyor noted per each Parcel under direction of H.F.Hartman, R.S. 10800-E
Dwn. by G.R.D. Checked by R.B.B. Date. Jan. 1975 Scales : As noted
Plotted by D.E.C., H.O.S., R.B.B., R.C.

2370

2370

MAG. 1974

Addendum A
Conversion Site # 16

Tract ID 594

Map # 2087

Vol 272 PG 284

wt Thomas Willing # 1868

A-72-251

Recorded NOV 12 1954 4:35 P.M.

VOL 272 PAGE 284 Michael M. Gerould

Recorder of Deeds
Tioga County

THIS INDENTURE, made the 10th day of November one thousand nine hundred and fifty-four, (1954).

BETWEEN the BLOSSBURG COAL COMPANY, a corporation, organized, existing and doing business under the laws of the Commonwealth of Pennsylvania, with its principal office located at Smith and Mills Street, Borough of Dunmore and Commonwealth of Pennsylvania, hereinafter referred to as the Grantor, party of the first part,

A

N

D

COMMONWEALTH OF PENNSYLVANIA, hereinafter referred to as the grantee, party of the second part.

WITNESSETH, that the said Grantor, for and in consideration of the sum of One Hundred Forty-eight Thousand Four Hundred Seven and Eighty-five One Hundredths Dollars ($148,407.85), lawful money of the United States of America, unto it well and truly paid by the said Grantee at and before the sealing and delivery hereof, the receipt whereof is hereby acknowledged, has granted, bargained, sold, enfeoffed, released and confirmed, and by these presents does grant, bargain, sell, enfeoff, release and confirm unto the said Grantee, and its assigns, all those certain ten (10) parcels, tracts, lots, pieces, or plots of land situate in the Borough of Blossburg, and in the Townships of Covington, Bloss, Duncan, Morris, Liberty, Union and Hamilton, County of Tioga and Commonwealth of Pennsylvania, herein after described, as follows:

For Maps, See File #1384

PARCEL NO. I

ALL that certain tract, parcel, piece, lot or plot of land situate in the Borough of Blossburg and in the Townships of Bloss, Covington, Duncan, Liberty and Morris, County of Tioga, and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at an old stones and a stake corner common to the lands herein described and lands now or formerly of the Custard Run Gun Club and being common to warrants No. 1180, No. 1179 and No. 1588; thence by line of the aforementioned lands along line common to warrants No. 1180 and No. 1588 north 8 degrees 10 minutes east 125.56 rods to a stones corner; thence by line of lands hereindescribed and lands of the Commonwealth of Pennsylvania along line common to warrants No. 1180, No. 1585 and No. 1875 north 7 degrees 26 minutes east 447.36 rods to a stones corner; thence by lands herein described along line crossing Babb Creek common to warrants No. 1875, and No. 1584 north 7 degrees 31 minutes east 334.00 rods to a cut-stone corner monument; thence by line of lands herein described along line common to warrants No. 5051 and No. 1584 north 85 degrees 07 minutes west 152.32 rods to a cut-stone corner monument; thence by lands herein described along line common to warrants No. 5051 and No. 1581 north 07 degrees 07 minutes east 435.64 rods to a stones corner; thence by lands herein described and lands now or formerly of the Wellsboro Water Company along line common to warrants No. 5051 and No. 5050 south 82 degrees 50 minutes east 205.84 rods to a cut-stone corner monument; thence by lands herein described and lands now or formerly of the Wellsboro Water Company, lands now or formerly of the 12 Point Hunting Club and lands now or formerly of Stephan Boyce along line through warrant No. 5050 north 07 degrees 24 minutes east 437.72 rods to a cut-stone corner monument; thence by lands herein described, lands now or formerly of the Wellsboro Water Company and lands now or formerly of Reese along line common to warrants

No. 5050, No. 5049, No. 1577 and No. 5044 south 82 degrees 30 minutes east 559.80 rods to a stones and a stake corner; thence by lands herein described, lands now or formerly of Knape, lands now or formerly of F. Knape, lands now or formerly of Reese, lands now or formerly of S. R. Woods and lands now or formerly of Hoover along line common to warrants No. 5049, No. 5048, No. 5047 and No. 5044 south 83 degrees 29 minutes east 612.00 rods to a stones corner; thence by lands hereindescribed and lands now or formerly of Hoover along line through warrant No. 5045 north 07 degrees 29 minutes east 210.00 rods to a stones corner; thence by lands herein described and lands now or formerly of Wm. Reese along line common to warrants No. 5045 and No. 5495 south 83 degrees 00 minutes east 310.24 rods to a stones corner; thence by lands hereindescribed, lands now or formerly of Wm. Reese and lands now or formerly of David Reese along line through warrant No. 5495 north 06 degrees 50 minutes east 226.76 rods to a stones corner; thence by lands herein described along line common to warrants No. 5495, and No. 5496 south 83 degrees 14 minutes east 148.72 rods to a stones corner; thence by lands herein described along lines through warrant No. 5495 the following three (3) courses and distances:

(1) South 06 degrees 00 minutes west 11.00 rods to a stones corner; thence

(2) South 84 degrees 00 minutes east 63.88 rods to a stones corner; thence

(3) North 06 degrees 00 minutes east 11.00 rods to a stones corner;

thence by lands herein described along line common to warrants No. 5495 and No. 5494 south 84 degrees 00 minutes east 35.12 rods to a stake corner in a beaver dam; thence by lands herein described and lands now or formerly of H. Williams along lines through warrant No. 5495 the following two (2) courses and distances:

(1) South 06 degrees 00 minutes west 152.00 rods to a stones corner; thence

(2) South 81 degrees 10 minutes east 134.00 rods to 24 inch maple corner tree;

thence continuing by lands of same along line common to warrants No. 5494 and No. 5495 north 06 degrees 00 minutes east 35.00 rods to a stones corner; thence by lands herein described and lands now or formerly of Hutchison along line through warrant No. 5494 south 83 degrees 38 minutes east 129.56 rods to a stones corner; thence continuing by lands of same along line common to warrants No. 5916 and No. 5494 north 05 degrees 20 minutes east 253.80 rods to a stones corner; thence by lands herein described along line common to warrants of same south 84 degrees 27 minutes east 365.6 rods to an iron rail and a stones corner; thence by lands hereindescribed along line common to warrant No. 5916 and Colburn Clemens warrant south 06 degrees 18 minutes west 191.72 rods to an iron rail and a stone corner; thence by lands hereindescribed along line common to warrants No. 5927 and Colburn Clemens warrant and through warrant No. 5977, said line crossing the Tioga River, south 84 degrees 18 minutes east 633.04 rods to an iron rail corner; thence by lands herein described along line common to warrants No. 5977 and No. 5835 and along a Blossburg Borough line south 07 degrees 05 minutes west 202.40 rods to an iron rail and a stones corner; thence by lands herein described along lines through warrant No. 5977 and through the Borough of Blossburg the following two (2) courses and distances:

(1) North 84 degrees 45 minutes west 184.48 rods to an iron rail and a stones corner; thence

(2) North 12 degrees 30 minutes east 6.64 rods to an iron rail and a stones corner;

thence by lands herein described along lines through warrants No. 5977 and No. 5927 the following three (3) courses and distances:

(1) North 39 degrees 40 minutes west 144.76 rods to an iron rail and a stones corner; thence

(2) South 74 degrees 18 minutes west 180.76 rods, crossing the Tioga River, to an iron rail and a stones corner on Blossburg Borough line; thence

(3) South 37 degrees 24 minutes east 54.28 rods along line through Blossburg Borough to an iron rail and a stones corner;

thence by lands hereindescribed and lands now or formerly of Cummings along line through Blossburg Borough the following two (2) courses and distances:

(1) South 84 degrees 30 minutes west 19.56 rods along line common to warrants No. 5927 and No. 809 to an iron rail and a stones corner; thence

(2) North 87 degrees 44 minutes west 188.52 rods through warrant No. 5927 to an iron rail and a stones corner;

thence by lands herein described, lands now or formerly of Cummings and lands now or formerly of Alex Hutchison along line common to warrants No. 5927 and No. 5916 and to Blossburg Borough south 06 degrees 45 minutes west 179.00 rods to an iron rail and a stones corner; thence by lands herein described and lands now or formerly of Alex Hutchison along line through warrants No. 5927 and No. 809 and Blossburg Borough south 86 degrees 25 minutes east 237.60 rods to an iron rail and a stones corner; thence by lands herein described along line through warrant No. 809 and Blossburg Borough south 83 degrees 18 minutes east 65.64 rods to an iron rail and a stones corner; thence by lands herein described along lines through Blossburg Borough the following three (3) courses and distances:

(1) South 08 degrees 00 minutes east 123.32 rods along line through warrants No. 809 and No. 5927 to a cut-stone corner monument; thence

(2) South 47 degrees 26 minutes west 160.00 rods along line through warrant No. 5927 to a cut-stone corner monument; thence

Addendum A
Conversion Site # 17

(3) North 83 degrees 54 minutes west 230.28 rods by lands aforementioned, lands now or formerly of C. Ayres and lands now or formerly of V. F. W. Club along line through warrant No. 5927 to an iron rail and a stones corner;

thence by lands herein described and lands now or formerly of the V. F. W. Club along line common to warrants No. 5932 and No. 5927 and to Blossburg Borough and along line through warrant No. 5932 south 07 degrees 07 minutes west 272.24 rods to a cut-stone corner monument, the southwestern corner of Blossburg Borough; thence by lands herein described along line common to warrants No. 5914 and No. 5955 south 07 degrees 58 minutes west 534.84 rods to a cut-stone corner monument; thence by lands herein described along line common to warrants No. 5914 and No. 5978 north 81 degrees 04 minutes west 379.24 rods to a stones corner; thence by lands herein described along line common to warrants No. 1868 and No. 5978 south 06 degrees 30 minutes west 68.00 rods to a stake and a stones corner; thence by lands herein described and lands now or formerly of Guy along line through warrant No. 1868 the following six (6) courses and distances:

(1) North 82 degrees 06 minutes west 268.08 rods crossing Route No. 15 to an iron rail and a stones corner; thence

(2) South 05 degrees 41 minutes west 91.88 rods to an iron rail and a stones corner; thence

(3) South 84 degrees 23 minutes east 108.76 rods to a stones corner; thence

(4) North 22 degrees 30 minutes east 22.00 rods along Arnot Highway to a stones corner; thence

(5) North 52 degrees 50 minutes east 36.00 rods along Arnot Highway to a stones corner; thence

(6) South 83 degrees 50 minutes east 126.72 rods crossing Route No. 15 to an iron rail and a stones corner;

thence by lands herein described along line common to warrants No. 1868 and No. 5978 south 06 degrees 34 minutes west 73.72 rods to a stones corner; thence by lands herein described along line through warrant No. 1868 the following five (5) courses and distances:

(1) North 84 degrees 30 minutes west 166.48 rods crossing Route No. 15 to a stones corner; thence

(2) South 06 degrees 00 minutes west 93.20 rods along Route No. 15 to a stones corner; thence

(3) South 16 degrees 00 minutes east 15.60 rods to an iron rail and a stones corner; thence

(4) North 84 degrees 14 minutes west 72.92 rods by lands now or formerly of Skarvin to a stones corner; thence

(5) North 05 degrees 50 minutes east 20.00 rods by lands now or formerly of Skarvin to an iron rail and a stones corner;

thence by lands herindescribed, lands now or formerly of Skarvin, and lands now or formerly of L. Krueger along line through warrants No. 1868 and No. 1184 north 84 degrees 48 minutes west 80.64 rods to an iron rail and a stones corner; thence by lands herein described along lines through warrant No. 1183 the following nine (9) courses and distances:

(1) South 05 degrees 20 minutes west 140.8 rods by lands now or formerly of L. Kreuger to a stones corner; thence

(2) South 52 degrees 00 minutes west 5.00 rods to a stones corner; thence

(3) South 39 degrees 30 minutes west 21.60 rods to a stones corner; thence

(4) North 84 degrees 00 minutes west 158.00 rods by lands now or formerly of Pegenough to a stones corner; thence

(5) South 06 degrees 00 minutes west 56.00 rods by lands now or formerly of Pegenough to a stones corner; thence

(6) North 84 degrees 00 minutes west 168.4 rods by lands now or formerly of Killings to a stones corner; thence

(7) South 06 degrees 00 minutes west 138.52 rods by lands now or formerly of Killings to a stones corner; thence

(8) North 84 degrees 00 minutes west 27.40 rods by lands now or formerly of Lenhart to a stones corner; thence

(9) North 06 degrees 00 minutes east 106.60 rods by lands now or formerly of Lenhart to a stones corner;

thence by lands herein described and lands now or formerly of Lenhart along line through warrants No. 1183 and No. 1182 north 84 degrees 00 minutes west 80.44 rods to a stones corner; thence by lands herein described and lands now or formerly of the Fall Creek Hunting Club the following nineteen (19) courses and distances:

(1) North 06 degrees 00 minutes east 24.40 rods through warrant No. 1182 to a stones corner; thence

(2) North 84 degrees 03 minutes west 127.4 rods through warrant No. 1182 to an iron axle and a stones corner; thence

(3) South 06 degrees 02 minutes west 35.64 rods through warrant No. 1182 to an iron axle and a stones corner; thence

(4) North 84 degrees 30 minutes west 102.12 rods through warrant No. 1182 to a stones corner; thence

(5) North 06 degrees 00 minutes east 85.6 rods through warrant No. 1182 to a stones corner; thence

(6) North 84 degrees 00 minutes west 112.88 rods through warrant No. 1182 to a stones corner; thence

(7) North 06 degrees 00 minutes east 51.7 rods through warrant No. 1182 to a stones corner; thence

(8) North 84 degrees 00 minutes west 91.10 rods through warrant No. 1182 to a stones corner; thence

(9) South 06 degrees 00 minutes west 90.00 rods along line common to warrants No. 1182 and No. 1181 to a stones corner; thence

(10) South 84 degrees 00 minutes east 100.00 rods through warrant No. 1182 to a stones corner; thence

(11) South 06 degrees 00 minutes west 46.80 rods through warrant No. 1182 to a stones corner, thence

(12) North 84 degrees 00 minutes west 30.00 rods through warrant No. 1182 to a stones corner; thence

(13) South 06 degrees 00 minutes west 188.40 rods through warrant No. 1182 to a stones corner; thence

(14) North 81 degrees 40 minutes west 160.00 rods along line common to warrants No. 1182, No. 1181, No. 1178 and No. 1177 to a stones corner; thence

(15) North 07 degrees 00 minutes east 134.0 rods through warrant No. 1181 to a stones corner; thence

(16) North 82 degrees 30 minutes west 254.88 rods through warrant No. 1181 to a hemlock corner; thence

(17) South 07 degrees 00 minutes west 130.00 rods through warrant No. 1181 to a stones corner; thence

(18) North 82 degrees 30 minutes west 264.00 rods along line common to warrants No. 1181, No. 1180, No. 1178 and No. 1179 to a stones corner; thence

(19) North 06 degrees 00 minutes east 50.68 rods through warrant No. 1180 to a stones corner;

thence by lands herein described, lands now or formerly of the Fall Creek Hunting Club and lands now or formerly of the Custard Run Gun Club along line through warrant No. 1180 north 84 degrees 00 minutes west 55.68 rods to a stake and a stones corner; thence by lands herein described and lands now or formerly of the Custard Run Gun Club the following two (2) courses and distances:

(1) South 05 degrees 26 minutes west 49.88 rods through warrant No. 1180 to a stones corner; thence

(2) North 84 degrees 15 minutes west 220.00 rods along line common to warrants No. 1180 and No. 1179 to an old stones and a stake corner, the place of BEGINNING.

CONTAINING 26,807 acres, 10 perches of land be the same more or less.

EXCEPTING AND RESERVING, nevertheless from the aforedescribed PARCEL NO. I, the following pieces, parcels, tracts, lots, or plots of land designated "A", "B", "C", "D", "E", "F-I", "F-II" and "G":

A. VILLAGE OF ARNOT TRACT

ALL that certain parcel, tract, lot, piece or plot of land situate in warrants No. 5046 and No. 5055, Townships of Bloss and Duncan, County of Tioga, Commonwealth of Pennsylvania being more particularly bounded and described as follows:

BEGINNING at a stones corner common to the lands herein described and land aforedescribed as Parcel No. I, said corner being on a line common to warrants No. 5055 and No. 5914 and being the southeastern corner of lands of the Village of Arnot; thence by lands herein described and lands aforedescribed as Parcel No. I the following four (4) courses and distances:

(1) South 78 degrees 00 minutes west 411.52 rods through warrant No. 5055 to a stones corner; thence

(2) North 06 degrees 00 minutes east 318.92 rods through warrants No. 5055 and No. 5046 to a stones corner; thence

(3) South 84 degrees 00 minutes east 390.40 rods through warrant No. 5046 to a stones corner; thence

(4) South 06 degrees 00 minutes west 191.60 rods along line common to warrants No. 5046, No. 5055, No. 5914 and No. 5932 to a stones corner, the place of BEGINNING.

CONTAINING 622 acres, 112 perches of land, be the same more or less.

The southeastern corner of the aforedescribed Village of Arnot Tract is joined to the northeastern corner (a cut-stone corner monument) of warrant No. 5914 by the following two (2) tie-lines:

(1) North 06 degrees 00 minutes east 26.14 rods along line common to warrants No. 5055 and No. 5914 to a post corner, the northwestern corner of warrant No. 5914.

(2) South 84 degrees 00 minutes east 372.40 rods along line common to warrants No. 5914 and No. 5932 to a cut-stone warrant corner, the northeastern corner of warrant No. 5914.

B. LOT NO. 47 (FALL CREEK HUNTING CLUB)

ALL that certain parcel, tract, lot, piece, or plot of land situate in warrant No. 1181, Township of Liberty, County of Tioga, Commonwealth of Pennsylvania, being more particularly bounded and described as follows:

BEGINNING at a stones corner, the southeastern corner of lands hereindescribed; thence by lands hereindescribed and lands of the aforedescribed Parcel No. I along lines through warrant No. 1181, the following four (4) courses and distances:

(1) North 84 degrees 00 minutes west 115.00 rods to a stones corner; thence

(2) North 06 degrees 00 minutes east 100.00 rods to a stones corner; thence

(3) South 84 degrees 00 minutes east 115.00 rods to a stones corner; thence

(4) South 06 degrees 00 minutes west 100.00 rods to a stones corner, the place of BEGINNING.

CONTAINING 71 acres, 139 perches of land, be the same more or less.

The southeastern corner of the aforedescribed Lot No. 47 is joined to a stones corner being within warrant No. 1181 and being common to lands aforedescribed as Parcel No. I and other lands now or formerly of the Fall Creek Hunting Club by the following three (3) courses and distances:

(1) South 82 degrees 30 minutes east 14.00 rods through warrant No. 1181 to a post; thence

(2) South 06 degrees 00 minutes west 64.00 rods through warrant No. 1181 to a post; thence

(3) South 82 degrees 30 minutes east 40.00 rods through warrant No. 1181 to a stones corner.

C. SINCLAIR BULK PLANT LOT

ALL that certain, parcel, lot, piece, plot or tract of land situate in warrant No. 5914, Township of Bloss, County of Tioga, Commonwealth of Pennsylvania, being more particularly bounded and described as follows:

BEGINNING at an iron pin and a stones corner common to the lands herein described, lands now or formerly of the Erie Railroad Company and lands of Parcel No. I described aforesaid corner being within warrant No. 5914; thence by lands herein described and lands of Parcel No. I through warrant aforementioned the folowing five (5) courses and distances:

(1) North 44 degrees 32 minutes east 13.48 rods to an iron pin and a stones corner; thence

(2) North 66 degrees 02 minutes east 10.64 rods to an iron pin and a stones corner at edge of power line right-of-way; thence

(3) North 88 degrees 17 minutes east 47.80 rods, running along edge of power line right-of-way to a stake and a stones corner on line of old highway right-of-way; thence

(4) South 71 degrees 28 minutes west 11.76 rods along line of old highway right-of-way to a stake corner; thence

(5) South 57 degrees 31 minutes west 11.08 rods along line of old highway right-of-way to a stake corner on Erie Railroad Company right-of-way;

thence by lands herein described and lands of the Erie Railroad Company through warrant of same south 83 degrees 10 minutes west 46.96 rods to an iron pin and a stones corner, the place of BEGINNING.

CONTAINING 3 acres, 14 perches of land, be the same more or less.

The aforedescribed Sinclair Bulk Plant Lot is joined to the cut-stone corner monument at the northeastern corner of warrant No. 5914 by the following three (3) tie-lines:

From the stake corner at the southeastern corner of said lot, which is at the intersection of the right-of-way lines of the old highway and Erie Railroad Company, the following three (3) courses and distances:

(1) South 55 degrees 26 minutes west 10.68 rods to a point where the Erie Railroad intersects the north line of Route No. 15.

(2) North 64 degrees 28 minutes east 81.32 rods along north edge of Route No. 15 to point on line common to warrants No. 5914 and No. 5955.

(3) North 07 degrees 58 minutes east 8.24 rods along warrant line of same to a cut-stone corner monument aforementioned.

D. HIGHWAY PAVING COMPANY LOT

ALL that certain parcel, lot, piece, plot or tract of land situate in warrant No. 5914, Township of Bloss, County of Tioga, and Commonwealth of Pennsylvania, being more particularly bounded and described, as follows:

BEGINNING at a stones corner at the intersection of north right-of-way line of Route No. 15 and the south right-of-way line of the Erie Railroad Company, said corner being within warrant No. 5914, thence by lands herein described through warrant aforementioned the following three (3) courses and distances:

(1) South 61 degrees 46 minutes west 19.84 rods to a point in the center line of the improved road to Arnot; thence

(2) South 77 degrees 51 minutes west 24.40 rods along center line of road aforementioned to point; thence

(3) South 87 degrees 13 minutes west 19.24 rods along center line of road aforementioned to a point;

thence by lands herein described and lands of Parcel No. I aforedescribed through warrant of same. North 21 degrees 55 minutes east 13 rods to a stones corner on southern right-of-way line of the Erie Railroad Company; thence by lands herein described and lands now or formerly of the Erie Railroad Company through warrant of same the following two (2) courses and distances:

(1) South 88 degrees 20 minutes east 20.20 rods to a stones corner; thence

(2) North 83 degrees 10 minutes east 35.76 rods to a stones corner, the place of BEGINNING.

CONTAINING 2 acres, 136 perches of land, be the same more or less.

The aforedescribed Highway Paving Company Lot is joined to the southwestern corner of the Sinclair Bulk Plant Lot by the following two (2) tie-lines:

From the point of beginning of the aforedescribed lot

(1) South 83 degrees 10 minutes west 24.12 rods to a point.

(2) North 06 degrees 50 minutes west 9.44 rods to an iron pin and a stones corner.

E. AMES AND RICHARDS LOT

ALL that certain parcel, lot, piece, plot or tract of land situate in warrant No. 5927, Township of Covington, County of Tioga, and Commonwealth of Pennsylvania, more particularly bounded and described, as follows:

BEGINNING at the northwest corner of warrant No. 5927, said corner being an iron rail and stones and being common to lands herein described and lands of Parcel No. I described afore, thence by lands hereindescribed along line of warrant No. 5927 and Colburn Clemens warrant south 84 degrees 18 minutes east 188.72 rods to an iron rail corner; thence by lands herein described and lands of Parcel No. I described before through warrant No. 5927 the following four (4) courses and distances:

(1) South 02 degrees 40 minutes east 31.00 rods to a stake corner on west side of Route No. 15; thence

(2) South 26 degrees 40 minutes east 12.40 rods to a stake corner on the east side of Route No. 15; thence

(3) North 84 degrees 30 minutes west 114.20 rods to an iron rail and a stones corner; thence

(4) North 84 degrees 06 minutes west 86.04 rods to a post and stones corner;

thence by lands of same along line common to warrants No. 5927 and No. 5916 north 06 degrees 27 minutes east 40.72 rods to an iron rail and a stones corner, the place of BEGINNING.

CONTAINING 49 acres, 40 perches of land, be the same more or less.

F. ERIE RAILROAD COMPANY RIGHT OF WAY

ALL that certain parcel, tract, lot, piece or right-of-way of land situate in the Townships of Bloss, Morris, and Charleston, County of Tioga and Commonwealth of Pennsylvania, bounded and described in two (2) deeds as follows, to wit:

I. The Blossburg Coal Company to the Arnot and Pine Creek Railway Company October 10, 1882 (unrecorded)

BEGINNING at a point where the said Arnot and Pine Creek railroad branches off from the Tioga railroad in the Village of Arnot, and extending a distance of ten (10) feet each side of the center line of said Arnot and Pine Creek railroad; thence following the general alignment of said railroad ten (10) feet from and parallel to the said center line a distance of five thousand one hundred (5100) feet to the warrant line separating warrant No. 5046 from warrant No. 5047, running thence in a general southerly and westerly direction thirty (30) feet from and parallel to the said center line and on both sides of it - through warrants No. 5047, 5054, 5053, 5052, and 1875 to the warrant line dividing warrant No. 1875 from warrant No. 1584. All of which will more plainly appear from the map attached hereto.

II. John Magee to the Bloss Coal Mining and Rail Road Company.

BEING a piece of land eighty feet in width upon each side of the center line of said Bloss Coal Mining and R. R. Cos' Railroad which is now located and built through said warrants (No. 5914 and 5932) and of which the following are the courses and distances through the same:

BEGINNING on the east line of warrant No. 5914 and on the center line of said Rail Road and running thence south 77 degrees 37 minutes west 1725 feet; thence on a curve of six degrees to the right 932 feet; thence north 46 degrees 27 minutes west 904 feet; thence on a curve of six degrees to the left 741 feet; thence south 89 degrees 5 minutes west 873 feet; thence on a curve of four degrees to the right 641 feet; thence north 65 degrees 15 minutes west 927 feet to the west line of the said warrants.

ALSO all that land comprising right-of-way 66 feet in width extending through the

lands of Parcel No. I (described before) in warrant No. 5927.

Computations indicate that the total area of the aforedescribed rights-of-way (designated "I" and "II") to be deducted, totals 71 acres, 141 perches of land, be the same more or less.

G. THE MICHAEL DEISTER (now or formerly) TRACT

ALL that certain tract, parcel or lot of land situate in the Nicklin and Griffith warrant No. 5927, Township of Covington, County of Tioga, Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at an iron rail and a stones corner, the same being situate on the west side of Route No. 15 north of the Borough of Blossburg and being within the Nicklin and Griffith warrant No. 5927; thence by lands herein described and lands of the aforedescribed Parcel No. I the following four (4) courses and distances:

(1) North 12 degrees 00 minutes east 17.74 rods to a point where the center of Smith's Creek and the center of the Old Williamson Road intersect, said point being on the hard surface of the present Route No. 15; thence

(2) North 77 degrees 25 minutes west 17.88 rods up Smith's Creek to a point in same; thence

(3) South 11 degrees 30 minutes west 21.16 rods to an iron rail and a stones corner; thence

(4) South 88 degrees 38 minutes east 18.00 rods to an iron rail and a stones corner, the place of BEGINNING.

CONTAINING 2 acres, 26 perches of land, be the same more or less.

The total acreage of the above described exceptions and reservations deducted from Parcel No. 1 is 823 acres 128 perches, more or less, making the total net acreage of Parcel No. I, 25,983 acres, 42 perches, be the same more or less.

PARCEL NO. II

ALL that certain tract, parcel, piece, lot or plot of land known as Warrant No. 5903, situate adjacent to a Blossburg Borough line in the Township of Hamilton, County of Tioga and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at a stones corner, the northwestern corner of lands herein described, said corner being common to warrants No. 5903, No. 5955, No. 5982 and No. 5970 and being on a line of the Borough of Blossburg; thence by lands herein described the following four (4) courses and distances:

(1) South 83 degrees 08 minutes east 124.00 rods along line common to warrants No. 5903 and No. 5970 and to the Blossburg Borough to a stones corner; thence

(2) South 06 degrees 52 minutes west 68.00 rods along line common to warrants No. 5903 and No. 5970 to a stones corner; thence

(3) North 83 degrees 08 minutes west 124.00 rods along line common to warrants No. 5903, No. 5970 and No. 5955; thence

(4) North 06 degrees 52 minutes east 68.00 rods along line common to warrants No. 5903 and 5955 to a stones corner, the place of BEGINNING.

CONTAINING 52 acres, 112 perches of land, be the same more or less.

The stones northwestern corner of this said Parcel No. II is joined to Parcel No. I at the cut-stone northeastern corner of warrant No. 5914 by the following tie-line:

(1) North 83 degrees 08 minutes west 267.20 rods.

PARCEL NO. 111

ALL that certain parcel, lot, piece, plot or tract of land comprised by all or parts of warrants No. 5980, No. 5985, No. 5987, No. 5986 and No. 1, being situate in the Townships of Hamilton and Liberty, County of Tioga and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at an iron rail and a stones corner common to the lands herein described and being located on a line common to warrants No. 5985 and No. 5976; thence by lands herein described along a line common to warrants No. 5985 and No. 5976 north 07 degrees 31 minutes east 68.48 rods to an iron rail and a stones corner; thence by lands herein described along line common to warrants No. 5980 and No. 5978 north 10 degrees 02 minutes east 261.24 rods to a cut-stone corner monument; thence by lands herein described along line common to warrants No. 5980, No. 5955 and No. 5970 south 89 degrees 07 minutes east 283.00 rods to an iron rail and a stones corner; thence by lands herein described along line common to warrants No. 5980 and No. 5970 south 89 degrees 47 minutes east 29.52 rods to an iron rail and a stones corner; thence by lands herein described along line common to warrants No. 5980 and No. 1 (lots No. 1, No. 2, No. 3 and No. 4) south 82 degrees 20 minutes east 356.92 rods to a cut-stone corner monument; thence by lands hereindescribed through warrant No. 1 along line common to lots No. 4 and No. 5 north 05 degrees 40 minutes east 269.76 rods to a cut-stone corner monument; thence by lands hereindescribed along line common to warrants No. 1 and No. 5980 which is along the north line of lot No. 5 north 83 degrees 00 minutes east 78.40 rods to a cut-stone corner monument; thence by lands herein described through warrant No. 1 along line common to lots No. 5 and No. 6 south 05 degrees 41 minutes west 301.12 rods to a cut-stone corner monument; thence by lands herein described and lands now or formerly of the

Ogdensburg Gun Club along line common to warrants No. 1 and No. 3 north 84 degrees 45 minutes west 76.60 rods to a stones corner; thence continuing by lands of same along lines of lot No. 1 of warrant No. 3 the following three (3) courses and distances:

(1) South 08 degrees 17 minutes west 248.96 rods along line common to warrants No. 5980 and No. 3 to a stones corner; thence

(2) South 84 degrees 00 minutes east 36.00 rods along line common to warrants No. 5986 and No. 3 to a cut-stone corner monument; thence

(3) South 13 degrees 30 minutes east 119.60 rods along line common to warrants No. 5986 and No. 3 to a stones corner;

thence along line herein described and lands now or formerly of Capio through warrant No. 5986 north 81 degrees 04 minutes west 84.08 rods to an old stones corner; thence by lands herein described and lands now or formerly of H. Mays, the following two (2) courses and distances:

(1) North 82 degrees 00 minutes west 72.36 rods through warrant No. 5986 to a stones corner; thence

(2) South 07 degrees 09 minutes west 176.20 rods along line common to warrants No. 5987 and No. 5986 to a stones corner;

thence by lands herein described, lands of an unknown owner, and lands now or formerly of the East Point Hunting Club along line common to warrants No. 5987, S. H. Lloyd, and B. E. Valentine north 84 degrees 34 minutes west 348.88 rods to a Maple Post corner; thence by lands hereindescribed and lands now or formerly of the East Point Hunting Club along lines through warrant No. 5987 the following two (2) courses and distances:

(1) North 23 degrees 17 minutes east 86.16 rods to a stones corner.

-22-

(2) South 84 degrees 00 minutes west 17.60 rods to a stones corner

thence by lands hereindescribed along line common to warrants No. 5987 and No. 5985 north 20 degrees 00 minutes east 148.40 rods to an iron rail and a stones corner; thence by lands herein described along line through warrant No. 5985 north 89 degrees 05 minutes west 289.80 rods to an iron rail and a stones corner, the place of BEGINNING.

CONTAINING 2,030 acres, 48 perches of land, be the same more or less.

The cut-stone monument at the northwestern corner of the aforedescribed Parcel No. I I I is joined to the southwestern stones corner of Parce l No. I I by the following tie-line:

North 10 degrees 47 minutes west 479.00 rods.

Addendum A
Conversion Site # 17

PARCEL NO. IV

ALL that certain parcel, lot, piece, plot or tract of land consisting of lot No. 2, warrant No. 3, Townships of Union, Liberty and Hamilton, County of Tioga and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at a cut-stone corner monument the northwestern corner of lot No. 2, common to lands herein described, lands now or formerly of the Ogdensburg Gun Club, and lands of an unknown owner and being on line to warrants No. 3 and No. 1; thence by lands described along line common to warrants No. 3 and No. 1 south 84 degrees 23 minutes east 59.28 rods to a cut-stone corner monument, the northeastern corner of said lot No. 2; thence by lands herein described and lands now or formerly of the Ogdensburg Gun Club through warrant No. 3 the following three (3) courses and distances:

(1) South 07 degrees 12 minutes west 366.48 rods along line of lots No. 2 and No. 3 to a stones corner; thence

(2) North 81 degrees 04 minutes west 59.92 rods to a stones corner; thence

(3) North 07 degrees 12 minutes east 363.00 rods along line common to lots No. 2 and No. 1 to a cut-stone corner monument the place of BEGINNING.

CONTAINING 135 acres, 67 perches of land, be the same more or less.

The cut-stone at the northwestern corner of said lot No. 2, warrant No. 3 is joined to a cut-stone corner of Parcel No. III (the southeastern corner of lot No. 5 in warrant No. 1) by the following tie-line:

North 84 degrees 18 minutes west 45.92 rods.

PARCEL NO. V

ALL that certain parcel, lot, piece, plot or tract of land consisting of a portion of lot No. 4, warrant No. 3, Township of Union, County of Tioga and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at a cut-stone corner monument common to lands herein described and lands now or formerly of the Ogdensburg Gun Club and being common to warrants No. 3 and No. 2; thence by lands herein described along line common to warrants No. 3 and No. 2 south 83 degrees 37 minutes east 86.56 rods to a cut-stone corner monument, the northeastern corner of lot No. 4, warrant No. 3; thence by lands herein described and lands now or formerly of the Ogdensburg Gun Club the following three (3) courses and distances:

(1) South 06 degrees 18 minutes west 152.00 rods through warrant No. 3 along line common to lots No. 4 and No. 5 to a stones corner; thence

(2) North 83 degrees 00 minutes west 86.44 rods through warrant No. 3 to a stones corner; thence

(3) North 06 degrees 30 minutes east 152.00 rods to a cut-stone corner monument, the place of BEGINNING.

CONTAINING 81 acres, 115 perches of land, be the same more or less.

The cut-stone at the northwestern corner of the aforesaid lot No. 4, warrant No. 3 is joined to the cut-stone southwestern corner of lot No. 7, warrant No. 2 of Parcel No. VII by the following tie-line:

North 08 degrees 04 minutes east 57.40 rods.

PARCEL NO. VI

ALL that certain parcel, lot, piece, plot or tract of land consisting of a portion of lot No. 6, warrant No. 3, situate in the Township of Union, County of Tioga and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at a cut-stone corner monument the northwestern corner of said Parcel No. VI and lot No. 6 common to the lands herein described, lands now or formerly of the Ogdensburg Gun Club and lands of an unknown owner and being on a line common to warrants No. 3 and No. 2; thence by lands herein described along line common to warrants No. 3 and No. 2 south 82 degrees 30 minutes east 87.08 rods to a cut-stone corner monument, the northeastern corner of said lot No. 6, warrant No. 3, thence by lands herein described and lands now or formerly of the Ogdensburg Gun Club the following three (3) courses and distances:

(1) South 05 degrees 43 minutes west 288.50 rods by lands herein described and land now or formerly of Vromans through warrant No. 3 along line common to lots No. 6 and No. 7 to a stones corner; thence

(2) North 82 degrees 30 minutes west 87.80 rods by lands herein described and lands now or formerly of L. Smouther through warrant No. 3 to a stones corner; thence

(3) North 06 degrees 06 minutes east 289.00 rods by lands herein described and lands now or formerly of Ogdensburg Gun Club through warrant No. 3 along line common to lots No. 6 and No. 5 to a cut-stone corner monument, the place of BEGINNING.

CONTAINING 156 acres, 117 perches of land, be the same more or less.

The cut-stone at the northwestern corner of said Parcel No. VI is joined to the cut-stone northeastern corner of Parcel No. V by the following tie-line:

North 83 degrees 20 minutes west 89.20 rods.

PARCEL NO. VII

ALL that certain piece, lot, parcel, plot or tract of land consisting of lot No. 8 of warrant No. 1 and lots No. 2, No. 5 and No. 7 of warrant No. 2, situate in the Township of Union, County of Tioga and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at a cut-stone corner monument, being the southeastern corner of lot No. 7, warrant No. 2 and the northeastern corner of lot No. 8, warrant No. 2, being common to lands hereindescribed, lands now or formerly of Vromans, and lands of an unknown owner, being on a line common to warrants No. 2 and No. 3; thence by lands herein described through warrant No. 2 along line common to lots No. 7 and No. 8 north 82 degrees 57 minutes west 364.00 rods to a cut-stone corner monument; thence by lands herein described and lands now or formerly of the Ogdensburg Gun Club the following three (3) courses and distances:

(1) North 07 degrees 11 minutes east 58.36 rods along line common to warrants No. 2 and No. 3 to warrants No. 1 and No. 3 to a stones corner; thence

(2) North 06 degrees 49 minutes east 88.00 rods along line common to warrants No. 1 and No. 3 to a cut-stone corner monument; thence

(3) North 84 degrees 00 minutes west 14.00 rods along line common to warrants No. 1 and No. 3 to a stones corner;

thence by lands hereindescribed through warrant No. 1 along line common to No. 8 and No. 7 north 06 degrees 00 minutes east 295.00 rods to a cut-stone corner monument; thence by lands herein described on north line of lot No. 8, warrant No. 1 along line common to warrants No. 1 and No. 5840 south 81 degrees 59 minutes east 54.32 rods to a cut-stones

corner monument; thence by lands herein described and lands now or formerly of J. Wynn the following two (2) courses and distances:

(1) South 06 degrees 00 minutes west 42.36 rods along line common to lot No. 1 warrant No. 2 and lot No. 8, warrant No. 1 to a stones corner; thence

(2) South 84 degrees 00 minutes east 325.00 rods through warrant No. 1 along line common to lots No. 2 and No. 1 to a cut-stone corner monument.

Thence by lands herein described and lands now or formerly of the Vic Landon Estate along line common to lots No. 2 warrant No. 2 and lot No. 1, warrant No. 4 south 05 degrees 38 minutes west 68.00 rods to a cut-stone corner monument; thence by lands herein described and lands now or formerly of J. Wynn the following three (3) courses and distances:

(1) North 83 degrees 44 minutes west 324.88 rods through warrant No. 2 along line common to lots No. 3 and No. 2 to a cut-stones corner monument; thence

(2) South 06 degrees 00 minutes west 134.32 rods along lines common to lots No. 3 and No. 4, warrant No. 2 and lot No. 8, warrant No. 1 to a cut-stones corner; thence

(3) South 83 degrees 30 minutes east 323.96 rods through warrant No. 2 along line common to lots No. 5 and No. 4 to a cut-stone corner monument;

thence along line common to lands herein described and lands now or formerly of Vromans along line common to lot No. 5, warrant No. 2 and lot No. 1, warrant No. 5 south 06 degrees 00 minutes west 65.12 rods to a post and a stones corner; thence by lands herein described the following three (3) courses and distances:

(1) North 83 degrees 30 minutes west 322.72 rods through warrant No. 2 along line common to lots No. 5 and No. 6 to a stones corner; thence

(2) South 06 degrees 00 minutes west 67.60 rods along line common to lot No. 8, warrant No. 1 and lot No. 6, warrant No. 2 to a stones corner; thence

(3) South 83 degrees 30 minutes east 321.00 rods through warrant No. 2 along line common to lots No. 7 and No. 6 to a stones corner;

thence by lands herein described and lands now or formerly of Vromans along line of lot No. 7, warrant No. 2 which is common with line of lot No. 1, warrant No. 5 and lot No. 8, warrant No. 3 south 06 degrees 00 minutes west 63.20 rods to a cut-stone corner monument, the place of BEGINNING.

CONTAINING 530 acres 132 perches of land, be the same more or less.

The cut-stone at the southwestern corner of Parcel No. VII is joined to the northwestern corner of Parcel No. V by the following tie-line:

South 08 degrees 04 minutes west 57.40 rods.

PARCEL NO. VIII

ALL that certain parcel, lot, piece, plot or tract of land consisting of lot No. 3, warrant No. 4 and lots No. 4 and No. 5, warrant No. 5, situate in the Township of Union, County of Tioga, Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at a cut-stone corner monument, the southwestern corner of lot No. 4, warrant No. 5, Parcel No. VIII and the southeastern corner of lot No. 3, warrant No. 5; being common to lands herein described, lands now or formerly of E. Groover, lands now or formerly of Hartman and lands now or formerly of Vromans; being on a line common to warrants No. 5 and No. 5259; thence by lands herein described and lands now or formerly of Vromans through warrant No. 5 along line common to lots No. 4 and No. 3 north 05 degrees 51 minutes east 361.60 rods to a stones corner; thence by lands herein described and lands now or formerly of the Vic Landon Estate the following five (5) courses and distances:

(1) South 80 degrees 30 minutes east 3.52 rods by line of lot No. 4, warrant No. 5 and lot No. 2, warrant No. 4 to a stones corner; thence

(2) North 05 degrees 32 minutes east 236.96 rods through warrant No. 4 along line common to lots No. 3 and No. 2 to a cut-stone corner monument; thence

(3) North 78 degrees 00 minutes east 88.60 rods along line common to lot No. 3, warrant No. 4 and warrant No. 5241 to a cut-stone corner monument; thence

(4) South 06 degrees 25 minutes west 265.16 rods through warrant No. 4 along line common to lots No. 3 and No. 4 to a cut-stone corner monument; thence

(5) South 81 degrees 10 minutes east 49.00 rods along line common to lot No. 5, warrant No. 5 and lot No. 4, warrant No. 4 to a stones corner;

thence by lands herein described, lands now or formerly of I. Paige and lands now or formerly of Austin through warrant No. 5 along line common to No. 5 and No. 6 south 6 degrees 18 minutes west 358.24 rods to a stones corner; thence by lands herein described, lands now or formerly of Austin and lands now or formerly of E. Groover along line common to lots No. 4 and No. 5, warrant No. 5 and warrant No. 5259 north 84 degrees 00 minutes west, 133.00 rods to a cut-stone corner monument, the place of BEGINNING.

CONTAINING 426 acres, 110 perches of land, be the same more or less.

The cut-stone at the southwestern corner of the aforedescribed Parcel No. VIII is joined to the cut-stone southeastern corner of Parcel No. VII by the following tie-lines:

(1) North 84 degrees 00 minutes west 134.80 rods.

(2) North 06 degrees 00 minutes east 106.00 rods.

(3) North 84 degrees 00 minutes west 70.12 rods.

(4) South 06 degrees 00 minutes west 32.00 rods.

PARCEL NO. IX

ALL that certain parcel, plot, piece, lot or tract of land consisting of a portion of lot No. 1, warrant No. 7, situate in the Township of Union, County of Tioga, Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at an old stones corner, being common to the southwestern corner of lot No. 1, warrant No. 7 and the southeastern corner of lot No. 8, warrant No. 5, which corner is the southwestern corner of lands herein described; thence by lands hereindescribed and lands now or formerly of Naglen along line common to lot No. 1, warrant No. 7 and lot No. 8, warrant No. 5 north 06 degrees 00 minutes east 270.64 rods to a stones corner; thence by lands herein described through lot No. 1, warrant No. 7 south 84 degrees 00 minutes east 48.00 rods to a stones corner; thence by lands herein described and lands now or formerly of J. Wynne through warrant No. 7 along line common to lots No. 1 and No. 2 south 96 degrees 00 minutes west 271.32 rods to a stones corner; thence by lands herein described along line common to lot No. 1, warrant No. 7 and warrant No. 5250 north 84 degrees 00 minutes west 48.00 rods to a stones corner, the place of BEGINNING.

CONTAINING 81 acres, 32 perches of land, be the same more or less.

The stones at the southwestern corner of Parcel No. IX is joined to the stones southeastern corner of Parcel No. 8 by the following tie-lines:

(1) North 83 degrees 45 minutes west 65.28 rods; thence

(2) North 83 degrees 38 minutes west 66.44 rods; thence

(3) North 84 degrees 18 minutes west 69.24 rods.

PARCEL NO. X

ALL that certain piece, parcel, plot, lot or tract of land consisting of lot No. 6 and a portion of lot No. 7, warrant No. 4, situate in the Township of Union, County of Tioga and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

BEGINNING at a cut-stone corner monument, the southwestern corner of lot No. 6, warrant No. 4, being common to lands hereindescribed, lands now or formerly of Naglen and lands now or formerly of Vic Landon Estate; being on a line common to warrants No. 4 and No. 5; thence by lands herein described and lands now or formerly of the Vic Landon Estate the following four (4) courses and distances:

(1) North 05 degrees 55 minutes east 314.84 rods through warrant No. 4 along line common to lots No. 6 and No. 5 to a cut-stone monument; thence

(2) North 78 degrees 00 minutes east 120.00 rods along line common to warrant No. 4, lots No. 6 and No. 7, and warrant No. 5241 to a cut-stone monument; thence

(3) South 06 degrees 00 minutes west 239.20 rods through warrant No. 4 along line common to lots No. 7 and No. 8 to a stones corner; thence

(4) North 84 degrees 00 minutes west 50.20 rods through warrant No. 4 and lot No. 7 to an iron pipe and a stones corner;

thence by lands herein described, lands now or formerly of the Vic Landon Estate and lands now or formerly of Naglen along line through warrant No. 4 common to lots No. 6 and No. 7 and line common to warrant No. 4, lot No. 6 and warrant No. 5, lot No. 8 south 06 degrees 00 minutes west 116.84 rods to an iron pipe and a stones corner; thence by lands herein described and lands now or formerly of Naglen along line common to warrant No. 4, lot No.

6 and warrant No. 5, lots No. 8 and No. 7 north 81 degrees 52 minutes west 63.04 rods to a cut-stone corner monument, the place of BEGINNING.

CONTAINING 202 acres, 96 perches of land, be the same more or less.

The cut-stone monument at the southwest corner of the aforedescribed Parcel No. X is joined to a stones corner of Parcel No. VIII (northeastern corner of lot No. 5, warrant No. 5) by the following tie-line:

North 82 degrees 15 minutes west 96.00 rods.

CONTAINING 29,681 acres, 91 perches of land, be the same more or less, and being all or parts of original tracts as follows:

WARRANT NO.	WARRANTED TO	PATENTED TO	DATE	ENROLLED
5495	George Meade	George Meade	10-8-1794	P-24-93
5916	Philip Nicklin R. E. Griffith	Abm. Carlisle T. M. Allen	6-16-1836	H-36-204
5977	Philip Nicklin R. E. Griffith	Wm. Miller (in trust)	6-22-1835	H-33-410
5927	Philip Nicklin R. E. Griffith	Wm. Miller (in trust)	6-22-1835	H-35-170
809	Trustees of Franklin Col.	Trustees of Franklin Col.	3-16-1825	H-23-166
5916	Philip Nicklin R. E. Griffith	Abm. Carlisle T. M. Allen	6-16-1836	H-36-204
5932	Philip Nicklin R. E. Griffith	Fall Brook Coal Co.	3-29-1877	H-74-1
5982	Philip Nicklin R. E. Griffith	Wm. J. Miller (in trust)	6-22-1835	H-35-171
5046	James Wilson	Richard Stockton	7-14-1794	P-22-199
5045	James Wilson	Dr. Benj. Rush	7-12-1794	P-22-200
5047	James Wilson	Richard Stockton	7-14-1794	P-22-199
5048	James Wilson	Richard Stockton	3-27-1795	P-22-556
5052	James Wilson	Edward Burd	4-23-1817	H-14-96
5053	James Wilson	Edward Burd	4-26-1817	H-14-72
5054	James Wilson	Richard Stockton	7-16-1794	P-21-424
5055	James Wilson	Richard Stockton	7-16-1794	P-21-425
5914	Philip Nicklin Robert E. Griffith	Newton Lightner Adm.	2-18-1851	H-47-689
1868	Thomas M. Will- ing	Alex. Baring et al	5-29-1806	P-58-180
1184	Charles Willing	Alex. Baring et al	5-26-1806	P-58-194
1185	Charles Willing	Alex. Baring et al	5-26-1806	P-58-541

WARRANT NO.	WARRANTED TO	PATENTED TO	DATE	ENROLLED
1186	Charles Willing	Alex. Baring et al	5-26-1806	P-58-147
1875	Thomas M. Willing	Alex. Baring et al	5-29-1806	P-58-562
5050	James Wilson	Edward Burd	4-22-1817	H-14-94
5049	James Wilson	Edward Burd	4-25-1817	H-14-76
5051	James Wilson	Edward Burd	4-24-1817	H-14-92
1180	Chas. Willing	Alex Baring et al	5-26-1807	P-58-609
1181	Chas. Willing	Alex Baring et al	5-26-1806	P-58-187
1182	Chas. Willing	Alex Baring et al	5-26-1806	P-58-553
1183	Chas. Willing	Alex Baring et al	5-26-1807	P-58-604
5985	Philip Nicklin Robert E. Griffith	Conrad Kohler F. Boger	5-4-1854	H-51-155
5987	Philip Nicklin Robert E. Griffith	Conrad Kohler F. Boger	5-4-1854	H-51-155
5986	Philip Nicklin Robert E. Griffith	Chas. F. Veil	5-6-1870	H-66-316
2	William Wilson	William Wilson	11-19-1833	H-32-452
3	William Wilson	William Wilson	11-19-1833	H-32-456
4	William Wilson	William Wilson	11-19-1833	H-33-15
5	William Wilson	William Wilson	11-19-1833	H-32-454
7	William Wilson	William Wilson	11-19-1833	H-32-455
5903	John P. Helfenstine	John Snider	1-2-1806	P-56-252

WARRANT NO.	WARRANTED TO	PATENTED TO	DATE	ENROLLED
5980	Philip Nickline Robert E. Griffith	Wm. J. Miller (in trust)	6-22-1835	H-33-408
1	William Wilson	William Wilson	9-12-1833	H-32-453

The above described land was acquired by the BLOSSBURG COAL COMPANY, by deeds of conveyance, inter alia, as follows:

(1) Bloss Coal Mining and Railroad Company, dated June 13, 1890, recorded in Deed Book Volume 94 at page 234.

(2) The Fall Brook Coal Company, dated June 1, 1903, recorded in Deed Book Volume 122 at page 48.

(3) Trustees of the Bingham Estate, dated December 28, 1875, recorded in Deed Book Volume 56 at page 14.

(4) William H. Jessup, Trustee, dated August 16, 1884, recorded in Deed Book Volume 75 at page 512.

(5) Emmeline M. Gulick et al, dated August 25, 1834, recorded in Deed Book Volume 75 at page 514.

(6) F. N. Drake, dated November 29, 1831, recorded in Deed Book Volume 67 at page 20.

(7) Chas. F. Neil et ux, dated December 20, 1871, recorded in Deed Book Volume 48 at page 524.

(8) Conrad Kohler et ux, dated June 27, 1881, recorded in Deed Book Volume 66 at page 44.

(9) Edward G. Thompson et ux, dated December 24, 1872, recorded in Deed Book Volume 50 at page 325.

(10) Franklin N. Drake et ux, dated June 2, 1879, recorded in Deed Book Volume 61 at page 488.

(11) Mark Hoyt et ux, dated June 6, 1881, recorded in Deed Book Volume 64 at page 411.

(12) L. V. Gillette et ux, dated November 4, 1882, recorded in Deed Book Volume 69 at page 495.

(13) John C. Bennette et ux, dated October 18, 1877, recorded in Deed Book Volume 59 at page 144.

(14) H. J. Landrus et ux, dated June 28, 1880, recorded in Deed Book Volume 63 at page 363.

(15) Washington Landrus et ux, dated April 24, 1876, recorded in Deed Book Volume 56 at page 5231.

(16) Ralph E. Cross et ux, dated November 27, 1871, recorded in Deed Book Volume 48 at page 555.

(17) Washington Landrus et ux, dated February 19, 1875, recorded in Deed Book Volume 55 at page 213.

(18) Henry J. Landrus et ux, dated July 29, 1882, recorded in Deed Book Volume 75 at page 353.

(19) Fall Brook Coal Company, dated June 1, 1896, recorded in Deed Book Volume 106 at page 447.

(20) James A. Drake et ux et al, dated April 10, 1890, recorded in Deed Book Volume 91 at page 224.

The within described land was made the subject of a survey by A. R. Fine, Jr., under direction of John C. Rex, a licensed surveyor (No. 13778) in the period from October, 1952 to June, 1953, and two (2) prints made from plats as the result of said survey, entitled "Blossburg Coal

Company Purchase - Parcels No. 1 & 2" and "Blossburg Coal Company Purchase - Parcels No. 2 to 10" are attached to and made a part of this instrument.

EXCEPTING AND RESERVING to the GRANTOR, its successors and assigns, all coal, natural gas, oil, petroleum and other minerals in, under and upon the surface herein described with the right and privilege of mining and removing the same, and to erect all structures and appliances necessary for that purpose, including the right to mine by the stripping method in a limited area, set out below, in the vicinity of the Village of Arnot; and also the right at all times to enter into and upon said surface to drill wells, lay pipes and erect and maintain all structures and appliances necessary or convenient for searching for, procuring and removing any natural gas, oil and/or petroleum that may be found therein or thereon or thereunder.

PROVIDED, HOWEVER, that all mining activities shall be conducted in such a manner as not to cause subsidence to the surface nor injury to growing timber or structures erected thereon, and no mining shall be conducted on the premises by the open pit or strip mining method except on that portion now under lease and under existing provisions in leases of record affecting that area, comprising 1,177 acres, more or less, and being portions of warrants No. 5046, 5047 and 5054, located in the Townships of Duncan and Bloss, County of Tioga and Commonwealth of Pennsylvania, bounded and described, as follows: and being in lease dated August 5, 1938 from The Blossburg Coal Co. to Raymond F. Guy, et al., and amendment thereto dated February 25, 1942,

BEGINNING at a point in the westerly line of warrant No. 5932 which point is also the northeasterly corner of a parcel of land conveyed to John Berguson et al; thence along the westerly line of warrant No. 5932 north 2620 feet, more or less, to a point; thence crossing through warrants Nos. 5046 and 5047 west 14,370 feet, more or less, to the westerly line of said warrant No. 5047; thence along the westerly line of warrant No. 5047 south 5000 feet, more or less, to the right-of-way of the railroad branch formerly leading to Maple Hill; thence in an easterly direction along the said railroad right-of-way 9200 feet, more or less, to the intersection of said railroad right-of-way and the center of the road leading from Village of Arnot to Wellsboro which point is also in the westerly line of that parcel of land conveyed to John Berguson et al aforesaid; thence along the center of said highway in a northerly direction 1400 feet, more or less, to a point; thence east along the northerly line of aforesaid parcel of land conveyed to John Berguson et al aforesaid, 5600 feet, more or less, to the place of BEGINNING.

CONTAINING one thousand one hundred seventy seven (1,177) acres, more or less.

THIS CONVEYANCE is made under and subject to all leases of record now in effect for interests in the above described land, as follows:

LESSEE	DATE	USE	LOCATION
C. R. Adams	Aug. 9, 1947	Camp Site	Blossburg-Bloss Twp.
Blossburg Water Company et al	Jan. 4, 1933	51.6 acres	Blossburg Township
Raymond F. Guy and Leon Norman	Aug. 26, 1940	5.0 acres	Bloss Township
Phillip Norman	July 30, 1945	R/W. Road	Blossburg
Edward Rokski	Nov. 8, 1948	3 Signboards	Bloss Township
E. B. Stroble	Sept. 26, 1947	One Acre-Camp	Bloss Township

LESSEE	DATE	USE	LOCATION
Swedish Church of Arnot / Penna.	June 11, 1897	Cemetery	Bloss Township
Valley Chemical Company	Sept. 23, 1949	Chemical Wood contract 50¢ per cord.	Bloss Township
Northern Penna. Power / Co.	Apr. 1, 1928	R/W Pole Line	Covington Township

THIS conveyance is made in pursuance of a resolution moved, seconded and unanimously adopted by the board of directors of the BLOSSBURG COAL COMPANY, at a meeting, duly convened upon proper advance notice to all directors, of the time, place and purpose of authorizing the sale and conveyance of the within described land, at which meeting there was present and voting a majority of the said directors, and all of whom voted in favor of the resolution, a certified copy of which is attached hereto, marked "Exhibit A" and made a part of this instrument.

TOGETHER with all and singular the improvements, streets, alleys, passages, ways, waters, watercourses, rights, liberties, privileges, hereditaments and appurtenances whatsoever, thereunto belonging or in anywise appertaining, and the reversions and remainders, rents, issues and profits thereof; and all the estate, right, title, interest, property, claim and demand whatsoever of it, the said grantor, in law, equity or otherwise howsoever, of, in and to the same and every part thereof.

TO HAVE AND TO HOLD the said tracts, parcels, lots, plots or pieces of land above described, hereditaments and premises hereby granted, or mentioned and intended so to be, with the appurtenances, unto the said grantee and its assigns, to and for the only proper use and behoof of the said grantee, and its assigns forever.

AND the said BLOSSBURG COAL COMPANY, the herein named grantor, for itself, its successors and assigns, does covenant, promise and agree to and with the said grantee, and its assigns, by these presents that it, the said grantor, all and singular the hereditaments and premises hereby described and granted or mentioned and intended so to be with appurtenances unto the said grantee, and its assigns, against it the said grantor, and against all and every other person and persons whomsoever lawfully claiming or to claim the same or any part thereof, shall and will, by these presents forever warrant and defend.

IN WITNESS WHEREOF, the BLOSSBURG COAL COMPANY, has caused this Indenture to be duly executed by J.A Martin its President, thereunto he being duly authorized, and its corporate seal to be hereunto affixed and duly attested, the day and year first above written.

BLOSSBURG COAL COMPANY

BY J.A Martin
President

ATTEST: Fred V. Lynn
Secretary.

VOL 272 PAGE 323

Addendum A
Conversion Site # 17

COMMONWEALTH OF PENNSYLVANIA :
: ss
COUNTY OF ~~TIOGA~~ Lackawanna :

On this, the 10th day of November, 1954, before me, a NOTARY PUBLIC, the undersigned officer, personally appeared J. A. Martin who acknowledged himself to be the President of the BLOSSBURG COAL COMPANY, a corporation, and he as such President, being authorized to do so, executed the foregoing instrument for the purposes therein contained, by signing the name of the corporation by himself as President.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

James E. Hazcock
NOTARY PUBLIC

My Commission Expires: My Commission Expires January 7, 1955

-44-

CERTIFICATE OF RESIDENCE

I hereby certify that the principal office and place of doing business of the Commonwealth of Pennsylvania, the within named grantee, is Main Capitol Building, Harrisburg, Pennsylvania.

Raymond C. Miller
Raymond C. Miller,
Deputy Attorney General.

Goldthorp Dewitt Cox & Wilcox
By Thomas E. Wilcox
Atty's

THE BLOSSBURG COAL COMPANY

"At its meeting on June 27, 1951, the Board approved the sale of the remaining surface owned by The Blossburg Coal Company, about 28,500 acres, all of which is located in Tioga County, Pennsylvania, to Kovalchick Salvage Company of Sykesville, Pennsylvania, at a rate of $4.00 an acre, the Coal Company reserving the oil, gas, coal and other minerals thereunder. The offer of Kovalchick Salvage Company was not accepted, however, pending a decision from the State Department of Forests and Waters which, as reported at the Board meeting on August 22, 1951, had revived its interest in the Company's lands.

"The Secretary of the Department of Forests and Waters of the State of Pennsylvania recently accepted our offer to sell this surface to the State for $5.00 an acre, the Company reserving the oil, gas, coal and other minerals. The Board was so advised and on motion duly seconded and carried the Board ratified the management's agreement to sell this surface to the State of Pennsylvania at a rate of $5.00 an acre instead of accepting Kovalchick Salvage Company's offer of $4.00 an acre."

THE BLOSSBURG COAL COMPANY

I HEREBY CERTIFY that the above is a true excerpt from the minutes of meeting of the Board of Directors of The Blossburg Coal Company held at the office of the Company in Dushore, Pennsylvania, November 28, 1951.

Secretary

Dated: October 13, 1954

"Exhibit A"

2087

Parcel #1

Parcel #2

Parcel #3

WT. 1577 — Wellsboro Water Co. — Stephan Boyce — 12 Point Hunting Club — WT. 1580 — WT. 1581 — WT. 1584 — WT. 1585 — WT. 1588 — WT. 1179 — WT. 1178 — WT. 1177

WT. 5044 — Reese — Knape — F. Knape — Reese — S. 82°30' E. 559.80 — S. 83° 29' E. 612.00 — S. 83°00' E. 310.24

WT. 5050 JAMES WILSON 109? a.s. Wt. Feb. 3, 1794 Sur. June 16, 1794 D-8-63 Pat: April 22, 1817 to Edward Burd H-14-94

WT. 5049 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 16, 1794 D-11-155 Pat.: April 25, 1817 to Edward Burd H-14-76

WT. 5048 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 16, 1794 A-71-21 Pat: March 27, 1795 to Richard Stockton P-22-556

WT. 5047 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 17, 1794 C-230-164 Pat: July 14, 1794 to Richard Stockton P-22-199

WT. 5046 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 17, 1794 C-230-162 Pat: July 14, 1794 to Richard Stockton P-22-199

WT. 5045 JAMES WILSON 1081 ½ a.s. Wt. Feb. 3, 1794 Sur. June 17, 1794 P-247 Pat. July 12, 1794 to Dr. Benj. Rush P-22-200

WT. 5051 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 16, 1794 D-8-64 Pat: April 24, 1817 to Edward Burd H-14-92

WT. 5052 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 17, 1794 D-8-65 Pat: Apr 23, 1817 to Edward Burd H-14-96

WT. 5053 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 16, 1794 D-8-61 Pat: Apr 26, 1817 to Edward Burd H-14-72

WT. 5054 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 17, 1794 C-230-163 Pat: July 16, 1794 to Richard Stockton P-21-424

WT. 5055 JAMES WILSON 1099 a.s. Wt. Feb. 3, 1794 Sur. June 17, 1794 P-246 Pat: July 14, 1794 to Richard Stockton P-21-425

WT. 5496 — WT. 5495 GEORGE MEAD 1100 a.s. Wt. Mar. 4, 1794 Sur. July 17, 1794 M-285 Pat. Oct. 8, 1794 to Geo. Meade P-24-93

WT. 5494 GEORGE MEAD 1100 a.s. Wt. Mar. 4, 1794 Sur July 16, 1794 C-131-284 Pat: Oct. 8, 1794 to Geo. Meade & Heirs P-24-95

WT. 5916 NICKLIN & GRIFFITH 1100 a.s. Wt. March 19, 1805 Sur. Nov. 20, 1807 C-170-118 Pat.: June 16, 1836 to Abm. Carlisle & T.M.A. Allen H-36-204

WT. 5977 NICKLIN & GRIFFITH 1100 a.s. Wt. Mar. 19, 1805 Sur. Nov. 18, 1807 C-170-121 Pat: June 22, 1835 to Wm. Miller, in trust H-33-410

WT. 5927 NICKLIN & GRIFFITH 1100 a.s. Wt. March 19, 1805 Sur. Nov. 18, 1807 S-283

WT. 5835

WT. 809 FRANKLIN COLLEGE 300 a.s. Wt. June 14, 1787 Sur. Oct. 30, 1788 A-32-155 Pat. Mar 16, 1825 to Trustees Franklin Col. H-25-166

WT. 6008

WT. 613

WT. 5932 NICKLIN & GRIFFITH 1061 a.s. 126 ps. Wt. March 19, 1805 Sur. Nov. 21, 1807 C-200-17 Pat: March 29, 1877 to Fall Brook Coal Co. H-74-1

Pat: June 22, 1835 to Wm. J. Miller, in trust H-35-170

WT. 5982

WT. 5914 NICKLIN & GRIFFITH 1100 a.s. Wt. March 19, 1805 Sur. Nov. 20, 1807 S-255 Pat: Feb. 18, 1851 to Newton Lightner, Adm. H-47-689

WT. 5955 — WT. 5970 — WT. 5978 — WT. 5976 — WT. 5980 — WT. 5985 — WT. 5987

WT. 5903 JOHN P. HELFENSTINE 87 a.s. 60 ps. Wt. March 18, 1805 Sur. Oct. 23, 1805 C-464 Pat: Jan. 2, 1805 to John Snider P-56-252

WT. #1 — Lot #1 — Lot #2 — Lot #3 — Lot #4

WT. 1875 THOMAS M. WILLING 1099 a.s. Wt. Aug. 18, 1792 Sur. June 7, 1793 A-72-241 Pat. May 29, 1806 to Alex Baring et al. P-58-562

WT. 1186 CHARLES WILLING 1099 a.s. Wt. Apr. 21, 1792 Sur. June 6, 1793 A-72-242 Pat: May 26, 1806 to Alex Baring et al P-58-147

WT. 1185 CHARLES WILLING 1099 a.s. Wt Apr. 21, 1792 Sur. June 6, 1793 A-72-243 Pat: May 26, 1806 to Alex Baring & others P-58-541

WT. 1184 CHARLES WILLING 1099 a.s. Wt Apr. 21, 1792 Sur. June 6, 1793 A-72-244 Pat: May 26, 1806 to Alex Baring & others P-58-194

WT. 1868 THOMAS M. WILLING 1099 a.s. Wt. Aug. 18, 1792 Sur. June 3, 1793 A-72-251 Pat: May 29, 1806 to Alex Baring & others P-58-180

WT. 1180 CHAS. WILLING 1099 a.s. Wt. Apr. 21, 1792 Sur. June 4, 1793 A-72-226 Pat: May 26, 1807 to Alex. Baring & others P-58-609

WT. 1181 CHARLES WILLING 1099 a.s. Wt. Apr. 21, 1792 Sur. June 5, 1793 A-72-240

WT. 1182 CHARLES WILLING 1099 a.s. Wt. Apr. 21, 1792 Sur. June 5, 1793 A-72-274

WT. 1183 CHARLES WILLING 1099 a.s. Wt. Apr. 21, 1792 Sur. June 5, 1793 A-72-230 Pat: May 26, 1807 to Alex Baring et al P-58-604

Pat: May 26, 1806 to Alex Baring & others P-58-187

Pat: May 26, 1806 to Alex Baring & others P-58-553

ABANDONED ERIE R.R. GRADE Acquired by Commonwealth — 60' R/W — 20' R/W Deeded to Arnot Village — ARNOT VILLAGE — Bailey Run — Old Erie R.R. Grade — Mill Creek — Old Erie R.R. Grade — Tie Line S. 84° E. 372.40 — See Map #2679 — 160' R/W — Route #15 — Hamilton Twp. — Liberty Twp.

Swedish Cemetery Lot See detail on Tracing #2606

Old Erie R.R. Grade — Mill Creek — Old Erie R.R. Grade — Tie Line S. 83°08' E. 267.20 — See Map #2679 — 160' R/W

COLBURN CLEMENS WT. — Tan Brook Run — Richards — Dummings — Alex. Hutchinson — C. Ayres — V.F.W. Club — Spoil Banks — Shelter — Old Erie R.R. Grade — Borough of Blossburg — Blossburg Township — Covington Twp. — Hamilton Twp.

Covington Twp. — Hamilton Twp. — Borough of Blossburg — Blossburg Twp. — Duncan Twp. — Blossburg Twp. — Duncan Twp. — Morris Twp. — Liberty Twp. — Hamilton Twp. — Liberty Twp. — Duncan Twp. — Morris Twp.

Wellsboro Water Co. — Old Cut Stn. — Old S.F. Stn. — Old Stone Fence — Old Iron Fence — Old Wire Fence — Old Fence — Old Stone Wall — Old Stone Dam — Old Stone Foundation — Old Stone Abutments — Old Iron Bridge — Old Iron Pipe — Old Iron Rail — Old Iron Post — Old Iron Stake — Old Iron Pin — Old Iron Axle — Old Iron Spike — Old Iron Bolt — Old Iron Rod — Old Iron Pipe — Old Iron Stake — Old Iron Pin — Old Iron Axle — Old Iron Spike — Old Iron Bolt — Old Iron Rod

Abandoned Erie R.R. Grade — Acquired by Commonwealth — Abandoned Stripped Area — Abandoned Erie R.R. Grade — Abandoned Stripped Area — Old Erie R.R. Grade — Old Erie R.R. Grade — Old Erie R.R. Grade

M-O&G (12-80)
Oil and Gas Lease

Commonwealth of Pennsylvania
Department of Environmental Resources
Minerals Section, Bureau of Forestry
P. O. Box 1467
Harrisburg, Pennsylvania 17120

CONTRACT NO.
M-110259-10

OIL AND GAS LEASE FOR STATE FOREST AND PARK LANDS*

THIS AGREEMENT made and entered into on this 20th day of January, 1981, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF ENVIRONMENTAL RESOURCES, hereinafter designated "Department" and BUEL H. NEECE, with his principal place of business at P. O. Box 550, Sperry, Oklahoma 74073, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH: THAT,

WHEREAS, Department is authorized by the Act 275 of December 3, 1970, P.L. 834, 71 P.S., Sections 1902A and 1906A, as amended to lease State Forest and Park lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the opening of the bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

NOW THEREFORE, in consideration of the sum of EIGHTY-FOUR THOUSAND SIX HUNDRED THIRTY-SEVEN AND 00/100 DOLLARS ($84,637.00), paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas, and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, TRACT NO. 259 containing 3,655 acres, more particularly described on the Oil and Gas Lease Attachment identified as Exhibit "A" and as shown on the Map identified as Exhibit "C" which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as Exhibit "C" are approximate.

*When this lease is granted in whole or in part on State Park land, then the words "State Forest land" shall be understood to mean State Park land in their entirety or in part whichever shall apply, wherever the words appear in the lease; and the words, "District Forester," shall be understood to mean "Park Superintendent."

1. TERM OR PERIOD

1.1 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth and shall continue from year to year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder, or engaged in the abandonment, or plugging of wells or removal of equipment therefrom.

2. RENTAL

2.1 Lessee shall pay to Department a rental for the above described leased premises at the following rate: the first year's rental shall consist of the bonus payment which was competitively bid by Lessee and shall be payable upon delivery of this lease to Lessee; the second and third years' rental shall be TWO DOLLARS ($2.00) per acre each year payable upon the anniversary date of this lease; for the fourth and all subsequent years thereafter, the rental shall be THREE DOLLARS ($3.00) per acre each year payable upon the anniversary date of this lease.

2.2 The drilling of each well in the leased premises as provided in Section 9 shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 10, which reduction shall become effective on the next rental date, provided the well is a producer. If such wells are drilled on a unit created by a spacing order issued by Department or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3. OIL ROYALTY

3.1 Lessee shall pay to Department, as royalty, ONE-EIGHTH (1/8th) of the field price per barrel (42 U.S. Gallons) at 60° F produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks.

3.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises.

3.3 If oil, gas, condensate, and other liquid hydrocarbons each in paying quantities should be developed from the same well, then the oil and the gas, condensate, and other hydrocarbons shall be saved.

3.4 Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with standard practices as outlined in American Petroleum Institute Standard 2500, January 1, 1955, or as subsequently amended by the same authority, and at a temperature base of 60° F. Lessee shall provide tanks for accurately measuring the crude oil produced from the lease. Positive copies of one hundred percent (100%) capacity tank tables are to be furnished to Department or other acceptable standards of measuring production.

4. GAS ROYALTY

4.1 Lessee shall pay to Department, as royalty, THIRTY CENTS ($0.30) per thousand cubic feet (Mcf) or ONE-EIGHTH (1/8th) of the market value, whichever is higher, for all natural gas, casinghead gas, or other gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; said royalties shall be payable monthly at the prevailing market value for natural gas in the area at the time of delivery.

4.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all gas and other gaseous substances produced and saved from the leased premises.

5. GAS MEASUREMENT

5.1 The volume of gas produced, saved, and marketed shall be measured according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

a. The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

b. The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, irrespective of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

c. The temperature of the gas passing the meters shall be determined: (1) by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes; (2) if a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of fifty degrees Fahrenheit (50° F) shall be used in computing gas volume.

d. The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, at intervals of three (3) months, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

e. The deviation of the natural gas from Boyle's Law shall be determined by tests at intervals of three (3) months or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with the recommendations of the National Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

6. PAYMENTS

6.1 Lessee shall be held responsible for the payment of all royalties, which shall be mailed to the office of Department at Harrisburg, Pennsylvania, and made payable to Department. Payments of royalties shall be made not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

6.2 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

7. OPERATIONS

7.1 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up to date oil and gas field practices.

7.2 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department's Bureau of Soil and Water Conservation. A copy of the plan shall be forwarded to the Minerals Section, Bureau of Forestry, P. O. Box 1467, Harrisburg, Pennsylvania 17120 and District Forester.

8. RESTRICTIONS

8.1 Under Department's multiple use policy, the leased premises are continuously used for recreation, conservation and other purposes and many Department authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions:

(a) No drilling is permitted within 200 feet of any building.

(b) No drilling is permitted within 100 feet of any stream or body of water.

(c) No drilling is permitted within 330 feet of any picnic area which has been so designated by Department.

(d) No drilling is permitted within 330 feet of any trail, road or existing right of way.

(e) No drilling is permitted within 100 feet of any area of historic value, tree plantation, overlook, vista or fire tower site.

(f) No drilling is permitted for oil within 660 feet of the boundary line of leased premises.

(g) No drilling is permitted for natural gas within 2,640 feet of the boundary line of leased premises where it is contiguous with State Park lands or other special-use State Forest lands, such as, Wild Areas and Natural Areas.

(h) In addition, the following specific restrictions for this lease shall also apply:

_____
_____
_____
_____
_____
_____

8.2 Upon written request by Lessee, Department may waive in writing any portion of the above restrictions if in Department's judgement such a waiver is justified and in its best interests.

9. FIRST WELL

9.1 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well on the leased premises or on unitized acreage containing a portion of the leased premises, but the well need not necessarily be on the portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, the lease shall be automatically terminated in its entirety, unless Department approves in writing, thirty (30) days in advance of the anniversary date of this lease, the continuation of the lease on a year to year basis.

10. SUBSEQUENT WELLS

10.1 If the "FIRST WELL" drilled by Lessee or any subsequent well is productive of oil and/or gas and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises, but not necessarily on the portion of the leased premises contained within the unit, as would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If an additional well is necessary, it must be commenced within six (6) months after the completion of the last well drilled; provided, however, that if Lessee concludes an additional well is not justified then Lessee shall submit to Department the information upon which the conclusion is based. Upon review of such information if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within six (6) months from Department's determination or releasing all of the acreage covered by the lease except forty (40) acres around each well from which oil is produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product and has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres around each shallow well from which gas is being produced as the principal product which has been completed above the Onondaga Formation, or that amount of leased acreage actually contained within an established unit, whichever is less.

10.2 Lessee shall not be required under this provision to drill more wells than required or allowed under any spacing order, rule, or regulation of Department, or in the absence of any such order, more than one well for each forty (40) acres where oil is being produced as the principal product of such well, or more than six hundred forty (640) acres where gas is being produced as the principal product of such well and has been drilled to the Onondaga Formation or deeper, or more than three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which is productive from formations above the Onondaga Formation.

10.3 The amount of acreage included in a spacing unit by Department, or in the absence of an order by Department, forty (40) acres where oil is being produced as the principal product of such well, or six hundred forty (640) acres where gas is being produced as the principal product of such deep well which has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which has been drilled to formations above the Onondaga Formation, shall be referred to elsewhere in the lease as "acreage attributable to a well."

11. DEVELOPMENT

11.1 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

11.2 Well spacing shall not be closer than one (1) well per forty (40) acres; should closer spacing be required, written approval must be obtained from Department.

12. OFFSETS

12.1 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth that is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, and any well drilled on leases not owned by the Commonwealth that is completed within two thousand six hundred and forty (2,640) feet of the boundary line of the leased premises and from which gas is being produced as the principal product; or any well drilled on leases not owned by the Commonwealth that is completed within the radius of the drainage areas set by an order of Department; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may at its discretion relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except forty (40) acres around each well from which oil is being produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product, or that acreage attributable to a well by an order of Department if the affected acreage falls within an area subject to such a spacing order.

12.2 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on leases not owned by the Commonwealth and if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression.

12.3 Lessee agrees that any well along the boundary line, contiguous to other lands where minerals, oil and/or gas are owned by the Commonwealth, shall be located at least six hundred and sixty (660) feet from such boundary if oil is the principal product anticipated from the objective formation of the well or at least two thousand six hundred and forty (2,640) feet from such boundary if gas is the principal product anticipated from the objective formation of the well, or that distance from such boundary line which will be the radius of the drainage area set forth by an order of Department, if the area is subject to such a spacing order.

12.4 Upon application by Lessee, this provision providing for the distance from such boundary line may be waived by Department when deemed in the interest of the Commonwealth and not in an area subject to a spacing order of Department.

13. UNITIZATION

13.1 Lessee shall have the right at any time or times to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering, with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises or portions thereof with adjoining lands to prevent the drilling of an excessive number of wells or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

13.2 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of any such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises.

13.3 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

14. SEISMIC SURVEYS

14.1 Lessee, its agents, contractors and subcontractors and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit to District Forester for his approval a map showing the location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to him, Lessee must obtain the customary Seismic Survey Permit from Department. The bond, hereinafter described, shall be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

15. PIPELINES

15.1 Lessee is herewith granted the right to lay any necessary pipelines on or under the leased premises; however, a route map for each line shall be submitted to District Forester for his approval as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, it must enter into the customary pipeline right of way agreement with Department.

16. DRILLING

16.1 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before the drilling thereof is commenced, and no well shall be commenced until a permit has been issued where necessary by Department's Oil and Gas Regulation Division.

16.2 Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

16.3 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth.

16.4 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

16.5 Lessee shall maintain at all times the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells or wells being serviced by a rig shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall at all times be available for efficient operations. Blowout control equipment must be capable in case of an emergency to shut in the well at a point at least fifty (50) feet from the wellhead.

16.6 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is the highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head or leaking oil or gas between the producing string and next larger size casing string when such pressures or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

16.7 While a well is being drilled with mud or water as a drilling fluid, Lessee shall test control equipment daily to the extent possible without causing premature removal of drill pipe from the hole while drilling and record the results of such tests daily. While a well is drilling with air or gas as a drilling fluid, Lessee may test control equipment only during trips for the drilling bit.

16.8 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

16.9 Drilling mud of sufficient weight to prevent oil, gas or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

16.10 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

16.11 Lessee shall use a casing program which complies with oil and gas statutes and rules and regulations of the Commonwealth and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies and blowouts.

16.12 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

16.13 The production casing shall be of new or reconditioned seamless pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(i) The maximum anticipated rock pressure at any point in the casing string shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield as shown in A.P.I. Bulletin 5-C-2 dated April, 1972 or later amendments.

(ii) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated at any point in the casing does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield as shown in A.P.I. Bulletin 5-C-2 or later amendments.

16.14 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After the corrective operation, the casing shall again be tested in the same manner.

16.15 All surface casing and production casing shall be cemented in the ground with good quality cement equalling or exceeding A.P.I. specification in the manner hereinafter described.

16.16 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department.

16.17 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In the event that the cement cannot be circulated to the surface due to the presence of fractures or other lost circulation zones, Lessee shall determine as accurately as possible the depth of the top of the cement in the annular space behind the casing and record it on the well record.

16.18 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another or to the surface does not occur behind the casing.

16.19 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval of Department.

16.20 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not allow the well to blow open, except in case of an emergency over twenty-four (24) hours after drilling-in. Lessee will pay Department at the regular royalty rate for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

16.21 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Test Method (USBM-Monograph 7) or by other methods standard to the industry and approved by Department.

16.22 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

16.23 At least once every six (6) months, Lessee will determine the open flow potential of each producing well as required in Section 16.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive in writing all or parts of this requirement if during any calendar year production averages less than sixty (60) Mcf per day and/or the semiannual twenty-four (24) hour pressure tests show reservoir pressures to be less than one hundred (100) psi.

16.24 Lessee shall at all times conduct prudent drilling operations, including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

16.25 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

16.26 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

16.27 Lessee shall

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) after H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) use special steel pipe and casing which is resistant to H_2S stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) post warning signs around all wellsites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to and at a safe distance from all facilities handling the H_2S gas including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

(h) immediately notify Department and record on appropriate well records and driller's logs any H_2S gas found in the course of drilling or producing operations.

17. REPAIR OF EQUIPMENT

17.1 Lessee does hereby agree that it will, at all times, during the continuance and delivery of oil, gas, and liquid hydrocarbons, to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

18. WELL RECORDS, LOGS AND REPORTS

18.1 Lessee shall keep a daily drilling record which will describe the formations penetrated, depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. Any other data that is usually acquired in the normal procedure of drilling shall be recorded and furnished to Department, such as drilling time, rate of fill-up, lost circulation zones, caving strata, casing records, core analyses, mud log analyses, perforation, and production test data. Within thirty (30) days after completion of each well, Lessee shall furnish Department an accurate location plat, a detailed lithologic log, a detailed history of the well and all well data including geologic, driller, electrical, and any other well surveys made to obtain subsurface information. Upon request, samples of all formations penetrated and parts of cores taken, accurately labeled with the name of the well, and interval of depth shall be furnished to Department at Lessee's expense. If requested, Lessee shall ship a complete set of samples to the Pennsylvania State Geological Survey, Room 1201, Kossman Building, 100 Forbes Avenue, Pittsburgh, Pennsylvania 15222, within thirty (30) days after completion of each well.

19. AUDITS

19.1 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the lease. Department may keep such charts for examination for a period not to exceed ninety (90) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, and other products produced from the leased premises.

19.2 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, and liquid hydrocarbons, produced from any well covered by this lease, to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payments to Lessee, his heirs, administrators, executors, successors, and assigns for oil, gas, and liquid hydrocarbons from wells covered by this lease.

19.3 Lessee further grants to Department the right at any time to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from cancelling this lease upon delivery to Lessee of written notice of Department's intention.

20. LESSEE'S TERMINATION

20.1 Lessee may at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

20.2 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 10. Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

21. REMOVAL

21.1 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to remove all buildings, machinery, wells, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations, to fill and level all pits, and to the extent practicable, to restore the property to the same condition as when received.

22. RELEASE

22.1 Lessee shall not be granted a final release from the terms of this lease until District Forester has met with Lessee's field engineer on the ground, inspected the premises, and received a signed statement of release from Department indicating the proper cleanup has been completed.

23. PLUGGING

23.1 Lessee shall properly and effectively plug all wells on the leased premises before abandoning in accordance with the regulations of the Department's Oil and Gas Regulation Division and all applicable laws of the Commonwealth. A copy of the plugging procedure approved by the Oil and Gas Regulation Division shall be supplied to the Minerals Section, Bureau of Forestry. In addition to the above mentioned requirement upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements will be reason for cancellation of this lease and the posted bond will be forfeited in order that Department may properly plug the wells.

23.2 The plugging procedures, as herein stated, shall also include all shallow wells drilled in areas which are not coal productive and are not covered by the regulations of Department (Certificate of Plugging form may be obtained from Department's Oil and Gas Regulation Division).

24. ABANDONMENT AND STORAGE RIGHTS

24.1 In the event the development of this lease demonstrates, in the opinion of Department, that this tract has potential value as a gas storage reservoir (no storage rights are demised to Lessee under the terms of this lease), the well, equipment, property, and casing involved shall first be offered to Department, its nominee or assignee, at the then fair market value of those items before any well shall be plugged. Such firm offer shall be made in writing to Department at least thirty (30) days prior to commencement of removal of the equipment from the well by Lessee.

25. DEPARTMENTAL TERMINATION

25.1 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) days after demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

25.2 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a writ of Habre Facias Possessionem (without asking leave of court) waiving all stay and exemption laws and release of errors.

26. INDEMNITY

26.1 Lessee shall at all times hereinafter indemnify and save harmless Department from and against all detriment, damage, loss, claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

27. BOND

27.1 Lessee agrees to give Department a surety or performance bond with satisfactory corporate surety in the principal sum of TWENTY-FIVE THOUSAND DOLLARS ($25,000.00) with judgment clause in a form to be approved by the Attorney General conditioned on the faithful performance of the covenants of this lease. The bond shall be further conditioned that in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells upon termination of this lease, or within six (6) months from the termination, Commonwealth can execute upon the bond to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the bond shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises.

28. RELATED AGREEMENTS

28.1 Department will be furnished for record purposes and to protect its interests a copy of all agreements, contracts, letters or memoranda entered into, made, or sent by Lessee in any way concerning the development, operation, or sale of products from this lease.

29. ASSIGNMENTS

29.1 Lessee shall not use or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned and assignee, thereof, shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

30. LIMITATION ON WARRANTY

30.1 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the rents, rentals, and royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the proportion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may with the approval of the Attorney General enter into an escrow arrangement for future rents and royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the rents and royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The rents and royalties placed in escrow shall be refunded to Lessee in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

31. FORCE MAJEURE

31.1 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance, therewith, is prevented by or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If at the end of the primary term, hereof, such term has not been extended by production or drilling as in this lease provided and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the rental provision, hereof, shall be extended automatically from year to year for a period not to exceed ten (10) additional years unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises by reason of any of the above recited causes, this lease shall remain in full force and effect.

32. THIRD PARTIES' RIGHTS

32.1 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) have hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature.

33. PUBLICATION AND NOTICE

33.1 Within thirty (30) days following the receipt by Lessee of a copy of this lease, fully executed, Lessee shall record the lease in the county or counties in which the leased premises lie. Within thirty (30) days following the recording, Lessee shall advise Department in writing of the recording reference data. Thereafter, Department shall cause to be published in the Pennsylvania Bulletin at least the following information:

(1) the subject of this lease;
(2) the general location of the leased premises;
(3) the names of Department and Lessee; and
(4) the recording reference date for this lease.

34. LIABILITY

34.1 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, irrespective of whether or not such pollution or damage be due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause be found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises the pollution or other damage would not have occurred, it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

35. RIGHTS RESERVED BY DEPARTMENT

35.1 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

35.2 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

35.3 Department reserves the right to approve in writing all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises, unless upon due cause shown, Department waives the thirty (30) day requirement and allows a lesser, but reasonable, time for review.

35.4 The surface rights of Department shall be considered dominant and the oil and gas rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

36. PROTECTION AND CONSERVATION

36.1 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as Exhibit "B" attached hereto and made a part hereof.

36.2 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

Lucy M. Cunks

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

CLIFFORD L. JONES, Secretary

ATTEST:

Mark E. Martin
(Mark E. Martin)

LESSEE
(BUEL H. NEECE)

APPROVED AS TO LEGALITY
AND FORM:

Deputy General Counsel

~~ASSISTANT~~ ATTORNEY GENERAL
Deputy

APPROVED:

DRW GOVERNOR 3/9/81

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DAUPHIN

On this the 4th day of March, 1981, before me LUCY M. CUNKO, the undersigned officer, personally appeared CLIFFORD L. JONES, who acknowledged himself to be Secretary of Environmental Resources of the Commonwealth of Pennsylvania and that he as such Secretary of Environmental Resources being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing his name as CLIFFORD L. JONES, Secretary.

In Witness Whereof, I hereunto set my hand and official seal.

Lucy M. Cunko
Notary Public

Lucy M. Cunko, Notary Public
My Commission Expires May 2, 1983
Harrisburg, PA Dauphin County

ACKNOWLEDGMENT FOR INDIVIDUAL

STATE OF OKLAHOMA)
)ss.
COUNTY OF TULSA)

Before me, the undersigned, a Notary Public, in and for said County and State, on this 20th day of January, 1981, personally appeared BUEL H. NEECE, personally known to me to be the identical person who executed the within and foregoing instrument, and acknowledged to me that he executed the same as his free and voluntary act and deed, for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my official signature and affixed my official seal the day and year first above written.

My commission expires May 1, 1982.

Mark E. Martin
Mark E. Martin, Notary Public

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "A"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-110259-10, by and between: COMMONWEALTH OF PENNSYLVANIA and BUEL H. NEECE.

Tract 259

State Tract 259 containing 3,655 acres of Sproul State Forest land comprising all of the James Tower, John Dewart, Thomas Grant, John Kidd, John Brady and Benjamin Young Warrants and parts of the Henry Donely and John Donely Warrants in Burnside Township, Centre County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from C. M. Bower hy deed dated July 25, 1900, from S. P. Wolverton, L. H. Rohrbach and M. H. Kulp by deed dated April 10, 1900, and from William McClean and Henry Pleasants, Executors of the Last Will and Testament of Howard Spencer by deed dated August 2, 1906, and described as follows:

Beginning at the northwest corner of the John Brady Warrant, also being the northeast corner of the William Brady Warrant, also being a point on the Sproul State Forest boundary line; thence eastward approximately 9,850 feet along the north lines of the John Brady and Thomas Grant Warrants to the northeast corner of the Thomas Grant Warrant, also being a point on the west line of the James Tower Warrant; thence northward approximately 600 feet along the west line of the James Tower Warrant to the northwest corner of the James Tower Warrant; thence eastward approximately 6,700 feet along the north line of the James Tower Warrant to the northeast corner of the James Tower Warrant; thence southward approximately 8,250 feet along the James Tower and John Dewart Warrants to the southeast corner of the John Dewart Warrant; thence westward approximately 6,650 feet along the south line of the John Dewart Warrant to the southwest corner of the John Dewart Warrant, also being a point on the east line of the John Kidd Warrant; thence southward approximately 2,650 feet along the east lines of the John Kidd and John Donely Warrants to the southeast corner of the "nonoverlapping part" of the John Donely Warrant; thence westward approximately 10,050 feet along the south lines of the John Donely and Henry Donely Warrants to the southwest corner of the "nonoverlapping part" of the Henry Donely Warrant; thence northward approximately 10,500 feet along the west lines of the Henry Donely, Benjamin Young and John Brady Warrants to the northwest corner of the John Brady Warrant, the place of the beginning.

(1-77)
Revised (12-74)
Stipulation Form

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

EXHIBIT "B"

STIPULATIONS FOR PROTECTION AND CONSERVATION
OF STATE FOREST AND PARK LANDS

The lands embraced in this lease or permit[1] are leased by the Commonwealth of Pennsylvania, acting through the Department of Environmental Resources, hereinafter designated as "Lessor" or "Department." Lessee or Permittee hereby agrees to the following stipulations:

1. ENVIRONMENTAL QUALITY CONTROL

1.1 Lessee shall take all necessary precautions and measures throughout the entire course of this lease to insure strict compliance with all pertinent laws and rules and regulations promulgated thereunder, whenever enacted, including: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119, as amended through 1968, 35 P.S. 4001, et seq.); the Clean Streams Law (Act of June 22, 1937, P.L. 1987, as amended through July 31, 1970, 35 P.S. 691.1 et seq.); the Solid Waste Management Act (Act 241, July 31, 1968); the Gas Operations Well Drilling Petroleum and Coal Mining Act (Act of November 30, 1955, P.L. 756, as amended on March 3, 1970, and known as the Act of the General Assembly No. 38); the Surface Mining Conservation and Reclamation Act (Act of May 31, 1945, P.L. 1198, as amended through November 30, 1971, Act No. 147).

1.2 Notwithstanding any provision in this lease, Lessee shall be held liable by the Commonwealth of Pennsylvania, or any agency of the Commonwealth, for the violation of any relevent laws, rules and regulations.

1.3 Before any mining, drilling or quarrying, Lessee shall acquaint itself with all of the applicable rules and regulations governed by each respective Act.

1.4 Prior to undertaking actual mining, drilling or quarrying, Lessee shall confirm in writing to Lessor that he has reviewed and thoroughly understands the applicable requirements as contained in each of the aforementioned Acts.

1.5 During mining, drilling or quarrying, Lessee shall comply with all of the current applicable rules and regulations of the foregoing Acts. Where any of the rules and regulations differ concerning abatement of pollution, the more stringent rule shall apply.

1.6 Lessee shall at all times perform its work in such a manner as to substantially minimize the possibility of polluting the air, land, or bodies of water with any materials harmful to the environment.

1.7 As development of the leased premises progresses and unforeseen circumstances arise that were not evident during the design, emergency pollution control programs may be put into effect immediately. In such cases, instructions will be issued by Lessor and will be carried out by Lessee.

1.8 The Air Pollution Control Act of the Commonwealth prohibits the burning of any refuse, rubbish, brush, etc. in the designated air basins of the State, except by approval of the Department of Environmental Resources' respective Regional Air Pollution Control Engineer. Other emissions into the atmosphere are not permitted if they are injurious or hazardous to people, animals or vegetation.

[1]When a lease is granted, it shall be understood that the terms "Lease" and "Lessee" shall apply; when a permit is granted, it shall be understood that the terms "permit" and "Permittee" shall apply.

1.9 Lessee shall strictly adhere to all rules and regulations for collection, removal, transportation, and disposal of solid wastes. Littering of the leased premises will not be permitted.

1.10 The discharge of wastes to streams within the Commonwealth will not be permitted unless such discharges meet the standards of the Department of Environmental Resources.

2. PROTECTION OF PROPERTY AND OPERATIONS

2.1 Lessee shall not use or allow to be used the State Forest lands for any other purpose than that authorized by this lease. District Forester2 will be advised when operations begin and end. Any changes in the original plans, which may be necessary subsequent to the beginning of operations, must be approved by District Forester and Lessor.

2.2 Permission to remove overburden must first be obtained from District Forester who will designate the extent of such removal.

2.3 Lessee shall carry out no actual mining, quarrying, excavating, drilling, or stripping operations within sight of publicly traveled roads, as indicated by District Forester.

3. PUBLIC LAND USE

3.1 Lessee hereby recognizes and admits that the leased premises are dedicated to the purposes set forth in Environmental, Health, Park, Fish and Game Laws, and Rules and Regulations and Department's Forest Resource Plans promulgated thereunder and Lessee agrees to conduct operations with deference to such purposes.

4. HUNTING AND FISHING

4.1 Employees of Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not engage in hunting or fishing upon said land, except as permitted by law, and shall not injure or destroy wildlife and fish.

5. ANIMALS

5.1 Lessee shall prevent access of animals to pits or excavations dug for Lessee's operations by erecting, maintaining fences, or by other means approved by Department.

6. SLUSH PIT

6.1 Each slush pit will consist of two compartments; one to contain fluids from the drilling operations and the second to contain surface runoff from the drilling site. Unless authorized by Department, all slush pits will be located at approximately the same elevation as the drilling site. Depending on the topography and slope conditions, the slush pit to contain surface runoff may be located below the drilling site and at a safe and reasonable distance from the stream in which the effluent will be discharged. The slush pit used to contain drilling fluids, mud, and water, will be lined with plastic so that no escape of these fluids will occur. If said fluids contain oil or other chemical substances which are harmful to the forest environment, Lessee shall transport these fluids from State Forest lands for disposal. All trash, rubbish, or waste materials from each drilling site will be stored in one area and may be disposed of in the slush pit prior to restoration. All pits shall be filled with earth and leveled at Lessee's expense upon completion of each well. However, nothing in this paragraph shall be construed to permit a violation of any laws, rules and regulations of the Commonwealth.

[2]When this lease is granted in whole or in part on State Park land, then the words "District Forester" shall be understood to mean "Park Superintendent," whenever the words appear in the lease and State Park lands are involved.

6.2 Before any operations commence, the location, design, construction, and maintenance of any slush pit must be approved by Lessor. Pollution potential and aesthetics shall be among the factors to be considered by Lessor.

6.3 If drilling operations are conducted by air, gas, or airfoam, Lessee shall also provide sufficient means by which dust and/or foam dispersal are abated, kept to a minimum, and shall not become a nuisance.

7. SILTATION

7.1 Lessee realizes that as a result of its operation large areas of land which will be cleared to provide for compressor stations, pipeline rights of way, and drilling sites, and which will be exposed to the forces of erosion for varying periods of time, could create siltation to nearby streams. Lessee agrees, therefore, to regrade such areas immediately and reseed to either temporary or permanent grasses. Any other type of remedial work necessary to prevent erosion on such areas shall be performed by Lessee.

7.2 Lessee shall upon initial construction of all drilling sites restore all highwalls and reseed said highwalls and downslope embankment of each drilling site immediately. Department's representative shall be consulted for final design and approval of each drilling site prior to final restoration.

7.3 Lessee's contractors and subcontractors shall not construct earthen dams across any stream to obtain a water supply for its operations unless approved by Lessor.

7.4 Lessee shall on pipeline rights of way and access roads construct water bars or similar diversion channels to carry surface runoff away from the rights of way and roads to prevent siltation. During construction if excess siltation is expected, Lessee shall construct a settling basin at the base of the right of way or road to impound runoff and allow sediments to settle prior to discharge into nearby streams.

7.5 Lessee shall construct all access roads to all drilling sites along existing pipeline rights of way which are built to service the drilling site provided that a ten percent (10%) grade can be maintained. All road locations and grades must be approved by District Forester as provided hereunder. All roads will be maintained in a passable condition.

8. WATERS

8.1 Without prior approval of Department, Lessee shall not locate any bore or core hole or any part of rig or slush pit within one hundred (100) feet of any stream or body of water on State Forest lands, and hereby agrees to prevent the contamination or pollution of springs, brooks, streams, or other waters on these lands in any manner whatsoever, by such means and measures as may be lawfully required by the Environmental Quality Board of the Commonwealth of Pennsylvania or its successors in function. Lessee shall be familiar with and abide by all rules and regulations of the Environmental Quality Board and shall promptly, when ordered by the Environmental Quality Board, comply with any specific rulings concerning its operations.

8.2 Where construction, operation, or maintenance of any of the facilities on or connected with this lease causes damage to the watershed or pollution of the water resources, Lessee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by an authorized representative of Department and to pay for any and all damage or destruction of property, fish, and wildlife resulting from operations under this lease.

8.3 The cost of said property, wildlife, or fish destroyed shall be determined by Department, Pennsylvania Game Commission, or Pennsylvania Fish Commission using recognized procedures to establish the value of damage.

8.4 Upon termination of drilling or producing operations, Lessee shall obtain a certificate from Department certifying that it has complied with all requirements of law and that it has taken all necessary measures to prevent any future contamination or pollution of waters as a result of its operations. Lessee shall continue to be liable for any such damages up to one (1) year after the cessation of operations under the provisions of this lease.

9. FOREST GROWTH

9.1 Lessee shall not cut, injure, destroy, or remove any forest growth, except that which shall be absolutely unavoidable in conducting operations and shall obtain prior approval of District Forester thirty (30) days before removal is to be commenced. The full thirty (30) days prior notice may be reduced upon the discretion of District Forester.

9.2 Lessee at option of Department shall chip all tree tops, limbs, brush, slash and any timber not to be sold or utilized by Department or Lessee which have resulted from clearing operations from strp mine sites, well sites, access roads, pipeline rights of way, and other construction sites.

9.3 Lessee at the option of Department shall bury or dispose of all tree stumps and large rocks resulting from its clearing and construction operations using a plant approved by District Forester.

9.4 Lessee shall pay for all timber damages in place in accordance with the regulations of Department. Such regulations shall be obtained from District Forester and Lessee shall further be required to dispose of said timber off the area to be cleared.

9.5 Lessee shall upon completion of its operations and at its own expense secure and plant with grasses and/or trees or shrub seedlings and/or game foods all strip mine sites, well sites, access roads, pipeline rights of way and other cleared areas using a plan appproved by District Forester.

9.6 Lessee shall make full compensation to Department to be three (3) times the value of such material cut, injured, destroyed, or removed to be computed by Department should additional damage to the Commonwealth result at any time from the work incident to this lease or the construction, operation, maintenance, or removal of facilities not herein contemplated or specifically mentioned, but which may occur as a result of said work or facilities.

10. FIRE

10.1 Lessee's employees, agents, contractors, and subcontractors, and employees of contractors and subcontractors shall do everything within their power to prevent or suppress forest fires and shall not allow fires to be set on or adjacent to State Forest lands by Lessee, his agents, contractors and subcontractors, and employees of contractors and subcontractors, except in pursuance and in accordance with the conditions prescribed in the permission first obtained from District Forester fixing the time, place, and manner of burning. The burning of refuse, brush, slash, debris, or other materials, upon approval of District Forester, shall be so conducted that no living forest growth is damaged or killed.

10.2 Should any fire set by Lessee or any of the persons mentioned above escape in any manner or damage any State Forest land or other property, Lessee shall be liable for all such damages resulting from such escape and for all costs incurred by Department in fighting such fires; and Lessee's officers, agents, and employees in the vicinity, as well as contractors and subcontractors, shall with such assistance as Lessee may have at hand, or be able to summon, render aid in fighting said fire without cost to the Commonwealth.

10.3 Lessee further agrees that during periods of abnormal forest fire danger, District Forester may suspend all or part of the drilling, or other operations on all or part of the State Forest lands until the forest fire danger subsides.

10.4 Lessee, or its employees, shall report promptly all forest fires detected by them to District Forester.

11. REPLACEMENT AND REPAIR OF IMPROVEMENTS

11.1 Lessee shall replace or repair, as Department may direct, all State Forest signs, markers, corners, fences, other structures, and service utility lines, owned or used by Department which cross or otherwise lie within the State Forest lands destroyed or damaged in any work incident to this lease.

12. ROADS, QUARRY AND DRILLING SITES

12.1 Lessee shall not construct any roads, clear any quarry or drilling sites, or excavate any trenches without prior written approval from District Forester, who shall set forth the type and grade of roads, trenches, and area to be cleared. The access roads shall be held to a maximum grade of ten percent (10%). However, if steeper grades are necessary, written approval must be obtained from District Forester prior to their construction. Any roads built at the expense of Lessee in its operations shall not be removed or destroyed and shall become a part of the road system of the State Forest lands.

12.2 Lessee recognizes that all roads and trails owned or maintained by Department, which are used in the execution of this lease, were constructed and improved for the use of Department and for the general public having business in and making use of State Forest land. Lessee, therefore, agrees that its operations will never be conducted in such a manner as to prevent, hinder, or obstruct the customary use of such roads and trails by Department or by the public.

12.3 Where roads built by Lessee cross any fence, Lessee shall construct a gate and keep it closed except when the passageway is in use. Lessee shall keep all said roads and trails free at all times from obstruction by logs, brush, or debris resulting from Lessee's operation. District Forester may require Lessee to temporarily discontinue the use of said roads whenever in his opinion such action is necessary to prevent their serious damage.

12.4 Upon termination of this lease, Lessee shall repair said roads and trails and leave them in as good condition as at the beginning of this lease of which condition Department shall be the sole judge. In addition, Lessee shall make any repairs to said roads and trails deemed necessary by District Forester to insure adequate and proper drainage, road surface conditions, horizontal alinement, and cross slope.

12.5 It is understood that the bond required, under the terms of this lease, shall cover the use and repair of said roads.

12.6 Lessee also agrees to obtain prior written approval from Department for the use of all State Forest roads off the leased premises used in its operations and to repair damage to all State Forest roads within or bordering on the leased premises and when such damage is caused by Lessee's operations; provided, however, if in the opinion of District Forester in charge, the roads or portions thereof are used by others sufficiently to warrant the apportionment of the maintenance costs, then Lessee may be relieved of the burden of sole maintenance and be required to provide only Lessee's proportionate share as decided by Department through District Forester.

12.7 Lessee recognizes the rights and privileges afforded to Grantees by rights of way and other agreements executed with Department, prior to this lease, which cross or otherwise lie within the area of this lease; and therefore, agrees to relocate at Lessee's own expense all portions adversely affected by work incident to this lease in accordance with the then current rules and orders of the Public Utility Commission of the Commonwealth of Pennsylvania. In the event, the Public Utility Commission does not have any jurisdiction, any necessary relocation shall be completed subject to the approval of Grantor.

13. BUILDINGS

13.1 Lessee shall not drill any bore or core hole, carry on operations, make excavations, or otherwise disturb the surface of the lands within two hundred (200) feet of any building. However, if a lesser distance to any building is needed, written approval must be obtained from District Forester, or from the owner of the building if not the property of the Commonwealth.

13.2 Lessee shall consult with District Forester and obtain written approval prior to the construction and erection of any storage facilities, buildings, work sheds or any other physical structure upon State Forest lands outside of the leased premises.

14. APPEARANCE

14.1 In its appearances hereunder, Lessee shall at all times maintain State Forest lands in a neat and presentable manner, removing all rubbish and debris as it accumulates and restoring each individual area within thirty (30) days to as near as possible its original condition when its use is abandoned.

15. EXPLOSIVES

15.1 Lessee shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during periods of fire danger unless permission is granted by District Forester.

15.2 Explosives shall not be used in fish spawning or rearing areas, nesting areas of wildlife concentration, during periods of intense activity or at any other time or in any manner that might damage any wildlife resource.

16. RESTORATION AND REVEGETATION

16.1 Restoration and revegetation shall be accomplished in accordance with Lessee's approved reclamation plan under the Surface Mining Conservation and Reclamation Act. However, should Lessee not qualify for licensing under this Act, as amended, then Lessee shall comply with Sections 16.2, 16.3 and 16.4 of this lease which provides for restoration and revegetation of all areas disturbed by Lessee.

16.2 Upon completion of drilling, mining, quarrying, excavating, stripping, or any other operation, the surface of the site shall be backfilled to as near as possible to the original contour of the surface. Where necessary, the top of the highwall shall be graded into the drill, mine, quarry, excavation, strip, or any other site area, so that all safety hazards to both human and wildlife have been eliminated and the highwall restored to a safe and reasonable grade. Department shall be the sole judge as to what is safe and reasonable. If terraces or benches are present upon completion of operations or if restoration of the drill site, mine site, quarry site, excavation site, strip site, or any other site, is enhanced by such terraces or benches, the terraces or benches upon approval of Department may be cut into the highwall or left standing. The backfill material from the drilling, mining, quarrying, excavating, stripping, or any other operation, shall be graded to form a gradual slope away from the highwall and all peaks and ridges shall be leveled so that water shall not accumulate in pools over the restored area.

16.3 Upon completion of drilling, mining, quarrying, excavating, stripping, and backfilling of an area or any portion thereof and after backfilling has settled so as to provide an acceptable planting site, Lessee shall revegetate all disturbed or cleared areas. Such revegetation is to be done according to a planting plan prepared by Department. Lessee guarantees an establishment of not less than an average of five hundred (500) live and growing trees per acre one (1) year after date of planting. If area is planted in grasses, or shrubs, or trees and grasses, Lessee shall guarantee an establishment of sixty-five percent (65%) survival of said grasses or shrubs one (1) year after date of planting. If such growth has not resulted, Lessee shall replant such areas unless in the opinion of Department the lack of a satisfactory growth was due to soil conditions or other causes beyond the control of Lessee. Department shall be the sole judge in determining if replanting is required and shall notify Lessee in writing of areas to be revegetated. This provision may be waived by Department upon the recommendation of District Forester.

16.4 Restoration and revegetation plans of Lessee must be approved in advance of any operations by Department or its representatives. Department shall have the sole right to determine the time of backfilling and revegetation.

17. WATER WELLS

17.1 Any plan by Lessee for the drilling of water wells on State lands, and use of any water found, must be approved in writing by Department.

17.2 A final plat will be submitted within thirty (30) days after completion of each water well showing exact location, elevation, depth of well, formations penetrated and depth, type of shows, and volume of water or hydrocarbons present.

17.3 Lessee further agrees to supply Department with any other records, memoranda, accounts, reports, cuttings, cores, or other information relative to the drilling, completion, or operation of water wells on the above described premises. This will include true copies of any electrical or radioactivity surveys made in the wells.

17.4 Lessee shall be familiar with and comply in every respect with the provisions now existing or hereafter enacted of the Water Well Drillers License Act 610 of May 29, 1956 (P.L. 1840), providing for the orderly development of the ground water resources of the Commonwealth of Pennsylvania.

18. PIPELINES

18.1 Lessee shall refill to contour all ditches or other excavations caused by the construction, operation, maintenance or removal of pipelines; construct cross ditches; lime, fertilize and seed or replant the right of way; keep the pipeline and right of way in good repair and appearance, and take such other measures as may be deemed necessary by Department to control erosion and sedimentation and to maintain or restore the natural and aesthetic values as directed by Department.

19. CONTACT WITH STATE AGENCIES

19.1 Lessee shall periodically contact the following State agencies or their successors to keep informed on up-to-date information, policies, rules and regulations applicable to this lease.

Department of Environmental Resources	Brief Statement of Agency's Jurisdiction
Bureau of Forestry, Minerals Section P. O. Box 1467 Harrisburg, Pennsylvania 17120	Leasing programs, terms, policies and geophysical regulations for State owned land and waters
District Forester Forest District (where applicable) Park Superintendent State Parks (where applicable)	Restoration and replanting of leased premises, timber damages, location of well-sites, rights of way, roads, etc.
Secretary Environmental Quality Board P. O. Box 2063 Harrisburg, Pennsylvania 17120	Water encroachment regulations; disposal of water polluting materials and industrial wastes; well spacing orders and unitization
Bureau of Air Quality & Noise Control 18 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Blowing gas wells and air drilling, burning of waste materials, trash, etc.
Bureau of Soil & Water Conservation Regional Office (where applicable) or P. O. Box 1467 Harrisburg, Pennsylvania 17120	Soil Erosion & Sedimentation Control Plan
Bureau of Water Quality Management Division of Non-Point and Industrial Sources 12 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Slush pits, siltation, pollution, etc. Disposal of produced water
Bureau of Water Quality Management Water Emergency Response Team 12 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Notification of fires, breaks, leaks, spills or blowouts
Bureau of Dam Safety, Obstructions & Storm Water Management Division of Obstructions and Flood Plain Management 407 South Cameron Street Harrisburg, Pennsylvania 17120	Locating structures or pipelines in streams, rivers and lakes. Crossing streams -impoundment of stream for water supply
Bureau of Topographic & Geologic Survey Division of Oil & Gas Regulation 100 Forbes Avenue Pittsburgh, Pennsylvania 15222	Oil and gas regulations and enforcement (drilling permits, plugging, etc.)
Bureau of Surface Mine Reclamation 7 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Regulations and enforcement (when drilling in coal areas)
Bureau of Occuptional Health Division of Quarries & Explosives 6 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Blasting, seismic surveys, etc.
Pennsylvania Fish Commission	
Executive Director P. O. Box 1673 Harrisburg, Pennsylvania 17120	Regulations for the protection of fish life
Pennsylvania Game Commission	
Executive Director P. O. Box 1567 Harrisburg, Pennsylvania 17120	Regulations for the protection of wildlife

M-O&G (8-86)
Oil and Gas Lease

7-K-490

Commonwealth of Pennsylvania
Department of Environmental Resources
Minerals Section, Bureau of Forestry
P.O. Box 1467
Harrisburg, Pennsylvania 17120

CONTRACT NO.
M-110706-10

OIL AND GAS LEASE FOR STATE FOREST AND PARK LANDS*

THIS AGREEMENT, made and entered into on this 17th day of September, 1986, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF ENVIRONMENTAL RESOURCES, hereinafter designated "Department", and TEXACO INC. with its principal place of business at P. O. Box 2100, Denver, Colorado 80201 and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee".

W I T N E S S E T H

WHEREAS, Department is authorized by the Act 275 of December 3, 1970, P.L. 834, 71 P.S., Sections 1902A and 1906A, as amended, to lease State Forest and Park lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the opening of the bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

ENTERED FOR RECORD
'89 APR 17 AM 11 13
HAZEL M. PETERS
RECORDER OF DEEDS
CENTRE COUNTY

*When this lease is granted, in whole or in part, on State Park land, then the words "State Forest land" shall be understood to mean State Park land in their entirety or in part, whichever shall apply, wherever the words appear in the lease, and the words "District Forester", shall be understood to mean "Park Superintendent".

NOW THEREFORE, in consideration of the sum of TWENTY SIX THOUSAND NINE HUNDRED NINETY-TWO AND 80/100 DOLLARS ($26,992.80), paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas, and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, TRACT NO. 706 containing 2,760 acres, more particularly described on the Oil and Gas Lease Attachment identified as Exhibit "A" and as shown on the Map identified as Exhibit "C", which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as Exhibit "C" are approximate.

1. TERM OR PERIOD

1.01 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth, particularly Section 9 First Well, providing for the drilling of the first well within the first five (5) years of the lease; and shall continue from year to year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder, or engaged in the abandonment, or plugging of wells or removal of equipment therefrom.

2. RENTAL

2.01 Lessee shall pay to Department a rental for the above described leased premises at the following rate: the first year's rental shall consist of the bonus payment which was competitively bid by Lessee and shall be payable upon delivery of this lease to Lessee; the second and third years' rental shall be TWO DOLLARS ($2.00) per acre each year, payable upon the anniversary date of this lease; for the fourth and all subsequent years thereafter, the rental shall be THREE DOLLARS ($3.00) per acre each year, payable upon the anniversary date of this lease.

2.02 The drilling of each well in the leased premises, as provided in Section 9, shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 10, which reduction shall become effective on the next rental date, provided the well is a producer. If such wells are drilled on a unit created by a spacing order issued by Department or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

2.03 If at any time there is on the leased premises a well capable of producing natural gas and the well is shut-in, suspended, or otherwise not produced and the natural gas is not used or marketed therefrom during any year

ending on an anniversary date of this lease, Lessee shall pay Department at the expiration of each said year for that year a rental payment for each such well at the full rental rate per acre for the "acreage attributable to the well", as referred to in Section 10 of the lease.

3. OIL ROYALTY

3.01 Lessee shall pay to Department, as royalty, ONE-EIGHTH (1/8th) of the field price per barrel (42 U.S. Gallons) at 60° F, produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks; the amount to be paid to Department will be the one-eighth (1/8th) royalty multiplied by the fractional interest held by Department.

3.02 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises; the amount to be delivered to Department will be the one-eighth (1/8th) part of the oil produced multiplied by the fractional interest held by Department.

3.03 If oil, gas, condensate, and other liquid hydrocarbons, each in paying quantities, should be developed from the same well, then the oil and the gas, condensate, and other hydrocarbons shall be saved.

3.04 Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with standard practices as outlined in American Petroleum Institute Standard 2500, January 1, 1955, or as subsequently amended by the same authority, and at a temperature base of 60° F. Lessee shall provide tanks for accurately measuring the crude oil produced from the lease. Positive copies of one hundred percent (100%) capacity tank tables or other acceptable standards of measuring production are to be furnished to Department.

4. GAS ROYALTY

4.01 Lessee shall pay to Department, as royalty, TWENTY-FIVE CENTS ($0.25) per thousand cubic feet (MCF) or ONE-EIGHTH (1/8th) of the market value, whichever is higher, for all natural gas, casinghead gas, or other gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; the amount to be paid to Department will be the one-eighth (1/8th) royalty multiplied by the fractional interest held by Department and shall be payable monthly at the prevailing market value for natural gas in the area at the time of delivery.

4.02 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, into the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all gas and other gaseous substances produced and saved from the leased premises; the amount to be delivered to Department will be the one-eighth (1/8th) part of the gas produced multiplied by the fractional interest held by Department.

5. GAS MEASUREMENT

5.01 The volume of gas produced, saved, and marketed shall be measured according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

a. The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

b. The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, irrespective of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

c. The temperature of the gas passing the meters shall be determined: (1) by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes; (2) if a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of fifty degrees Fahrenheit (50° F) shall be used in computing gas volume.

d. The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, at intervals of three (3) months, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

e. The deviation of the natural gas from Boyle's Law shall be determined by tests at intervals of three (3) months or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with the recommendations of the National Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

6. PAYMENTS

6.01 Lessee shall be held responsible for the payment of all royalties, which shall be mailed to the office of Department at Harrisburg, Pennsylvania, and made payable to Department. Payments of royalties shall be made not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

6.02 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products

not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

6.03 Once it has been determined by Department that Lessee is in default in the payment of any sum of money payable under the provisions of this lease for 30 days, Lessee agrees to pay an additional twelve percent (12%) annual interest on the defaulted amount calculated from the time of such default. This provision is in no way a waiver of the requirement to pay on time.

7. OPERATIONS

7.01 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up-to-date oil and gas field practices.

7.02 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department's Bureau of Soil and Water Conservation. A copy of the plan shall be forwarded to the Minerals Section, Bureau of Forestry, Post Office Box 1467, Harrisburg, Pennsylvania 17120 and District Forester.

8. RESTRICTIONS

8.01 Under Department's multiple use policy, the leased premises are continuously used for recreation, conservation and other purposes; and many Department authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions:

a. No drilling is permitted within 200 feet of any building.

b. No drilling is permitted within 100 feet of any stream or body of water.

c. No drilling is permitted within 330 feet of any picnic area which has been so designated by Department.

d. No drilling is permitted within 330 feet of any trail, road or existing right-of-way.

e. No drilling is permitted within 100 feet of any area of historic value, tree plantation, overlook, vista or fire tower site.

f. No drilling is permitted for oil within 660 feet of the boundary line of leased premises.

g. No drilling is permitted for natural gas within 2,640 feet of the boundary line of leased premises where it is contiguous with State Park lands or other special-use State Forest lands such as Wild Areas and Natural Areas.

h. In addition, the following specific restrictions for this lease shall also apply:

None

8.02 Upon written request by Lessee, Department may waive, in writing, any portion of the above restrictions if, in Department's judgement, such a waiver is justified and in its best interests.

9. FIRST WELL

9.01 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well on the leased premises or on unitized acreage containing a portion of the leased premises, but the well need not necessarily be on the portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, the lease shall be automatically terminated in its entirety, unless Department approves, in writing, thirty (30) days in advance of the anniversary date of this lease, the continuation of the lease on a year-to-year basis.

9.02 Notwithstanding anything to the contrary in Section 9.01 above, if the drilling of the first well has not commenced by the beginning of the month directly preceding the 5th annual anniversary date of the lease, due to adverse weather conditions (which hinders or prevents construction of well sites and roads) or other unanticipated delays beyond Lessee's reasonable control, Department may at its sole discretion continue the lease in effect by granting a one-time written extension to the 5 year first-well-deadline of not more than 2 months. Department shall grant such an extension only when it considers it to be fair, reasonable and appropriate under the circumstances. The rental rate provision of the lease shall not be affected by such extension of the 5 year first-well-deadline.

9.03 If the aforesaid well is still not commenced by the end of the one-time extension period, the lease shall terminate unless Department approves in writing before the end of such extension period the continuation of the lease on a year-to-year basis. The granting of such extension period shall in no way affect the anniversary dates of this Agreement, or the rights and responsibilities of Department and Lessee associated therewith.

10. SUBSEQUENT WELLS

10.01 If the "FIRST WELL" drilled by Lessee, or any subsequent well, is productive of oil and/or gas, and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises; but not necessarily on the portion of the leased premises contained within the unit, as would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If an additional well is necessary, it must be commenced within six (6) months after the completion of the last well drilled; provided, however, that if Lessee concludes an additional well is not justified, then Lessee shall submit to Department the information upon which the conclusion is based. Upon

review of such information, if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within six (6) months from Department's determination or releasing all of the acreage covered by the lease except forty (40) acres around each well from which oil is produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product and has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres around each shallow well from which gas is being produced as the principal product which has been completed above the Onondaga Formation, or that amount of leased acreage actually contained within an established unit, whichever is less.

10.02 Lessee shall not be required, under this provision, to drill more wells than required or allowed under any spacing order, rule, or regulation of Department, or in the absence of any such order, more than one well for each forty (40) acres where oil is being produced as the principal product of such well, or more than six hundred forty (640) acres where gas is being produced as a principal product for such well and has been drilled to the Onondaga Formation or deeper, or more than three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which is productive from formations above the Onondaga Formation.

10.03 The amount of acreage included in a spacing unit by Department, or in the absence of an order by Department, forty (40) acres where oil is being produced as the principal product of such well, or six hundred forty (640) acres where gas is being produced as the principal product of such deep well which has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which has been drilled to formations above the Onondaga Formation, shall be referred to elsewhere in the lease as "acreage attributable to a well".

11. DEVELOPMENT

11.01 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

11.02 Well spacing shall not be closer than one (1) well per forty (40) acres; should closer spacing be required, written approval must be obtained from Department.

12. OFFSETS

12.01 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth that is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, and any well drilled on leases not owned by the Commonwealth that is completed within two thousand six hundred and forty (2,640) feet of the boundary line of the leased premises and from which gas

is being produced as the principal product; or any well drilled on leases not owned by the Commonwealth that is completed within the radius of the drainage areas set by an order of Department; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may, at its discretion, relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except forty (40) acres around each well from which oil is being produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product, or that acreage attributable to a well by an order of Department if the affected acreage falls within an area subject to such a spacing order.

12.02 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on leases not owned by the Commonwealth and, if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression.

12.03 Lessee agrees that any well along the boundary line, contiguous to State Park Lands or Special Use State Forest lands such as designated Wild Areas and Natural Areas, where minerals, oil and/or gas are owned by the Commonwealth, shall be located at least six hundred and sixty (660) feet from such boundary if oil is the principal product anticipated from the objective formation of the well or at least two thousand six hundred and forty (2,640) feet from such boundary if gas is the principal product anticipated from the objective formation of the well, or that distance from such boundary line which will be the radius of the drainage area set forth by an order of Department, if the area is subject to such a spacing order. Upon written request by Lessee, Department may waive, in writing, any portion of the above restrictions if, in Department's judgement, such a waiver is justified and in its best interests.

12.04 Upon application by Lessee, this provision providing for the distance from such boundary line may be waived by Department when deemed in the interest of the Commonwealth and not in an area subject to a spacing order of Department's Bureau of Oil and Gas Management.

13. UNITIZATION

13.01 Lessee shall have the right, at any time or times, to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering, with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises, or portions thereof, with adjoining lands to prevent the drilling of an excessive number of wells or of wells located too close to the boundary of this lease; provided, however, that such agreement and

termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

13.02 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of any such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises.

13.03 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area; and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

14. SEISMIC SURVEYS

14.01 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit to District Forester, for his approval, a map showing the location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to him, Lessee must obtain the customary Seismic Survey Permit from Department. The bond, hereinafter described, shall be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

15. PIPELINES

15.01 Lessee is herewith granted the right to lay any necessary pipelines on or under the leased premises; however, a route map for each line shall be submitted to District Forester for his approval as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, it must enter into the customary pipeline right-of-way agreement with Department.

16. DRILLING

16.01 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before the drilling thereof is commenced, and no well shall be commenced until a permit has been issued where necessary by Department's Bureau of Oil and Gas Management.

16.02 Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

16.03 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth.

16.04 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

16.05 Lessee shall maintain, at all times, the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells or wells being serviced by a rig shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall, at all times, be available for efficient operations. Blowout control equipment must be capable, in case of an emergency, to shut in the well at a point at least fifty (50) feet from the wellhead.

16.06 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is the highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head, or leaking oil or gas between the producing string and next larger size casing string when such pressures or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

16.07 While a well is being drilled with mud or water as a drilling fluid, Lessee shall test control equipment daily, to the extent possible, without causing premature removal of drill pipe from the hole while drilling, and record the results of such tests daily. While a well is drilling with air or gas as a drilling fluid, Lessee may test control equipment only during trips for the drilling bit.

16.08 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

16.09 Drilling mud of sufficient weight to prevent oil, gas or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

BOOK 481 PAGE 223 10477
BOOK 481 PAGE 431

16.10 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

16.11 Lessee shall use a casing program which complies with oil and gas statutes, and rules and regulations of the Commonwealth, and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies and blowouts.

16.12 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

16.13 The production casing shall be of new or reconditioned seamless pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

a. The maximum anticipated rock pressure, at any point in the casing string, shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield, as shown in A.P.I. Bulletin 5-C-2, dated April, 1972, or later amendments.

b. If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated, at any point in the casing, does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield, as shown in A.P.I. Bulletin 5-C-2, or later amendments.

16.14 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If, at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After the corrective operation, the casing shall again be tested in the same manner.

16.15 All surface casing and production casing shall be cemented in the ground with good quality cement equalling or exceeding A.P.I. specification in the manner hereinafter described.

16.16 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department. Sufficient centralizers shall be attached to the casing to keep it centered in the hole during cementing.

16.17 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In the event that the cement cannot be circulated to the surface, due to the presence of fractures or other lost circulation zones, Lessee shall determine, as accurately as possible, the depth of the top of the cement in the annular space behind the casing and record it on the well record.

16.18 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another, or to the surface, does not occur behind the casing.

16.19 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval of Department.

16.20 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not allow the well to blow open, except in case of an emergency, over twenty-four (24) hours after drilling-in. Lessee will pay Department, at the regular royalty rate, for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations, after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

16.21 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Test Method (USBM-Monograph 7) or by other methods standard to the industry and approved by Department.

16.22 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

16.23 At least once every six (6) months, Lessee will determine the open flow potential of each producing well, as required in Section 16.21, and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive, in writing, all or parts of this requirement if, during any calendar year, production averages less than sixty (60) MCF per day, and/or the semiannual twenty-four (24) hour pressure tests show reservoir pressures to be less than one hundred (100) psi.

16.24 Lessee shall, at all times, conduct prudent drilling operations, including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

16.25 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

16.26 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

16.27 In areas where H_2S is known to be present in the formations that are to be drilled, Lessee shall

a. install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas, in concentrations exceeding 100 ppm, is anticipated or used.

b. make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

c. after H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

d. use special steel pipe and casing which is resistant to H_2S stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

e. quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

f. post warning signs around all well sites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to, and at a safe distance from, all facilities handling the H_2S gas, including warning markers on all pipelines which may be used to transmit the toxic gas.

g. install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

h. immediately notify Department and record on appropriate well records and driller's logs any H_2S gas found in the course of drilling or producing operations.

17. REPAIR OF EQUIPMENT

17.01 Lessee does hereby agree that it will, at all times during the continuance and delivery of oil, gas, and liquid hydrocarbons to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

18. WELL RECORDS, LOGS AND REPORTS

18.01 Lessee shall keep a daily drilling record which will describe the formations penetrated, depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. Any other data that is usually acquired in the normal procedure of drilling shall be recorded and furnished to Department, such as drilling time, rate of fill-up, lost circulation zones, caving strata, casing records, core analyses, mud log analyses, perforation,

and production test data. Within thirty (30) days after completion of each well, Lessee shall furnish Department an accurate location plat, a detailed lithologic log, a detailed history of the well, and all well data including geologic, driller, electrical, and any other well surveys made to obtain subsurface information. Upon request, samples of all formations penetrated and parts of cores taken, accurately labeled with the name of the well, and interval of depth shall be furnished to Department at Lessee's expense. If requested, Lessee shall ship a complete set of samples to the Pennsylvania State Geological Survey, 7th Floor, Highland Building, 121 South Highland Avenue, Pittsburgh, Pennsylvania 15206-3988, within thirty (30) days after completion of each well.

19. AUDITS

19.01 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the lease. Department may keep such charts for examination for a period not to exceed ninety (90) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, and other products produced from the leased premises.

19.02 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, and liquid hydrocarbons, produced from any well covered by this lease, to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payments to Lessee, his heirs, administrators, executors, successors, and assigns for oil, gas and liquid hydrocarbons from wells covered by this lease.

19.03 Lessee further grants to Department the right, at any time, to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from cancelling this lease upon delivery to Lessee of written notice of Department's intention.

20. LESSEE'S TERMINATION

20.01 Lessee may, at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST

WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

20.02 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 10. Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

21. REMOVAL

21.01 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to remove all buildings, machinery, wells, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations, to fill and level all pits, and to the extent practicable, to restore the property to the same condition as when received.

22. RELEASE

22.01 Lessee shall not be granted a final release from the terms of this lease until District Forester has met with Lessee's field engineer on the ground, inspected the premises, and received a signed statement of release from Department indicating the proper cleanup has been completed.

23. PLUGGING

23.01 Lessee shall properly and effectively plug all wells on the leased premises before abandoning, in accordance with the regulations of the Department's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth. A copy of the plugging procedure approved by the Bureau of Oil and Gas Management shall be supplied to the Minerals Section, Bureau of Forestry. In addition to the above mentioned requirement, upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements will be reason for cancellation of this lease and the posted bond will be forfeited in order that Department may properly plug the wells.

23.02 The plugging procedures, as herein stated, shall also include all shallow wells drilled in areas which are not coal productive and are not covered by the regulations of Department (Certificate of Plugging form may be obtained from Department's Bureau of Oil and Gas Management).

24. ABANDONMENT AND STORAGE RIGHTS

24.01 In the event the development of this lease demonstrates, in the opinion of Department, that this tract has potential value as a gas storage reservoir (no storage rights are demised to Lessee under the terms of this lease), the well, equipment, property, and casing involved shall first be offered to Department, its nominee or assignee, at the then fair market value of those items before any well shall be plugged. Such firm offer shall be made in writing to Department at least thirty (30) days prior to commencement of removal of the equipment from the well by Lessee.

25. DEPARTMENTAL TERMINATION

25.01 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) days after demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

25.02 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant, and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a Writ of Possession waiving all stay and exemption laws and release of errors.

26. INDEMNITY

26.01 Lessee shall, at all times hereinafter, indemnify and save harmless Department from and against all detriment, damage, loss, claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

27. BOND

27.01 Lessee agrees to give Department a surety or performance bond with satisfactory corporate surety in the principal sum of TWENTY-FIVE THOUSAND DOLLARS ($25,000.00) with judgment clause in a form to be approved by the Attorney General conditioned on the faithful performance of the covenants of this lease. The bond shall be further conditioned that, in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells upon termination of this lease, or within six (6) months from the termination, Commonwealth can execute upon the bond to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the bond shall be conditioned in favor of the Commonwealth for all

damages that may arise as a result of fires, accidents, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises and in the use of all State Forest roads off the leased premises.

28. RELATED AGREEMENTS

28.01 Department will be furnished, for record purposes and to protect its interests, a copy of all agreements, contracts, letters or memoranda entered into, made, or sent to Lessee in any way concerning the development, operation, or sale of products from this lease.

29. ASSIGNMENTS

29.01 Lessee shall not use or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned; and assignee thereof shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interest of a party not in default.

30. LIMITATION ON WARRANTY

30.01 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the proportion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may, with the approval of the Attorney General, enter into an escrow arrangement for future royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claimining title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving

notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The royalties placed in escrow shall be refunded to Lessee in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

30.02 This proportionate reduction clause shall not apply to and shall not reduce the bonus payments or rents payable under this lease.

31. FORCE MAJEURE

31.01 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance therewith is prevented by, or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If, at the end of the primary term hereof, such term has not been extended by production or drilling, as in this lease provided; and Lessee, by reason of any of the above recited causes, is unable to drill a well on the leased premises for oil and gas, the primary terms and the rental provision hereof shall be extended automatically from year to year for a period not to exceed ten (10) additional years, unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises, by reason of any of the above recited causes, this lease shall remain in full force and effect.

32. THIRD PARTIES' RIGHTS

32.01 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) has hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee; and provided further that access to records shall be limited to those records which are non-confidential in nature.

33. PUBLICATION AND NOTICE

33.01 Within thirty (30) days following the receipt by Lessee of a copy of this lease, fully executed, Lessee shall record the lease in the county or counties in which the leased premises lie. Within thirty (30) days following the recording, Lessee shall advise Department, in writing, of the recording reference data. Thereafter, Department shall cause to be published in the Pennsylvania Bulletin at least the following information:

(1) the subject of this lease;

(2) the general location of the leased premises;
(3) the names of Department and Lessee; and
(4) the recording reference date for this lease.

34. LIABILITY

34.01 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, irrespective of whether or not such pollution or damage be due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause be found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises, the pollution or other damage would not have occurred; it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

35. RIGHTS RESERVED BY DEPARTMENT

35.01 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

35.02 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

35.03 Department reserves the right to approve, in writing, all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises unless, upon due cause shown, Department waives the thirty (30) day requirement and allows a lesser, but reasonable, time for review.

35.04 The surface rights of Department shall be considered dominant and the oil and gas rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

36. IDENTIFICATION OF WELL LOCATION AND WELLS

36.01 During drilling operation, a legible sign listing the name and address of the well operator, the permit number, the farm name and well number shall be placed in a conspicuous place near where the access road enters the well location.

36.02 The name of the operator and well number, legibly printed, shall be attached or painted on the pumping unit, wellhead or meter box of each well, in addition to a well number placed in a conspicuous place near where the access road enters the well location.

37. PROTECTION AND CONSERVATION

37.01 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as Exhibit "B", attached hereto and made a part hereof.

37.02 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

37.03 Lessee convenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the OIL AND GAS LEASE ACCESS ROAD SPECIFICATIONS FOR STATE FOREST LANDS, identified as Exhibit "D", attached hereto and made a part hereof.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

Nicholas DeBenedictis, Secretary

ATTEST:

TEXACO INC.

ASST. SECRETARY/~~TREASURER~~ (SEAL)

L. E. CASE, ATTORNEY-IN-FACT

APPROVED AS TO LEGALITY AND FORM:

OFFICE OF ATTORNEY GENERAL

APPROVED:

CHIEF/ASSISTANT COUNSEL
DEPARTMENT OF ENVIRONMENTAL RESOURCES

GOVERNOR

Recorded in the office for the recording of Deeds, etc in and for Centre County in RECORD Book No. 491 at page 422
17th day of April A. D. 19 87
Witness my hand and seal of office

Hazel M. Futer Recorder

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DAUPHIN

On this the 24th day of November, 1986 before me, a Notary Public, the undersigned officer, personally appeared NICHOLAS DeBENEDICTIS, who acknowledged himself to be Secretary of Environmental Resources of the Commonwealth of Pennsylvania; and that he, as such Secretary of Environmental Resources, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing his name as NICHOLAS DeBENEDICTIS, Secretary.

In Witness Whereof, I hereunto set my hand and official seal.

Kimberly L Dekoren
Notary Public

My Commission Expires:

Aug. 6, 1990

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "A"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-110706-10, by and between: COMMONWEALTH OF PENNSYLVANIA and TEXACO INC.

Tract 706

State Tract 706 containing 2760 acres of Sproul State Forest land comprising all of the Andrew Pettit, Blair McClanahan, George McClanahan, Jeremiah Jackson and William Gray, Jr. Warrants and overlapping Joseph Wallace and Thomas Hamilton Warrants and parts of the Charles Pettit, Robert Gray and William Brady Warrants in Burnside Township, Centre County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from Lillie C. Etters by deed dated December 12, 1928, from the Midland Mining Company by deed dated January 28, 1929, from the City of Philadelphia, Trustee Elias Boudinot by deed dated December 26, 1930 and from James H. Corl by deed dated August 22, 1906, and described as follows:

Beginning at the southeast corner of the George McClanahan Warrant, also being the southwest corner of the Ann McClanahan Warrant, also being a point on the Sproul State Forest boundary line; thence westward approximately 14,250 feet along the south lines of the George McClanahan, Blair McClanahan, Andrew Pettit and Charles Pettit Warrants to a point on the south line of the Charles Pettit Warrant; thence northward approximately 2475 feet within the Charles Pettit Warrant to a point within the Charles Pettit Warrant; thence eastward approximately 2640 feet within the Charles Pettit Warrant to a point on the east line of the Charles Pettit Warrant, also being a point on the west line of the Andrew Pettit Warrant; thence northward approximately 2991 feet along the west line of the Andrew Pettit Warrant to the northwest corner of the Andrew Pettit Warrant; thence eastward approximately 2500 feet along the north line of the Andrew Pettit Warrant to a point on the north line of the Andrew Pettit Warrant, also being the southwest corner of the Jeremiah Jackson Warrant; thence northward approximately 2808 feet along the west line of the Jeremiah Jackson Warrant to the northwest corner of the Jeremiah Jackson Warrant; thence eastward approximately 5280 feet along the north line of the Jeremiah Jackson Warrant to the northeast corner of the Jeremiah Jackson Warrant, also being the southwest corner of the Robert Gray Warrant; thence northward approximately 1564 feet along the west line of the Robert Gray Warrant to a point on the west line of the Robert Gray Warrant; thence northeastward approximately 4261 feet within the Robert Gray Warrant to a point on the north line of the Robert Gray Warrant, also being a point on the south line of the William Brady Warrant; thence north-northeastward approximately 4293 feet within the William Brady Warrant to the northeast corner of the William Brady Warrant; thence southward approximately 10,500 feet along the east lines of the William Brady, Robert Gray and William Gray Warrants to the southeast corner of the William Gray Warrant; thence westward approximately 1050 feet along the south line of the William Gray Warrant to a point on the south line of the William Gray Warrant, also being the northeast corner of the George McClanahan Warrant; thence southward approximately 5450 feet along the east line of the George McClanahan Warrant to the southeast corner of the George McClanahan Warrant, the place of the beginning.

(1-86)
Stipulation Form

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

EXHIBIT "B"

STIPULATIONS FOR PROTECTION AND CONSERVATION
OF STATE FOREST AND PARK LANDS

The lands embraced in this lease or permit[1] are leased by the Commonwealth of Pennsylvania, acting through the Department of Environmental Resources, hereinafter designated as "Lessor" or "Department". Lessee or Permittee hereby agrees to the following stipulations:

1. ENVIRONMENTAL QUALITY CONTROL

1.01 Lessee shall take all necessary precautions and measures throughout the entire course of this lease to insure strict compliance with all pertinent laws and rules and regulations promulgated thereunder, whenever enacted, including: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119, 35 P.S. 4001, et seq.); the Clean Streams Law, as amended (Act of June 22, 1937, P.L. 1987, 35 P.S. 691.1, et seq.); the Solid Waste Management Act, as amended (Act 241, July 31, 1968); the Gas Operations Well Drilling Petroleum and Coal Mining Act, as amended (Act of November 30, 1955, P.L. 756, and known as the Act of the General Assembly No. 38); the Surface Mining Conservation and Reclamation Act, as amended (Act of May 31, 1945, P.L. 1198).

1.02 Notwithstanding any provision in this lease, Lessee shall be held liable by the Commonwealth of Pennsylvania, or any agency of the Commonwealth, for the violation of any relevent laws, rules and regulations.

1.03 Before any mining, drilling or quarrying, Lessee shall acquaint itself with all of the applicable rules and regulations governed by each respective Act.

1.04 Prior to undertaking actual mining, drilling or quarrying, Lessee shall confirm, in writing, to Lessor that he has reviewed and thoroughly understands the applicable requirements as contained in each of the aforementioned Acts.

1.05 During mining, drilling or quarrying, Lessee shall comply with all of the current applicable rules and regulations of the foregoing Acts. Where any of the rules and regulations differ concerning abatement of pollution, the more stringent rule shall apply.

[1]When a lease is granted, it shall be understood that the terms "lease" and "Lessee" shall apply; when a permit is granted, it shall be understood that the terms "permit" and "Permittee" shall apply.

BOOK 481 PAGE 445
237 of 477

1.06 Lessee shall, at all times, perform its work in such a manner as to substantially minimize the possibility of polluting the air, land, or bodies of water with any materials harmful to the environment.

1.07 As development of the leased premises progresses and unforeseen circumstances arise that were not evident during the design, emergency pollution control programs may be put into effect immediately. In such cases, instructions will be issued by Lessor and will be carried out by Lessee.

1.08 The Air Pollution Control Act of the Commonwealth prohibits the burning of any refuse, rubbish, brush, etc. in the designated air basins of the State, except by approval of the Department of Environmental Resources' respective Regional Air Pollution Control Engineer. Other emissions into the atmosphere are not permitted if they are injurious or hazardous to people, animals or vegetation.

1.09 Lessee shall strictly adhere to all rules and regulations for collection, removal, transportation, and disposal of solid wastes. Littering of the leased premises will not be permitted.

1.10 The discharge of wastes to streams within the Commonwealth will not be permitted unless such discharges meet the standards of the Department of Environmental Resources.

2. PROTECTION OF PROPERTY AND OPERATIONS

2.01 Lessee shall not use or allow to be used the State Forest lands for any other purpose than that authorized by this lease. District Forester[2] will be advised when operations begin and end. Any changes in the original plans, which may be necessary subsequent to the beginning of operations, must be approved by District Forester and Lessor.

2.02 Permission to remove overburden must first be obtained from District Forester who will designate the extent of such removal.

2.03 Lessee shall carry out no actual mining, quarrying, excavating, drilling, or stripping operations within sight of publicly traveled roads, as indicated by District Forester.

3. PUBLIC LAND USE

3.01 Lessee hereby recognizes and admits that the leased premises are dedicated to the purposes set forth in Environmental, Health, Park, Fish and Game Laws, and Rules and Regulations and Department's Forest Resource Plans promulgated thereunder and Lessee agrees to conduct operations with deference to such purposes.

[2]When this lease is granted in whole or in part on State Park land, then the words "District Forester" shall be understood to mean "Park Superintendent", whenever the words appear in the lease and State Park lands are involved.

4. HUNTING AND FISHING

4.01 Employees of Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not engage in hunting or fishing upon said land, except as permitted by law, and shall not injure or destroy wildlife and fish.

5. ANIMALS

5.01 Lessee shall prevent access of animals to pits or excavations dug for Lessee's operations by erecting, maintaining fences, or by other means approved by Department.

6. SLUSH PIT

6.01 Each slush pit will consist of two compartments; one to contain fluids from the drilling operations and the second to contain surface runoff from the drilling site. Unless authorized by Department, all slush pits will be located at approximately the same elevation as the drilling site. Depending on the topography and slope conditions, the slush pit to contain surface runoff may be located below the drilling site and at a safe and reasonable distance from the stream in which the effluent will be discharged. The slush pit used to contain drilling fluids, mud, and water will be lined with plastic so that no escape of these fluids will occur. If said fluids contain oil or other chemical substances which are harmful to the forest environment, Lessee shall transport these fluids from State Forest lands for disposal. All trash, rubbish, or waste materials from each drilling site will be stored in one area and may be disposed of in the slush pit prior to restoration. All pits shall be filled with earth and leveled at Lessee's expense upon completion of each well. However, nothing in this paragraph shall be construed to permit a violation of any laws, rules and regulations of the Commonwealth.

6.02 Before any operations commence, the location, design, construction, and maintenance of any slush pit must be approved by Lessor. Pollution potential and aesthetics shall be among the factors to be considered by Lessor.

6.03 If drilling operations are conducted by air, gas, or airfoam, Lessee shall also provide sufficient means by which dust and/or foam dispersal are abated, kept to a minimum, and shall not become a nuisance.

7. SILTATION

7.01 Lessee realizes that, as a result of its operation, large areas of land which will be cleared to provide for compressor stations, pipeline rights-of-way, and drilling sites, and which will be exposed to the forces of erosion for varying periods of time, could create siltation to nearby streams. Lessee agrees, therefore, to regrade such areas immediately and reseed to either temporary or permanent grasses. Any other type of remedial work necessary to prevent erosion on such areas shall be performed by Lessee.

7.02 Lessee shall, upon initial construction of all drilling sites, restore all highwalls and reseed said highwalls and downslope embankment of each drilling site immediately. Department's representative shall be consulted for final design and approval of each drilling site prior to final restoration.

7.03 Lessee's contractors and subcontractors shall not construct earthen dams across any stream to obtain a water supply for its operations unless approved by Lessor.

7.04 Lessee shall, on pipeline rights-of-way and access roads, construct water bars or similar diversion channels to carry surface runoff away from the rights-of-way and roads to prevent siltation. During construction, if excess siltation is expected, Lessee shall construct a settling basin at the base of the right-of-way or road to impound runoff and allow sediments to settle prior to discharge into nearby streams.

7.05 Lessee shall construct all access roads to all drilling sites along existing pipeline rights-of-way, which are built to service the drilling site, provided that a ten percent (10%) grade can be maintained. All road locations and grades must be approved by District Forester as provided hereunder. All roads will be maintained in a passable condition.

8. WATERS

8.01 Without prior approval of Department, Lessee shall not locate any bore or core hole or any part of rig or slush pit within one hundred (100) feet of any stream or body of water on State Forest lands, and hereby agrees to prevent the contamination or pollution of springs, brooks, streams, or other waters on these lands in any manner whatsoever, by such means and measures as may be lawfully required by the Environmental Quality Board of the Commonwealth of Pennsylvania or its successors in function. Lessee shall be familiar with and abide by all rules and regulations of the Environmental Quality Board and shall promptly, when ordered by the Environmental Quality Board, comply with any specific rulings concerning its operations.

8.02 Where construction, operation, or maintenance of any of the facilities on or connected with this lease causes damage to the watershed or pollution of the water resources, Lessee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by an authorized representative of Department and to pay for any and all damage or destruction of property, fish, and wildlife resulting from operations under this lease.

8.03 The cost of said property, wildlife, or fish destroyed shall be determined by Department, Pennsylvania Game Commission, or Pennsylvania Fish Commission using recognized procedures to establish the value of damage.

8.04 Upon termination of drilling or producing operations, Lessee shall obtain a certificate from Department certifying that it has complied with all requirements of law and that it has taken all necessary measures to prevent any future contamination or pollution of waters as a result of its operations. Lessee

shall continue to be liable for any such damages up to one (1) year after the cessation of operations under the provisions of this lease.

9. FOREST GROWTH

9.01 Lessee shall not cut, injure, destroy, or remove any forest growth, except that which shall be absolutely unavoidable in conducting its operations and shall obtain prior approval of District Forester ninety (90) days before removal is to be commenced. The full ninety (90) days prior notice may be reduced upon the discretion of District Forester.

9.02 Lessee, under direction of Department, shall remove all tree tops, limbs, brush, slash and any other forest growth not to be sold or utilized by Department or Lessee which have resulted from clearing operations from strip mine sites, well sites, access roads, pipeline rights-of-way, and other construction sites.

9.03 Lessee shall bury or dispose of all tree stumps and large rocks resulting from its clearing and construction operations using a plan approved by District Forester.

9.04 Lessee shall pay Department for all forest growth cut or injured on State Forest land as a result of Lessee's operations, regardless of the ownership of the oil, gas, mineral or surface support rights. Even though the Department has been paid for the damage by Lessee, the title to all forest growth will still belong to the Commonwealth, except as provided in paragraph 9.06(a). Damage is defined as the cutting or injuring of the forest growth by clearing a site so that men and equipment can be brought onto the location to establish a base from which Lessee may undertake its operation.

9.05 Prior to the clearing of the forest growth by Lessee, District Forester will mark and/or designate the area from which forest growth will be removed. The value of the forest growth that will be cut or damaged for the clearing of a road, drilling site, or area to be mined, will be determined by Department based upon timber type, size and market data, or upon replacement value for young stands or plantations. Lessee shall then be invoiced for the value, as determined by Department. Payment to Department of said invoice must be made before any forest growth may be cut or damaged.

9.06 Lessee shall pay for said damages by one of the following methods:

(a) Lessee shall pay for the forest growth damage at two (2) times its value, as determined by Department; the forest growth shall then become Lessee's property, which then may be removed and sold by Lessee as job requirements dictate. Upon termination of this Agreement, ownership of any forest growth, not removed and sold by Lessee under this subsection, shall revert to Department.

(b) Lessee shall pay for the minimum value of the forest growth damage and must notify District Forester at least

BOOK 481 PAGE 449
241 of 477

ninety (90) days in advance of Lessee's need to occupy a cleared forested site for its operations. With sufficient lead time, District Forester shall mark and/or designate, advertise, and offer for sale and removal to the highest bidder, the computed forest growth volume located within the affected area. If time does not permit the sale of the forest growth by District Forester, Lessee shall then cut the forest growth to District Forester's specifications and shall stockpile the forest growth at specified locations, as determined by District Forester, for later disposal and/or sale.

9.07 Lessee shall, upon completion of its operations and at its own expense, secure and plant with grasses and/or trees or shrub seedlings and/or game foods all strip mine sites, well sites, access roads, pipeline rights-of-way and other cleared areas using a plan approved by District Forester.

9.08 Lessee shall make full compensation to Department at three (3) times the value of such forest growth cut, injured, destroyed, or removed, to be computed by Department should additional damage result at any time from the work incident to this lease or the construction, operation, maintenance, or removal of facilities not herein contemplated or specifically mentioned, but which may occur as a result of said work or facilities, or should any forest growth be cut, injured, destroyed or removed prior to payment thereof under paragraph 9.05 hereof.

10. FIRE

10.01 Lessee's employees, agents, contractors and subcontractors, and employees of contractors and subcontractors shall do everything within their power to prevent or suppress forest fires and shall not allow fires to be set on or adjacent to State Forest lands by Lessee, his agents, contractors and subcontractors, and employees of contractors and subcontractors, except in pursuance and in accordance with the conditions prescribed in the permission first obtained from District Forester fixing the time, place, and manner of burning. The burning of refuse, brush, slash, debris, or other materials, upon approval of District Forester, shall be so conducted that no living forest growth is damaged or killed.

10.02 Should any fire set by Lessee or any of the persons mentioned above escape in any manner or damage any State Forest land or other property, Lessee shall be liable for all such damages resulting from such escape and for all costs incurred by Department in fighting such fires; and Lessee's officers, agents, and employees in the vicinity, as well as contractors and subcontractors, shall with such assistance as Lessee may have at hand, or be able to summon, render aid in fighting said fire without cost to the Commonwealth.

10.03 Lessee further agrees that during periods of abnormal forest fire danger, District Forester may suspend all or part of the drilling, or other operations on all or part of the State Forest lands until the forest fire danger subsides.

10.04 Lessee, or its employees, shall report promptly all forest fires detected by them to District Forester.

11. REPLACEMENT AND REPAIR OF IMPROVEMENTS

11.01 Lessee shall replace or repair, as Department may direct, all State Forest signs, markers, corners, fences, other structures, and service utility lines, owned or used by Department which cross or otherwise lie within the State Forest lands destroyed or damaged in any work incident to this lease.

12. ROADS, QUARRY AND DRILLING SITES

12.01 Lessee shall not construct any roads, clear any quarry or drilling sites, or excavate any trenches without prior written approval from District Forester, who shall set forth the type and grade of roads, trenches and area to be cleared. The access roads shall be held to a maximum grade of ten percent (10%). However, if steeper grades are necessary, written approval must be obtained from District Forester prior to their construction. Any roads built at the expense of Lessee in its operations shall not be removed or destroyed and shall become a part of the road system of the State Forest lands.

12.02 Lessee recognizes that all roads and trails owned or maintained by Department, which are used in the execution of this lease, were constructed and improved for the use of Department and for the general public having business in and making use of State Forest land. Lessee, therefore, agrees that its operations will not be conducted in such a manner as to prevent, hinder, or obstruct the customary use of such roads and trails by Department or by the public.

12.03 Where roads built by Lessee cross any fence, Lessee shall construct a gate and keep it closed except when the passageway is in use. Lessee shall keep all said roads and trails free at all times from obstruction by logs, brush, or debris resulting from Lessee's operation. District Forester may require Lessee to temporarily discontinue the use of said roads whenever, in his opinion, such action is necessary to prevent their serious damage.

12.04 Upon termination of this lease, Lessee shall repair said roads and trails and leave them in as good condition as at the beginning of this lease of which condition Department shall be the sole judge. In addition, Lessee shall make any repairs to said roads and trails deemed necessary by District Forester to insure adequate and proper drainage, road surface conditions, horizontal alinement, and cross slope.

12.05 Lessee, in its operations, is hereby granted the right to use all State Forest roads, both on or off the leased premises, provided that Lessee agrees to obtain prior written approval from District Forester and to repair any damage to all State Forest roads, on or off the leased premises, when such damage is caused by Lessee's operations; provided, however, if in the opinion of the District Forester in charge, the roads or portions thereof are used by others sufficiently to warrant the apportionment of the maintenance costs, then Lessee may be relieved of the burden of sole maintenance and be required to provide only Lessee's proportionate share as decided by Department through District Forester.

12.06 It is understood that the bond required, under the terms of this lease, shall cover the use and repair of all State Forest roads on or off the leased premises.

12.07 Lessee recognizes the rights and privileges afforded to Grantees by rights-of-way and other agreements executed with Department, prior to this lease, which cross or otherwise lie within the area of this lease; and, therefore, agrees to relocate at Lessee's own expense, all portions adversely affected by work incident to this lease in accordance with the then current rules and orders of the Public Utility Commission of the Commonwealth of Pennsylvania. In the event the Public Utility Commission does not have any jurisdiction, any necessary relocation shall be completed subject to the approval of Grantor.

13. BUILDINGS

13.01 Lessee shall not drill any bore or core hole, carry on operations, make excavations, or otherwise disturb the surface of the lands within two hundred (200) feet of any building. However, if a lesser distance to any building is needed, written approval must be obtained from District Forester, or from the owner of the building if not the property of the Commonwealth.

13.02 Lessee shall consult with District Forester and obtain written approval prior to the construction and erection of any storage facilities, buildings, work sheds or any other physical structure upon State Forest lands outside of the leased premises.

14. APPEARANCE

14.01 In its appearances hereunder, Lessee shall, at all times, maintain State Forest lands in a neat and presentable manner, removing all rubbish and debris as it accumulates and restoring each individual area within thirty (30) days to as near as possible its original condition when its use is abandoned.

15. EXPLOSIVES

15.01 Lessee shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during periods of fire danger unless permission is granted by District Forester.

15.02 Explosives shall not be used in fish spawning or rearing areas, and/or nesting areas of wildlife concentration, during periods of intense activity or at any other time or in any manner that might damage any wildlife resource.

16. RESTORATION AND REVEGETATION

16.01 Restoration and revegetation shall be accomplished in accordance with Lessee's approved reclamation plan under the Surface Mining Conservation and Reclamation Act. However, should Lessee not qualify for licensing under this Act, as amended, then Lessee shall comply with Sections 16.02, 16.03 and 16.04 as described hereafter which provides for restoration and revegetation of all areas disturbed by Lessee.

16.02 Upon completion of drilling, mining, quarrying, excavating, stripping, or any other operation, the surface of the site shall be backfilled to as near as possible to the original contour of the surface. Where necessary, the top of the highwall shall be graded into the drill, mine, quarry, excavation, strip, or any other site area, so that all safety hazards to both humans and wildlife have been eliminated and the highwall restored to a safe and reasonable grade. Department shall be the sole judge as to what is safe and reasonable. If terraces or benches are present upon completion of operations or if restoration of the drill site, mine site, quarry site, excavation site, strip site, or any other site, is enhanced by such terraces or benches, the terraces or benches, upon approval of Department, may be cut into the highwall or left standing. The backfill material from the drilling, mining, quarrying, excavating, stripping, or any other operation, shall be graded to form a gradual slope away from the highwall and all peaks and ridges shall be leveled so that water shall not accumulate in pools over the restored area.

16.03 Upon completion of drilling, mining, quarrying, excavating, stripping, and backfilling of an area or any portion thereof and after backfilling has settled so as to provide an acceptable planting site, Lessee shall revegetate all disturbed or cleared areas. Such revegetation is to be done according to a planting plan prepared by Department. Lessee guarantees an establishment of not less than an average of five hundred (500) live and growing trees per acre one (1) year after date of planting. If area is planted in grasses, or shrubs, or trees and grasses, Lessee shall guarantee an establishment of sixty-five percent (65%) survival of said grasses or shrubs one (1) year after date of planting. If such growth has not resulted, Lessee shall replant such areas unless, in the opinion of Department, the lack of a satisfactory growth was due to soil conditions or other causes beyond the control of Lessee. Department shall be the sole judge in determining if replanting is required and shall notify Lessee in writing of areas to be revegetated. This provision may be waived by Department upon the recommendation of District Forester.

16.04 Restoration and revegetation plans of Lessee must be approved in advance of any operations by Department or its representatives. Department shall have the sole right to determine the time of backfilling and revegetation.

17. WATER WELLS

17.01 Any plan by Lessee for the drilling of water wells on State lands, and use of any water found, must be approved in writing by Department.

17.02 A final plat will be submitted within thirty (30) days after completion of each water well showing exact location, elevation, depth of well, formations penetrated and depth, type of shows, and volume of water or hydrocarbons present.

17.03 Lessee further agrees to supply Department with any other records, memoranda, accounts, reports, cuttings, cores, or other information relative to the drilling, completion, or operation of water wells on the above described premises. This will include true copies of any electrical or radioactivity surveys made in the wells.

BOOK 481 PAGE 245 of 459

17.04 Lessee shall be familiar with and comply in every respect with the provisions now existing or hereafter enacted of the Water Well Drillers License Act 610 of May 29, 1956 (P.L. 1840), providing for the orderly development of the ground water resources of the Commonwealth of Pennsylvania.

18. PIPELINES

18.01 Lessee shall refill to contour all ditches or other excavations caused by the construction, operation, maintenance or removal of pipelines; construct cross ditches; lime, fertilize and seed or replant the right-of-way; keep the pipeline and right-of-way in good repair and appearance, and take such other measures as may be deemed necessary by Department to control erosion and sedimentation and to maintain or restore the natural and aesthetic values as directed by Department.

19. RARE AND ENDANGERED SPECIES

19.01 If in the course of his operations, Lessee encounters any fauna or flora listed on federal or state registers of threatened or endangered species, or habitat critical to their survival, Lessee shall immediately cease operations and contact the District Forester so that arrangements can be made with Bureau of Forestry specialists to field check the site to make all necessary preparations to protect and preserve the fauna and flora which may be endangered.

20. HISTORICAL AND ARCHAEOLOGICAL SITES

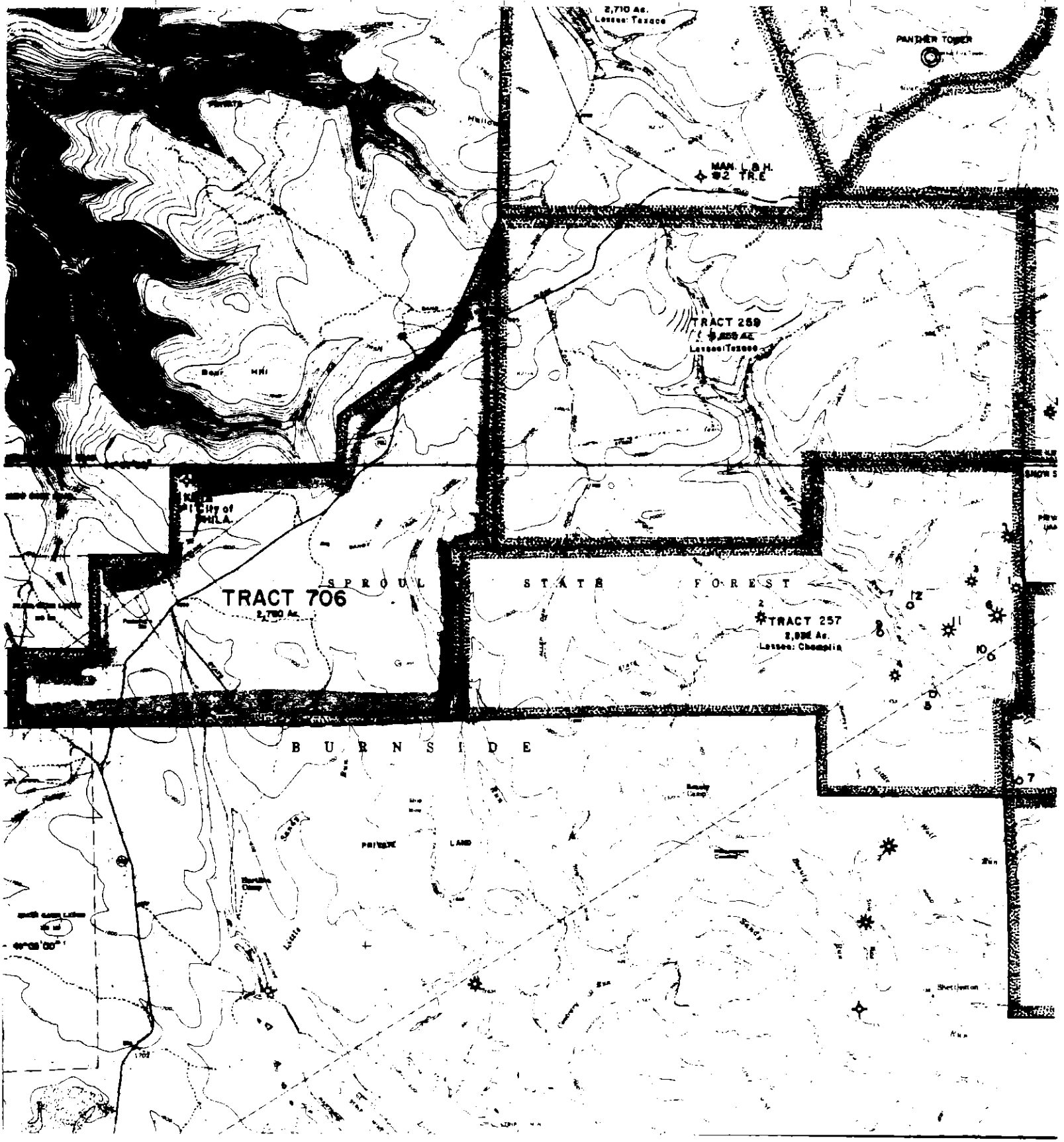
20.01 If in the course of his operations, Lessee encounters any historical or archaeological sites, Lessee shall immediately cease operations and contact the District Forester so that arrangements can be made with Bureau of Historical Preservation specialists to field check the site to make all necessary preparations to protect and preserve the artifacts which may be endangered.

21. CONTACT WITH STATE AGENCIES

21.01 Lessee shall periodically contact the following State agencies or their successors to keep informed on up-to-date information, policies, rules and regulations applicable to this lease.

Department of Environmental Resources	Brief Statement of Agency's Jurisdiction
Bureau of Forestry, Minerals Section P.O. Box 1467 Harrisburg, Pennsylvania 17120 (717-787-4835)	Leasing programs, terms, policies and geophysical regulations for State owned land and waters. Rare and endangered species.
District Forester Forest District (where applicable) Park Superintendent State Parks (where applicable)	Restoration and replanting of leased premises, timber damages, location of well sites, rights-of-way, roads, etc.
Bureau of Solid Waste Management P.O. Box 2063 Harrisburg, Pennsylvania 17120 (717-787-9870)	Disposal of water polluting materials and hazardous industrial wastes
Bureau of Air Quality Control P.O. Box 2063 Harrisburg, Pennsylvania 17120 (717-787-9702)	Blowing gas wells and air drilling, burning of waste materials, trash, etc.
Bureau of Soil & Water Conservation Regional Office (where applicable) or P.O. Box 1467 Harrisburg, Pennsylvania 17120 (717-787-5267)	Soil Erosion & Sedimentation Control Plan
Bureau of Water Quality Management P.O. Box 2063 Harrisburg, Pennsylvania 17120 (717-787-2666)	Slush pits, siltation, pollution, etc. Disposal of produced water; notification of fires, breaks, leaks, spills or blowouts
Bureau of Dams and Waterway Management Division of Waterways and Storm Water Management P.O. Box 2357 Harrisburg, Pennsylvania 17120 (717-783-1384)	Locating structures or pipelines in streams, rivers and lakes. Crossing streams - impoundment of stream for water supply
Bureau of Topographic & Geologic Survey Division of Oil & Gas Geology 7th Floor, Highland Building 121 South Highland Avenue Pittsburgh, Pennsylvania 15206-3988 (412-665-2155)	Instructions before sample delivery

Bureau of Oil & Gas Management 7th Floor, Highland Building 121 South Highland Avenue Pittsburgh, Pennsylvania 15206-3988 (412-665-2900)	Oil and gas regulations and enforcement (drilling permits, plugging, etc.)
Bureau of Mining and Reclamation P.O. Box 2357 Harrisburg, Pennsylvania 17120 (717-787-5103)	Regulations and enforcement (when drilling in coal areas); blasting, seismic surveys, etc.
Pennsylvania Fish Commmission	
Executive Director P.O. Box 1673 Harrisburg, Pennsylvania 17120 (717-657-4515)	Regulations for the protection of fish life
Pennsylvania Game Commission	
Executive Director P.O. Box 1567 Harrisburg, Pennsylvania 17120 (717-787-3633)	Regulations for the protection of wildlife
Pennsylvania Historical and Museum Commission Executive Director P.O. Box 1026 Harrisburg, Pennsylvania 17120 (717-787-2891)	Protection and documentation of historical and archaeological sites.



LEGEND

- STATE FOREST BOUNDARY
- STATE PARK BOUNDARY
- WILD/NATURAL AREA BOUNDARY
- CHUCK KEIPER TRAIL
- TRACT BOUNDARY
- GAS WELL
- DRY HOLE

(Nondev)	TRACT NO. 669	68 Ac.
	TRACT NO. 691	2,554 Ac.
	TRACT NO. 696	6,524 Ac.
	TRACT NO 700	1,581 Ac.
	TRACT NO. 706	2,760 Ac.
	TRACT NO. 707	2,050 Ac.
	TRACT NO. 708	1,627 Ac.
	TRACT NO. 709	1,333 Ac.
	TRACT NO. 710	1,829 Ac.

AREA OF MAP

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF RESOURCES MANAGEMENT
MINERALS SECTION - BUREAU OF FORESTRY

REVISIONS
10/30/85 WIL

OIL & GAS TRACTS
669,691,696,700 & 706 THRU 710
SPROUL STATE FOREST

CENTRE CO.
CLINTON CO.
BURNSIDE TWP
NOYES, BEECH CREEK } TWPS.
GRUGAN, CHAPMAN

J.T. WALKER, P.R. MYERS

MAY 1985

EXHIBIT (C)

BOOK 181 PAGE 457

2490477

Addendum B

SCALE 1" = 4,000'

0 2000 4000 6000 8000 10,000 FEET

N.E., HOWARD N.W., SNOW SHOE S.E., HOWARD, & PARTS OF KEATING, REMOVO WEST, REMOVO EAST GLEN UNION SNOW SHOE N.W., FARRANDSVILLE, SNOW SHOE, & BEECH CREEK 7 1/2' TOPO QUAD'S

Conversion Site #

M-O&G (6-77)
Oil and Gas Lease

Commonwealth of Pennsylvania
Department of Environmental Resources
Minerals Section, Bureau of Forestry
P. O. Box 1467
Harrisburg, Pennsylvania 17120

CONTRACT NO.
M-110284-10

OIL AND GAS LEASE FOR STATE FOREST AND PARK LANDS*

THIS AGREEMENT made and entered into on this 24th day of December, 1979, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF ENVIRONMENTAL RESOURCES, hereinafter designated "Department" and TEXACO INC. with its principal place of business at P. O. Box 2420, Tulsa, Oklahoma 74102 and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH: THAT,

WHEREAS, Department is authorized by the Act 275 of December 3, 1970, P.L. 834, 71 P.S., Sections 1902A and 1906A, as amended to lease State Forest and Park lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the opening of the bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

NOW THEREFORE, in consideration of the sum of EIGHTY-TWO THOUSAND AND NINETY-TWO DOLLARS ($82,092.00), paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas, and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, TRACT NO. 284 containing 2,059 acres, more particularly described on the Oil and Gas Lease Attachment identified as Exhibit "A" and as shown on the Map identified as Exhibit "C" which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as Exhibit "C" are approximate.

*When this lease is granted in whole or in part on State Park land, then the words "State Forest land" shall be understood to mean State Park land in their entirety or in part whichever shall apply, wherever the words appear in the lease; and the words, "District Forester," shall be understood to mean "Park Superintendent."

28141-A

Tr. 284
Addendum B
Conversion Site # 3

1. TERM OR PERIOD

1.1 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth and shall continue from year to year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder, or engaged in the abandonment, or plugging of wells or removal of equipment therefrom.

2. RENTAL

2.1 Lessee shall pay to Department a rental for the above described leased premises at the rate of ONE DOLLAR ($1.00) per year for each acre of this lease retained by Lessee. The first rental will be paid on or before one (1) year after the delivery of this lease to Lessee and each successive rental, thereafter, upon each successive anniversary of the date of this lease.

2.2 The drilling of each well in the leased premises as provided in Section 9 shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 10, which reduction shall become effective on the next rental date, provided the well is a producer. If such wells are drilled on a unit created by a spacing order issued by Department or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3. OIL ROYALTY

3.1 Lessee shall pay to Department, as royalty, ONE-EIGHTH (1/8th) of the field price per barrel (42 U.S. Gallons) at 60° F produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks.

3.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises.

3.3 If oil, gas, condensate, and other liquid hydrocarbons each in paying quantities should be developed from the same well, then the oil and the gas, condensate, and other hydrocarbons shall be saved.

3.4 Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with standard practices as outlined in American Petroleum Institute Standard 2500, January 1, 1955, or as subsequently amended by the same authority, and at a temperature base of 60° F. Lessee shall provide tanks for accurately measuring the crude oil produced from the lease. Positive copies of one hundred percent (100%) capacity tank tables are to be furnished to Department or other acceptable standards of measuring production.

4. GAS ROYALTY

4.1 Lessee shall pay to Department, as royalty, TWENTY-NINE CENTS ($0.29) per thousand cubic feet (Mcf) or ONE-EIGHTH (1/8th) of the market value, whichever is higher, for all natural gas, casinghead gas, or other gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; said royalties shall be payable monthly at the prevailing market value for natural gas in the area at the time of delivery.

4.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all gas and other gaseous substances produced and saved from the leased premises.

5. GAS MEASUREMENT

5.1 The volume of gas produced, saved, and marketed shall be measured according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

a. The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

b. The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, irrespective of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

c. The temperature of the gas passing the meters shall be determined: (1) by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes; (2) if a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of fifty degrees Fahrenheit (50° F) shall be used in computing gas volume.

d. The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, at intervals of three (3) months, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

e. The deviation of the natural gas from Boyle's Law shall be determined by tests at intervals of three (3) months or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with the recommendations of the National Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

6. STATEMENT

6.1 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

7. PAYMENTS

7.1 Lessee shall be held responsible for the payment of all royalties, which shall be mailed to the office of Department at Harrisburg, Pennsylvania, and made payable to Department. Payments of royalties shall be made not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

8. OPERATIONS

8.1 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up to date oil and gas field practices.

9. FIRST WELL

9.1 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well on the leased premises or on unitized acreage containing a portion of the leased premises, but the well need not necessarily be on the portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, the lease shall be automatically terminated in its entirety, unless Department approves in writing, thirty (30) days in advance of the anniversary date of this lease, the continuation of the lease on a year to year basis.

10. SUBSEQUENT WELLS

10.1 If the "FIRST WELL" drilled by Lessee or any subsequent well is productive of oil and/or gas and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises, but not necessarily on the portion contained within the unit, as would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If an additional well is necessary, it must be commenced within six (6) months after the completion of the last well drilled; provided, however, that if Lessee concludes an additional well is not justified then Lessee shall submit to Department the information upon which the conclusion is based. Upon review of such information if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within six (6) months from Department's determination or releasing all of the acreage covered by the lease except forty (40) acres around each well from which oil is produced as the principal product and six hundred (600) acres around each well from which gas is being produced as the principal product.

10.2 Lessee shall not be required under this provision to drill more wells than required or allowed under any spacing order, rule, or regulation of Department, or in the absence of any such order, more than one well for each forty (40) acres where oil is being produced as the principal product of such well, or more than six hundred (600) acres where gas is being produced as the principal product of such well.

10.3 The amount of acreage included in a spacing unit by Department, or in the absence of an order by such Board, forty (40) acres where oil is being produced as the principal product of such well, or six hundred (600) acres where gas is being produced as the principal product of such well, shall be referred to elsewhere in the lease as "acreage attributable to a well."

11. DEVELOPMENT

11.1 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

11.2 Well spacing shall not be closer than one (1) well per twenty (20) acres; should closer spacing be required, written approval must be obtained from Department.

12. OFFSETS

2640

12.1 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth that is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, and any well drilled on leases not owned by the Commonwealth that is completed within two thousand five hundred and sixty (2,560) feet of the boundary line of the leased premises and from which gas is being produced as the principal product; or any well drilled on leases not owned by the Commonwealth that is completed within the radius of the drainage areas set by an order of Department; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may at its discretion relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well based on the ratio the affected acreage bears to the total acreage drained by the well, or release all of the acreage of the leased premises except forty (40) acres around each well from which oil is being produced as the principal product and six hundred (600) acres around each well from which gas is being produced as the principal product, or that drainage attributable to a well by an order of Department if the affected acreage falls within an area subject to such a spacing order.

12.2 No well on the leased premises shall be shut in if drainage will occur through offsetting wells within the aforeprescribed distances for oil and gas wells on leases not owned by the Commonwealth and if such offsetting gas wells are on compression, the offset wells on the leased premises shall be placed on compression.

12.3 Lessee agrees that any well along the boundary line, contingent to other lands where minerals, oil and/or gas are owned by the Commonwealth, shall be located at least six hundred and sixty (660) feet from such boundary if oil is the principal product anticipated from the objective formation of the well or at least two thousand five hundred and sixty (2,560) feet from such boundary if gas is the principal product anticipated from the objective formation of the well, or that distance from such boundary line which will be the radius of the drainage area set forth by an order of Department, if the area is subject to such a spacing order.

12.4 Upon application by Lessee, this provision providing for the distance from such boundary line may be waived by Department when deemed in the interest of the Commonwealth and not in an area subject to a spacing order of Department.

13. UNITIZATION

13.1 Lessee shall have the right at any time or times to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering, with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises or portions thereof with adjoining lands to prevent the drilling of an excessive number of wells or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

13.2 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of any such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises.

13.3 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

14. LESSEE'S USE

14.1 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

14.2 Lessee, his agents, contractors and subcontractors and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit to District Forester for his approval a map showing the location of each and every line to be shot. The bond, hereinafter described, shall be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

15. PIPELINES

15.1 Lessee is herewith granted the right to lay any necessary pipelines on or under the leased premises; however, a route map for each line shall be submitted to District Forester for his approval as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to him, Lessee must enter into the customary pipeline right of way agreement with Department.

16. DRILLING

16.1 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before the drilling thereof is commenced, and no well shall be commenced until a permit has been issued where necessary by Department's Oil and Gas Division.

16.2 Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

16.3 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth.

16.4 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

16.5 Lessee shall maintain at all times the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells or wells being serviced by a rig shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall at all times be available for efficient operations. Blowout control equipment must be capable in case of an emergency to shut in the well at a point at least fifty (50) feet from the wellhead.

16.6 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is the highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head or leaking oil or gas between the producing string and next larger size casing string when such pressures or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

16.7 While a well is being drilled with mud or water as a drilling fluid, Lessee shall test control equipment daily to the extent possible without causing premature removal of drill pipe from the hole while drilling and record the results of such tests daily. While a well is drilling with air or gas as a drilling fluid, Lessee may test control equipment only during trips for the drilling bit.

16.8 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

16.9 Drilling mud of sufficient weight to prevent oil, gas or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

16.10 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

16.11 Lessee shall use a casing program which complies with oil and gas statutes and rules and regulations of the Commonwealth and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies and blowouts.

16.12 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

16.13 The production casing shall be of new or reconditioned seamless pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(i) The maximum anticipated rock pressure at any point in the casing string shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield as shown in A.P.I. Bulletin 5-C-2 dated April, 1972 or later amendments.

(ii) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated at any point in the casing does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield as shown in A.P.I. Bulletin 5-C-2 or later amendments.

16.14 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After the corrective operation, the casing shall again be tested in the same manner.

16.15 All surface casing and production casing shall be cemented in the ground with good quality cement equalling or exceeding A.P.I. specification in the manner hereinafter described.

16.16 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department.

16.17 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In the event that the cement cannot be circulated to the surface due to the presence of fractures or other lost circulation zones, Lessee shall determine as accurately as possible the depth of the top of the cement in the annular space behind the casing and record it on the well record.

16.18 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another or to the surface does not occur behind the casing.

16.19 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval of Department.

16.20 Lessee, its agent, contractors and subcontractors, and employees of contractors and subcontractors shall not allow the well to blow open, except in case of an emergency over twenty-four (24) hours after drilling-in. Lessee will pay Department at the regular royalty rate for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

16.21 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Test Method (USBM-Monograph 7) or by other methods standard to the industry and approved by Department.

16.22 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

16.23 At least once every six (6) months, Lessee will determine the open flow potential of each producing well as required in Section 16.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive in writing all or parts of this requirement if during any calendar year production averages less than sixty (60) Mcf per day and/or the semiannual twenty-four (24) hour pressure tests show reservoir pressures to be less than one hundred (100) psi.

16.24 Lessee shall at all times conduct prudent drilling operations, including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

16.25 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

16.26 Lessee shall

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) after H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) use special steel pipe and casing which is resistant to H_2S stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) post warning signs around all wellsites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to and at a safe distance from all facilities handling the H_2S gas including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

(h) immediately notify Department and record on appropriate well records and driller's logs any H_2S gas found in the course of drilling or producing operations.

17. REPAIR OF EQUIPMENT

17.1 Lessee does hereby agree that it will, at all times, during the continuance and delivery of oil, gas, and liquid hydrocarbons, to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

18. WELL RECORDS, LOGS AND REPORTS

18.1 Lessee shall keep a daily drilling record which will describe the formations penetrated, depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. Any other data that is usually acquired in the normal procedure of drilling shall be recorded and furnished to Department, such as drilling time, rate of fill-up, lost circulation zones, caving strata, casing records, core analyses, mud log analyses, perforation, and production test data. Within thirty (30) days after completion of each well, Lessee shall furnish Department an accurate location plat, a detailed lithologic log, a detailed history of the well and all well data including geologic, driller, electrical, and any other well surveys made to obtain subsurface information. Upon request, samples of all formations penetrated and parts of cores taken, accurately labeled with the name of the well, and interval of depth shall be furnished to Department at Lessee's expense. If requested, Lessee shall ship a complete set of samples to the Pennsylvania State Geological Survey, Room 1201, Kossman Building, 100 Forbes Avenue, Pittsburgh, Pennsylvania 15222, within thirty (30) days after completion of each well.

19. AUDITS

19.1 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the lease. Department may keep such charts for examination for a period not to exceed ninety (90) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, and other products produced from the leased premises.

19.2 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, and liquid hydrocarbons, produced from any well covered by this lease, to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payments to Lessee, his heirs, administrators, executors, successors, and assigns for oil, gas, and liquid hydrocarbons from wells covered by this lease.

19.3 Lessee further grants to Department the right at any time to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from cancelling this lease upon delivery to Lessee of written notice of Department's intention.

20. LESSEE'S TERMINATION

20.1 Lessee may at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

20.2 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 10. Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

21. REMOVAL

21.1 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to remove all buildings, machinery, wells, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations, to fill and level all pits, and to the extent practicable, to restore the property to the same condition as when received.

22. RELEASE

22.1 Lessee shall not be granted a final release from the terms of this lease until District Forester has met with Lessee's field engineer on the ground, inspected the premises, and received a signed statement of release from Department indicating the proper policing has been completed.

23. PLUGGING

23.1 Lessee shall properly and effectively plug all wells on the leased premises before abandoning in accordance with the regulations of the Department's Oil and Gas Division and all applicable laws of the Commonwealth. A copy of the plugging procedure approved by the Oil and Gas Division shall be supplied to the Minerals Section, Bureau of Forestry. In addition to the above mentioned requirement upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements will be reason for cancellation of this lease and the posted bond will be forfeited in order that Department may properly plug the wells.

23.2 The plugging procedures, as herein stated, shall also include all shallow wells drilled in areas which are not coal productive and are not covered by the regulations of Department (Certificate of Plugging form may be obtained from Department's Oil and Gas Division).

24. ABANDONMENT AND STORAGE RIGHTS

24.1 In the event the development of this lease demonstrates, in the opinion of Department, that this tract has potential value as a gas storage reservoir (no storage rights are demised to Lessee under the terms of this lease), the well, equipment, property, and casing involved shall first be offered to Department, its nominee or assignee, at the then fair market value of those items before any well shall be plugged. Such firm offer shall be made in writing to Department at least thirty (30) days prior to commencement of removal of the equipment from the well by Lessee.

25. DEPARTMENTAL TERMINATION

25.1 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) days after demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

25.2 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a writ of Habre Facias Possessionem (without asking leave of court) waiving all stay and exemption laws and release of errors.

26. INDEMNITY

26.1 Lessee shall at all times hereinafter indemnify and save harmless Department from and against all detriment, damage, loss, claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

27. BOND

27.1 Lessee agrees to give Department a surety or performance bond with satisfactory corporate surety in the principal sum of TWENTY-FIVE THOUSAND DOLLARS ($25,000.00) with judgment clause in a form to be approved by the Attorney General conditioned on the faithful performance of the covenants of this lease. The bond shall be further conditioned that in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells upon termination of this lease, or within six (6) months from the termination, Commonwealth can execute upon the bond to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the bond shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises.

28. RELATED AGREEMENTS

28.1 Department will be furnished for record purposes and to protect its interests a copy of all agreements, contracts, letters or memoranda entered into, made, or sent by Lessee in any way concerning the development, operation, or sale of products from this lease.

29. ASSIGNMENTS

29.1 Lessee shall not use or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned and assignee, thereof, shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

30. LIMITATION ON WARRANTY

30.1 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the rents, rentals, and royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the proportion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may with the approval of the Attorney General enter into an escrow arrangement for future rents and royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the rents and royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The rents and royalties placed in escrow shall be refunded to Lessee in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

31. FORCE MAJEURE

31.1 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance, therewith, is prevented by or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If at the end of the primary term, hereof, such term has not been extended by production or drilling as in this lease provided and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the rental provision, hereof, shall be extended automatically from year to year for a period not to exceed ten (10) additional years unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises by reason of any of the above recited causes, this lease shall remain in full force and effect.

32. THIRD PARTIES' RIGHTS

32.1 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) have hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature.

33. PUBLICATION AND NOTICE

33.1 Within thirty (30) days following the receipt by Lessee of a copy of this lease, fully executed, Lessee shall record the lease in the county or counties in which the leased premises lie. Within thirty (30) days following the recording, Lessee shall advise Department in writing of the recording reference data. Thereafter, Department shall cause to be published in the Pennsylvania Bulletin at least the following information:

(1) the subject of this lease;
(2) the general location of the leased premises;
(3) the names of Department and Lessee; and
(4) the recording reference date for this lease.

34. LIABILITY

34.1 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, irrespective of whether or not such pollution or damage be due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause be found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises the pollution or other damage would not have occurred, it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

35. RIGHTS RESERVED BY DEPARTMENT

35.1 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

35.2 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

35.3 Department reserves the right to approve in writing all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises, unless upon due cause shown, Department waives the thirty (30) day requirement and allows a lesser, but reasonable, time for review.

35.4 The surface rights of Department shall be considered dominant and the mineral rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

36. PROTECTION AND CONSERVATION

36.1 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as Exhibit "B" attached hereto and made a part hereof.

36.2 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

M-O&G (3-79)
Oil and Gas Lease

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

Lucy M. Cunko

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

CLIFFORD L. JONES, Secretary

ATTEST:

TEXACO INC.

APPROVED
Form
Terms

BY:

LESSEE
Attorney-in-Fact

APPROVED AS TO LEGALITY
AND FORM:

ASSISTANT ATTORNEY GENERAL

APPROVED:

GOVERNOR

- 16 -

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DAUPHIN

On this the 24th day of Decemba, 1979, before me LUCY M. CUNKO, the undersigned officer, personally appeared CLIFFORD L. JONES, who acknowledged himself to be Secretary of Environmental Resources of the Commonwealth of Pennsylvania and that he as such Secretary of Environmental Resources being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing his name as CLIFFORD L. JONES, Secretary.

In Witness Whereof, I hereunto set my hand and official seal.

Lucy M. Cunko, Notary Public
My Commission Expires May 2, 1983
Harrisburg, PA Dauphin County

Lucy M. Cunko
Notary Public

PENNSYLVANIA ACKNOWLEDGMENT

STATE OF OKLAHOMA

COUNTY OF TULSA

On this the 19th day of December, 1979, before me, the undersigned Notary Public, personally appeared PAUL B. HARRIS, known to me to be the person whose name is subscribed as attorney in fact for TEXACO INC., a corporation, and acknowledged that he as such attorney in fact, being authorized so to do, executed the foregoing instrument as the act of his principal for the purposes therein contained by signing the name of the corporation by himself as attorney in fact.

In witness whereof I hereunto set my hand and official seal.

M. K. Vann
Notary Public

My Commission Expires:

Nov. 17, 1983

M. K. VANN
MY COMMISSION EXPIRES
NOVEMBER 17, 1983

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That, TEXACO INC., a corporation organized and existing under the laws of the State of Delaware (formerly named The Texas Company), acting herein by and through L. W. CALAHAN, its duly authorized Vice President, has and does hereby appoint A. R. McDANIEL, PAUL B. HARRIS and J. A. SCHELL, jointly or severally, of Tulsa County, Oklahoma, its true and lawful Attorneys-in-Fact with power and authority for and on behalf and in the name of TEXACO INC., whether for TEXACO INC., acting alone or for TEXACO INC., acting jointly with other party or parties, to contract for and to purchase lands, and oil, gas, sulphur, or other mineral fees, and oil, gas, sulphur or other mineral royalty interests; to apply for, contract for, purchase and acquire directly or by assignment oil, gas, sulphur, and mineral leases, subleases, assignments, prospecting and other permits, licenses and other oil, gas, sulphur and mineral agreements upon any and all property of every nature and kind, whether privately or publicly owned and with such terms, agreements and stipulations as he may deem proper; to let or sublet any lands, leases, permits, licenses or other rights or privileges; to make, execute, acknowledge and deliver unit, pooling, cooperative, joint operating, or any other agreements with any other person or persons, whether natural or corporate, covering and binding lands, mineral fees or oil, gas, sulphur or other mineral leases belonging to TEXACO INC., and property of such other person or persons, upon such terms and conditions as said Attorneys-in-Fact shall deem proper or expedient, whether or not under any such agreement TEXACO INC. is designated as the Operator of the area subjected to any such agreement; to release and surrender, in whole or in part, any lease, assignment, sublease, prospecting or other permit or license in favor of, or any operating or other agreement with or by, TEXACO INC.; to make agreements whereby said TEXACO INC. recognizes pledges and assignments of rentals and royalties payable under leases or subleases held by it and agrees to make payment of such rentals or royalties to the pledgees or assignees in accordance with the pledges or assignments; to contract for the drilling and reworking of wells and all related activities; to contract for the hire and/or the operation of any and all vessels, boats, barges, and other floating equipment for use in the exploration for oil, gas, sulphur, or other minerals or for the production and handling thereof; to contract for the sale of oil and gas (including casinghead gas), sulphur, and other minerals, or products therefrom, owned by TEXACO INC.; to contract for the processing or treatment of natural gas from wells owned or operated by TEXACO INC., and to undertake or agree to treat or process natural gas from wells owned or operated by TEXACO INC. and to undertake or agree to treat or process natural gas from wells owned or operated by others; to agree to pay overriding or other royalties, carried interests, or other interests in production measured by the amount or value of oil, gas (including casinghead gas), sulphur or other minerals, produced by TEXACO INC. or others for its account; to sell, exchange or dispose of equipment, materials and supplies which in his opinion are no longer required for use in the business of TEXACO INC., to grant, acquire or release, in whole or in part, servitudes, easements, and rights of way; to execute any and all forms, papers, and documents, including oaths and affidavits thereon, required to document, register or list with the Bureau of Customs, Treasury Department, United States of America, and with any other Federal or State agency or subdivision any and all vessels, boats, barges and other floating equipment owned or operated by or for TEXACO INC.; to grant, bargain, sell, convey and assign any lands, property, leases, subleases, permits, licenses, mineral fees, royalty or other interest belonging to said TEXACO INC.; to receive, receipt for and collect such sums of money as may be due and payable to said TEXACO INC. by virtue of any transaction which he shall have had under and by virtue of these presents or due and

payable to said TEXACO INC. by virtue of similar transactions which other parties shall have had by virtue of other powers of attorney of said TEXACO INC.; to make, execute, acknowledge and deliver all instruments, contracts, agreements, documents, bonds, and affidavits of every nature and kind required in carrying out or incident to carrying out the purposes of this power of attorney, with such terms, covenants and stipulations as he may deed proper or expedient; hereby giving and granting to them the power and authority to do and perform any and all acts and things whatsoever necessary or proper to be done in carrying out the foregoing as fully to all intents and purposes as TEXACO INC. might or could do if acting directly through its executive officers; hereby ratifying and confirming all that they shall lawfully do by virtue hereof.

The authority herein granted to file offers to lease with respect to Public Domain and Acquired Lands under Group 3100 of Title 43, Code of Federal Regulations, is hereby specifically limited to filing such offers for the sole and exclusive benefit of TEXACO INC. and not in behalf of any other person in whole or in part (although, as aforesaid, said Attorneys-in-Fact are authorized to make such filings in the name of TEXACO INC., whether for TEXACO INC., acting alone, or for TEXACO INC., acting jointly with any other party or parties) and said Attorneys-in-Fact are hereby specifically authorized to execute all statements of interest and of holdings in behalf of TEXACO INC. and to execute all other statements required, or which may be required, by the Acts and the regulations relating to oil and gas leasing on the Public Domain and Acquired Lands, and TEXACO INC. agrees to be bound by such representations of said Attorneys-in-Fact and waives any and all defenses which may be available to TEXACO INC. to contest, negate or disaffirm the actions of said Attorneys-in-Fact under this power of attorney.

Effective as of the date below, this power of attorney supersedes all powers of attorney granted to said A. R. McDANIEL, PAUL B. HARRIS and J. A. SCHELL prior to said date and all of such prior powers of attorney are hereby revoked, annulled and set aside as of said date.

The said A. R. McDANIEL, PAUL B. HARRIS and J. A. SCHELL shall remain the true and lawful Attorneys-in-Fact of said TEXACO INC. as aforesaid from the date hereof until such time as this instrument has been revoked by proper instrument of revocation.

IN WITNESS WHEREOF, TEXACO INC., acting by L. W. CALAHAN, one of its Vice Presidents, and under its seal, has executed this instrument at Houston, Texas, on this 22nd day of August, 1978.

TEXACO INC.

ATTEST:

By L W Calahan
L. W. CALAHAN, Vice President

RUTH M. GWIN
Ruth M. Gwin
Assistant Secretary

(SEAL)

OK AS TO FORM
OK AS TO TERMS

STATE OF TEXAS)
: SS.
COUNTY OF HARRIS)

On this 22nd day of August, 1978, before me, the undersigned, a Notary Public in and for the county and state aforesaid, personally appeared L. W. CALAHAN, to me known to be the identical person who subscribed the name of the maker thereof to the foregoing instrument as its Vice President and acknowledged to me that he executed the same as his free and voluntary act and deed, and as the free and voluntary act and deed of such corporation for the uses and purposes therein set forth.

Given under my hand and seal of office the day and year last above written.

Billie Livingston
Notary Public

BILLIE LIVINGSTON

My Commission Expires:
November 30, 1978

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "A"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-110284-10, by and between: COMMONWEALTH OF PENNSYLVANIA and TEXACO, INC.

Tract 284

State Tract 284 containing 2,059 acres of Sproul State Forest land comprising all of the John Schlonecker, Solomon Bastress, and John Pfoutz Warrants and parts of the William Gallagher (#2), James Gamble, and Samuel Morrison Warrants in Grugan and Gallagher Townships, Clinton County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from J. W. Christman by deed dated June 22, 1908; from S. N. Williams Estate by deed dated October 19, 1928.

Beginning at the southeast corner of the John Pfoutz Warrant, also being the southwest corner of the John Hamilton Warrant, also being a point on the Sproul State Forest boundary; thence westward approximately 6,850 feet along the south lines of the John Pfoutz Warrant and the James Gamble Warrant to a point on the south line of the James Gamble Warrant, also being a point on the Sproul State Forest boundary; thence northward approximately 7,400 feet through the James Gamble and William Gallagher Warrants to a point within the William Gallagher Warrant, also being a point on the Sproul State Forest boundary; thence eastward approximately 7,000 feet along the State Forest boundary through the William Gallagher Warrant and along the south line of the James Wilson Warrant to the southeast corner of the James Wilson Warrant, also being the southwest corner of the Samuel Morrison Warrant; thence northward approximately 3,600 feet along the west line of the Samuel Morrison Warrant to a point on the west line of the Samuel Morrison Warrant, also being a point on the northern boundary of the Pennsylvania Electric Power line right of way; thence eastward approximately 4,000 feet along the northern boundary of the Pennsylvania Electric Power line right of way through the Samuel Morrison Warrant to a point within the Samuel Morrison Warrant; thence in a general southeasterly direction approximately 1,100 feet South, 900 feet East, 1,350 feet South and 650 feet East within the Samuel Morrison Warrant to a point on the east line of the Samuel Morrison Warrant, also being a point on the Sproul State Forest boundary; thence southward approximately 4,700 feet along the east lines of the Samuel Morrison Warrant and John Schlonecker Warrant to the southeast corner of the John Schlonecker Warrant; thence westward approximately 5,550 feet along the south line of the John Schlonecker Warrant to the southwest corner of the John Schlonecker Warrant, also being the northeast corner of the John Pfoutz Warrant, also being a point on the Sproul State Forest boundary; thence southward approximately 3,850 feet along the east boundary of the John Pfoutz Warrant to the southeast corner of the John Pfoutz Warrant, the place of the beginning.

Drilling and Development Restrictions

Lessee shall not construct any roads, clear any drilling sites, excavate any trenches, drill any wells or conduct any oil or gas field exploration activity whatsoever within 200 feet of the Hyner View Road, Richey Road or Hyner Mt. Snowmobile Trail.

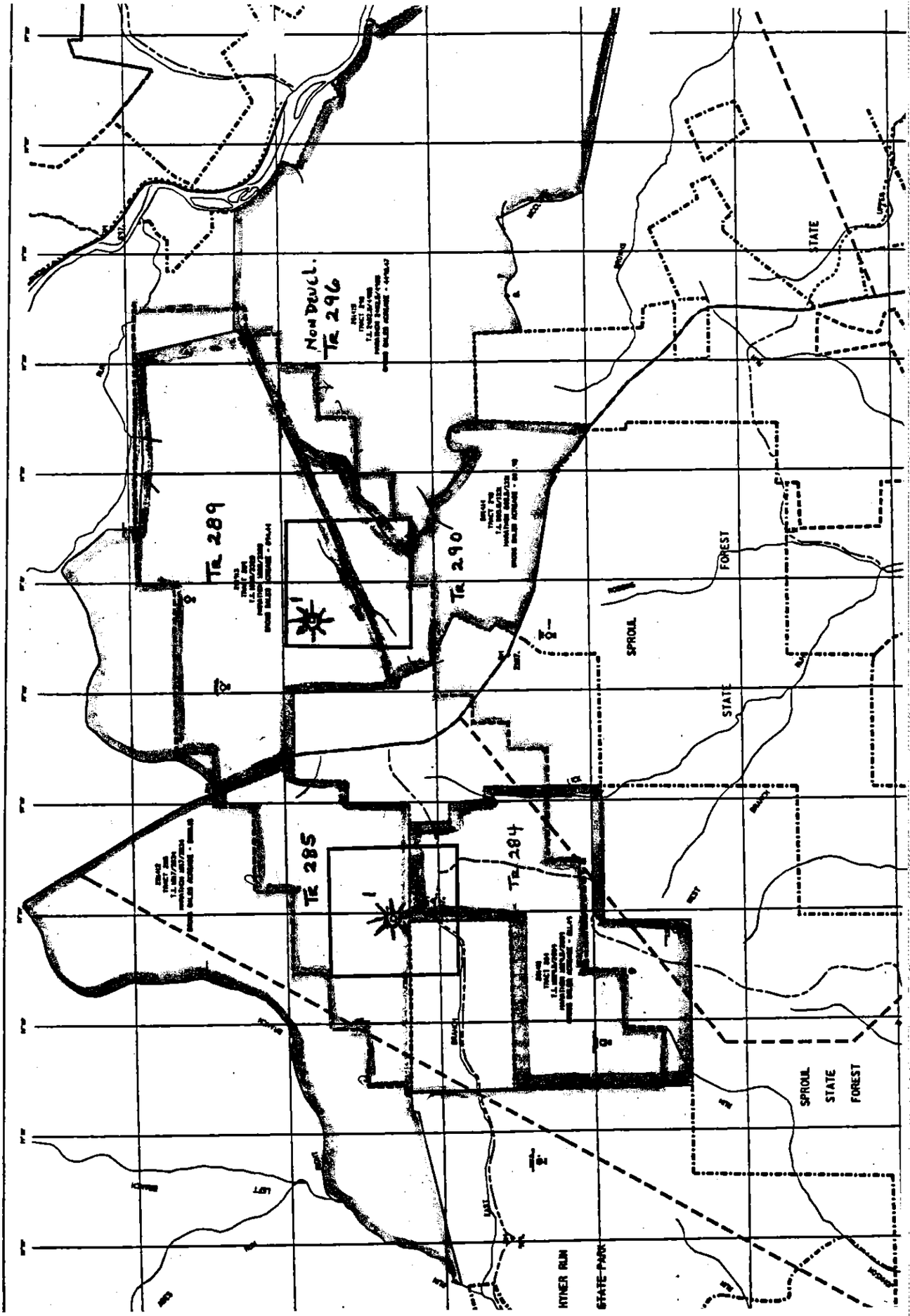


Exhibit D
Location Map

Legend

50% Leasehold Oil & Gas Assigned from TEPI To E. States 12-1-93

"In-Pool Acreage" Boundary

Lease Tract Outlines

Gas Well with Well #

Marathon Oil Co. owns all other leasehold oil and gas on these tracts

Showing Acreage Involved In Assignment
of 50% Leasehold Oil and Gas
From Texaco Exploration & Production Inc.
To Eastern States Exploration Co.
Grugan Gas Field
Tracts 284, 285, 289, 290 & 296
Sproul & Tiadaghton State Forests
Clinton & Lycoming Counties, PA
Scale: 1" = 5000' approx.

JTW July 6, 1994

Addendum B
Conversion Site # 3

M-O&G (10-7-80)
Oil and Gas Lease

Commonwealth of Pennsylvania
Department of Environmental Resources
Minerals Section, Bureau of Forestry
P. O. Box 1467
Harrisburg, Pennsylvania 17120

CONTRACT NO.
M-110324-9

OIL AND GAS LEASE FOR STATE FOREST AND PARK LANDS*

THIS AGREEMENT made and entered into on this 7th day of November, 1980, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF ENVIRONMENTAL RESOURCES, hereinafter designated "Department" and ADOBE OIL AND GAS Corporation, with it principal place of business at 1100 Western United Life Building, Midland, Texas 79701, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH: THAT,

WHEREAS, Department is authorized by the Act 275 of December 3, 1970, P.L. 834, 71 P.S., Sections 1902A and 1906A, as amended to lease State Forest and Park lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the opening of the bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

NOW THEREFORE, in consideration of the sum of TWO HUNDRED FIFTY-TWO THOUSAND, THREE HUNDRED SEVEN AND 55/100 DOLLARS ($252,307.55), paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas, and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, TRACT NO. 324 containing 4,565 acres, more particularly described on the Oil and Gas Lease Attachment identified as Exhibit "A" and as shown on the Map identified as Exhibit "C" which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as Exhibit "C" are approximate.

*When this lease is granted in whole or in part on State Park land, then the words "State Forest land" shall be understood to mean State Park land in their entirety or in part whichever shall apply, wherever the words appear in the lease; and the words, "District Forester," shall be understood to mean "Park Superintendent."

1. TERM OR PERIOD

1.1 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth and shall continue from year to year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder, or engaged in the abandonment, or plugging of wells or removal of equipment therefrom.

2. RENTAL

2.1 Lessee shall pay to Department a rental for the above described leased premises at the following rate: the first year's rental shall consist of the bonus payment which was competitively bid by Lessee and shall be payable upon delivery of this lease to Lessee; the second and third years' rental shall be TWO DOLLARS ($2.00) per acre each year payable upon the anniversary date of this lease; for the fourth and all subsequent years thereafter, the rental shall be THREE DOLLARS ($3.00) per acre each year payable upon the anniversary date of this lease.

2.2 The drilling of each well in the leased premises as provided in Section 9 shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 10, which reduction shall become effective on the next rental date, provided the well is a producer. If such wells are drilled on a unit created by a spacing order issued by Department or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3. OIL ROYALTY

3.1 Lessee shall pay to Department, as royalty, ONE-EIGHTH (1/8th) of the field price per barrel (42 U.S. Gallons) at 60° F produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks.

3.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises.

3.3 If oil, gas, condensate, and other liquid hydrocarbons each in paying quantities should be developed from the same well, then the oil and the gas, condensate, and other hydrocarbons shall be saved.

3.4 Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with standard practices as outlined in American Petroleum Institute Standard 2500, January 1, 1955, or as subsequently amended by the same authority, and at a temperature base of 60° F. Lessee shall provide tanks for accurately measuring the crude oil produced from the lease. Positive copies of one hundred percent (100%) capacity tank tables are to be furnished to Department or other acceptable standards of measuring production.

4. GAS ROYALTY

4.1 Lessee shall pay to Department, as royalty, THIRTY CENTS ($0.30) per thousand cubic feet (Mcf) or ONE-EIGHTH (1/8th) of the market value, whichever is higher, for all natural gas, casinghead gas, or other gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; said royalties shall be payable monthly at the prevailing market value for natural gas in the area at the time of delivery.

4.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all gas and other gaseous substances produced and saved from the leased premises.

5. GAS MEASUREMENT

5.1 The volume of gas produced, saved, and marketed shall be measured according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

a. The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

b. The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, irrespective of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

c. The temperature of the gas passing the meters shall be determined: (1) by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes; (2) if a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of fifty degrees Fahrenheit (50° F) shall be used in computing gas volume.

d. The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, at intervals of three (3) months, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

e. The deviation of the natural gas from Boyle's Law shall be determined by tests at intervals of three (3) months or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with the recommendations of the National Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

6. PAYMENTS

6.1 Lessee shall be held responsible for the payment of all royalties, which shall be mailed to the office of Department at Harrisburg, Pennsylvania, and made payable to Department. Payments of royalties shall he made not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

6.2 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

7. OPERATIONS

7.1 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up to date oil and gas field practices.

7.2 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department's Bureau of Soil and Water Conservation. A copy of the plan shall be forwarded to the Minerals Section, Bureau of Forestry, P. O. Box 1467, Harrisburg, Pennsylvania 17120 and District Forester.

8. RESTRICTIONS

8.1 Under Department's multiple use policy, the leased premises are continuously used for recreation, conservation and other purposes and many Department authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions:

(a) No drilling is permitted within 200 feet of any building.

(b) No drilling is permitted within 100 feet of any stream or body of water.

(c) No drilling is permitted within 330 feet of any picnic area which has been so designated by Department.

(d) No drilling is permitted within 330 feet of any trail, road or existing right of way.

(e) No drilling is permitted within 100 feet of any area of historic value, tree plantation, overlook, vista or fire tower site.

(f) No drilling is permitted within 330 feet of any Wild Area or Natural Area as designated by Department.

(g) No drilling is permitted for oil within 660 feet of the boundary line of leased premises.

(h) No drilling is permitted for natural gas within 2,640 feet of the boundary line of leased premises.

(i) In addition, the following specific restrictions for this lease shall also apply:

_____
_____
_____
_____
_____
_____

8.2 Upon written request by Lessee, Department may waive in writing any portion of the above restrictions if in Department's judgement such a waiver is justified and in its best interests.

9. FIRST WELL

9.1 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well on the leased premises or on unitized acreage containing a portion of the leased premises, but the well need not necessarily be on the portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, the lease shall be automatically terminated in its entirety, unless Department approves in writing, thirty (30) days in advance of the anniversary date of this lease, the continuation of the lease on a year to year basis.

10. SUBSEQUENT WELLS

10.1 If the "FIRST WELL" drilled by Lessee or any subsequent well is productive of oil and/or gas and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises, but not necessarily on the portion of the leased premises contained within the unit, as would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If an additional well is necessary, it must be commenced within six (6) months after the completion of the last well drilled; provided, however, that if Lessee concludes an additional well is not justified then Lessee shall submit to Department the information upon which the conclusion is based. Upon review of such information if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within six (6) months from Department's determination or releasing all of the acreage covered by the lease except forty (40) acres around each well from which oil is produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product and has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres around each shallow well from which gas is being produced as the principal product which has been completed above the Onondaga Formation, or that amount of leased acreage actually contained within an established unit, whichever is less.

10.2 Lessee shall not be required under this provision to drill more wells than required or allowed under any spacing order, rule, or regulation of Department, or in the absence of any such order, more than one well for each forty (40) acres where oil is being produced as the principal product of such well, or more than six hundred forty (640) acres where gas is being produced as the principal product of such well and has been drilled to the Onondaga Formation or deeper, or more than three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which is productive from formations above the Onondaga Formation.

10.3 The amount of acreage included in a spacing unit by Department, or in the absence of an order by Department, forty (40) acres where oil is being produced as the principal product of such well, or six hundred forty (640) acres where gas is being produced as the principal product of such deep well which has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which has been drilled to formations above the Onondaga Formation, shall be referred to elsewhere in the lease as "acreage attributable to a well."

11. DEVELOPMENT

11.1 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

11.2 Well spacing shall not be closer than one (1) well per forty (40) acres; should closer spacing he required, written approval must be obtained from Department.

12. OFFSETS

12.1 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth that is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, and any well drilled on leases not owned by the Commonwealth that is completed within two thousand six hundred and forty (2,640) feet of the boundary line of the leased premises and from which gas is being produced as the principal product; or any well drilled on leases not owned by the Commonwealth that is completed within the radius of the drainage areas set by an order of Department; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may at its discretion relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except forty (40) acres around each well from which oil is being produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product, or that acreage attributable to a well by an order of Department if the affected acreage falls within an area subject to such a spacing order.

12.2 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on leases not owned by the Commonwealth and if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression.

12.3 Lessee agrees that any well along the boundary line, contiguous to other lands where minerals, oil and/or gas are owned by the Commonwealth, shall be located at least six hundred and sixty (660) feet from such boundary if oil is the principal product anticipated from the objective formation of the well or at least two thousand six hundred and forty (2,640) feet from such boundary if gas is the principal product anticipated from the objective formation of the well, or that distance from such boundary line which will be the radius of the drainage area set forth by an order of Department, if the area is subject to such a spacing order.

12.4 Upon application by Lessee, this provision providing for the distance from such boundary line may be waived by Department when deemed in the interest of the Commonwealth and not in an area subject to a spacing order of Department.

13. UNITIZATION

13.1 Lessee shall have the right at any time or times to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering, with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises or portions thereof with adjoining lands to prevent the drilling of an excessive number of wells or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

13.2 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of any such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises.

13.3 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

14. SEISMIC SURVEYS

14.1 Lessee, its agents, contractors and subcontractors and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit to District Forester for his approval a map showing the location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to him, Lessee must obtain the customary Seismic Survey Permit from Department. The bond, hereinafter described, shall be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

15. PIPELINES

15.1 Lessee is herewith granted the right to lay any necessary pipelines on or under the leased premises; however, a route map for each line shall be submitted to District Forester for his approval as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, it must enter into the customary pipeline right of way agreement with Department.

16. DRILLING

16.1 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before the drilling thereof is commenced, and no well shall be commenced until a permit has been issued where necessary by Department's Oil and Gas Regulation Division.

16.2 Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

16.3 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth.

16.4 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

16.5 Lessee shall maintain at all times the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells or wells being serviced by a rig shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall at all times be available for efficient operations. Blowout control equipment must be capable in case of an emergency to shut in the well at a point at least fifty (50) feet from the wellhead.

16.6 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is the highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head or leaking oil or gas between the producing string and next larger size casing string when such pressures or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

16.7 While a well is being drilled with mud or water as a drilling fluid, Lessee shall test control equipment daily to the extent possible without causing premature removal of drill pipe from the hole while drilling and record the results of such tests daily. While a well is drilling with air or gas as a drilling fluid, Lessee may test control equipment only during trips for the drilling bit.

16.8 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

16.9 Drilling mud of sufficient weight to prevent oil, gas or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

16.10 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

16.11 Lessee shall use a casing program which complies with oil and gas statutes and rules and regulations of the Commonwealth and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies and blowouts.

16.12 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

16.13 The production casing shall be of new or reconditioned seamless pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(i) The maximum anticipated rock pressure at any point in the casing string shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield as shown in A.P.I. Bulletin 5-C-2 dated April, 1972 or later amendments.

(ii) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated at any point in the casing does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield as shown in A.P.I. Bulletin 5-C-2 or later amendments.

16.14 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After the corrective operation, the casing shall again be tested in the same manner.

16.15 All surface casing and production casing shall be cemented in the ground with good quality cement equalling or exceeding A.P.I. specification in the manner hereinafter described.

16.16 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department.

16.17 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In the event that the cement cannot be circulated to the surface due to the presence of fractures or other lost circulation zones, Lessee shall determine as accurately as possible the depth of the top of the cement in the annular space behind the casing and record it on the well record.

16.18 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another or to the surface does not occur behind the casing.

16.19 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval of Department.

16.20 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not allow the well to blow open, except in case of an emergency over twenty-four (24) hours after drilling-in. Lessee will pay Department at the regular royalty rate for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

16.21 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Test Method (USBM-Monograph 7) or by other methods standard to the industry and approved by Department.

16.22 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

16.23 At least once every six (6) months, Lessee will determine the open flow potential of each producing well as required in Section 16.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive in writing all or parts of this requirement if during any calendar year production averages less than sixty (60) Mcf per day and/or the semiannual twenty-four (24) hour pressure tests show reservoir pressures to be less than one hundred (100) psi.

16.24 Lessee shall at all times conduct prudent drilling operations, including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

16.25 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

16.26 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

16.27 Lessee shall

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) after H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) use special steel pipe and casing which is resistant to H_2S stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) post warning signs around all wellsites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to and at a safe distance from all facilities handling the H_2S gas including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

(h) immediately notify Department and record on appropriate well records and driller's logs any H_2S gas found in the course of drilling or producing operations.

17. REPAIR OF EQUIPMENT

17.1 Lessee does hereby agree that it will, at all times, during the continuance and delivery of oil, gas, and liquid hydrocarbons, to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

18. WELL RECORDS, LOGS AND REPORTS

18.1 Lessee shall keep a daily drilling record which will describe the formations penetrated, depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. Any other data that is usually acquired in the normal procedure of drilling shall be recorded and furnished to Department, such as drilling time, rate of fill-up, lost circulation zones, caving strata, casing records, core analyses, mud log analyses, perforation, and production test data. Within thirty (30) days after completion of each well, Lessee shall furnish Department an accurate location plat, a detailed lithologic log, a detailed history of the well and all well data including geologic, driller, electrical, and any other well surveys made to obtain subsurface information. Upon request, samples of all formations penetrated and parts of cores taken, accurately labeled with the name of the well, and interval of depth shall be furnished to Department at Lessee's expense. If requested, Lessee shall ship a complete set of samples to the Pennsylvania State Geological Survey, Room 1201, Kossman Building, 100 Forbes Avenue, Pittsburgh, Pennsylvania 15222, within thirty (30) days after completion of each well.

19. AUDITS

19.1 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the lease. Department may keep such charts for examination for a period not to exceed ninety (90) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, and other products produced from the leased premises.

19.2 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, and liquid hydrocarbons, produced from any well covered by this lease, to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payments to Lessee, his heirs, administrators, executors, successors, and assigns for oil, gas, and liquid hydrocarbons from wells covered by this lease.

19.3 Lessee further grants to Department the right at any time to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from cancelling this lease upon delivery to Lessee of written notice of Department's intention.

20. LESSEE'S TERMINATION

20.1 Lessee may at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

20.2 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 10. Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

21. REMOVAL

21.1 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to remove all buildings, machinery, wells, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations, to fill and level all pits, and to the extent practicable, to restore the property to the same condition as when received.

22. RELEASE

22.1 Lessee shall not be granted a final release from the terms of this lease until District Forester has met with Lessee's field engineer on the ground, inspected the premises, and received a signed statement of release from Department indicating the proper cleanup has been completed.

23. PLUGGING

23.1 Lessee shall properly and effectively plug all wells on the leased premises before abandoning in accordance with the regulations of the Department's Oil and Gas Regulation Division and all applicable laws of the Commonwealth. A copy of the plugging procedure approved by the Oil and Gas Regulation Division shall be supplied to the Minerals Section, Bureau of Forestry. In addition to the above mentioned requirement upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements will be reason for cancellation of this lease and the posted bond will be forfeited in order that Department may properly plug the wells.

23.2 The plugging procedures, as herein stated, shall also include all shallow wells drilled in areas which are not coal productive and are not covered by the regulations of Department (Certificate of Plugging form may be obtained from Department's Oil and Gas Regulation Division).

24. ABANDONMENT AND STORAGE RIGHTS

24.1 In the event the development of this lease demonstrates, in the opinion of Department, that this tract has potential value as a gas storage reservoir (no storage rights are demised to Lessee under the terms of this lease), the well, equipment, property, and casing involved shall first be offered to Department, its nominee or assignee, at the then fair market value of those items before any well shall be plugged. Such firm offer shall be made in writing to Department at least thirty (30) days prior to commencement of removal of the equipment from the well by Lessee.

25. DEPARTMENTAL TERMINATION

25.1 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) days after demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

25.2 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a writ of Habre Facias Possessionem (without asking leave of court) waiving all stay and exemption laws and release of errors.

26. INDEMNITY

26.1 Lessee shall at all times hereinafter indemnify and save harmless Department from and against all detriment, damage, loss, claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

27. BOND

27.1 Lessee agrees to give Department a surety or performance bond with satisfactory corporate surety in the principal sum of TWENTY-FIVE THOUSAND DOLLARS ($25,000.00) with judgment clause in a form to be approved by the Attorney General conditioned on the faithful performance of the covenants of this lease. The bond shall be further conditioned that in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells upon termination of this lease, or within six (6) months from the termination, Commonwealth can execute upon the bond to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the bond shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises.

28. RELATED AGREEMENTS

28.1 Department will be furnished for record purposes and to protect its interests a copy of all agreements, contracts, letters or memoranda entered into, made, or sent by Lessee in any way concerning the development, operation, or sale of products from this lease.

29. ASSIGNMENTS

29.1 Lessee shall not use or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned and assignee, thereof, shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

30. LIMITATION ON WARRANTY

30.1 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the rents, rentals, and royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the proportion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may with the approval of the Attorney General enter into an escrow arrangement for future rents and royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the rents and royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The rents and royalties placed in escrow shall be refunded to Lessee in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

31. FORCE MAJEURE

31.1 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance, therewith, is prevented by or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If at the end of the primary term, hereof, such term has not been extended by production or drilling as in this lease provided and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the rental provision, hereof, shall be extended automatically from year to year for a period not to exceed ten (10) additional years unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises by reason of any of the above recited causes, this lease shall remain in full force and effect.

32. THIRD PARTIES' RIGHTS

32.1 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) have hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature.

33. PUBLICATION AND NOTICE

33.1 Within thirty (30) days following the receipt by Lessee of a copy of this lease, fully executed, Lessee shall record the lease in the county or counties in which the leased premises lie. Within thirty (30) days following the recording, Lessee shall advise Department in writing of the recording reference data. Thereafter, Department shall cause to be published in the Pennsylvania Bulletin at least the following information:

(1) the subject of this lease;
(2) the general location of the leased premises;
(3) the names of Department and Lessee; and
(4) the recording reference date for this lease.

34. LIABILITY

34.1 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, irrespective of whether or not such pollution or damage be due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause be found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises the pollution or other damage would not have occurred, it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

35. RIGHTS RESERVED BY DEPARTMENT

35.1 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

35.2 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

35.3 Department reserves the right to approve in writing all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises, unless upon due cause shown, Department waives the thirty (30) day requirement and allows a lesser, but reasonable, time for review.

35.4 The surface rights of Department shall be considered dominant and the oil and gas rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

36. PROTECTION AND CONSERVATION

36.1 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as Exhibit "B" attached hereto and made a part hereof.

36.2 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

Lucy M. Cunko

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

CLIFFORD L. JONES, Secretary

ATTEST:

Assistant Secretary

ADOBE OIL & GAS CORPORATION

LESSEE Vice President

APPROVED AS TO LEGALITY
AND FORM:

ASSISTANT ATTORNEY GENERAL

APPROVED:

DRW GOVERNOR 11/25/80

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DAUPHIN

On this the 21st day of November, 1980, before me LUCY M. CUNKO, the undersigned officer, personally appeared CLIFFORD L. JONES, who acknowledged himself to be Secretary of Environmental Resources of the Commonwealth of Pennsylvania and that he as such Secretary of Environmental Resources being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing his name as CLIFFORD L. JONES, Secretary.

In Witness Whereof, I hereunto set my hand and official seal.

Lucy M. Cunko

Notary Public

Lucy M. Cunko, Notary Public
My Commission Expires May 2, 1983
Harrisburg, PA Dauphin County

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "A"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-110324-9, by and between: COMMONWEALTH OF PENNSYLVANIA and ADOBE OIL AND GAS CORPORATION

Tract 324

State Tract 324 containing 4,565 acres of Moshannon State Forest land comprising all of Warrants #5361 and #5362 and parts of Warrants #5322, #5325, #5358, #1925 and #1926 in Girard and Goshen Townships, Clearfield County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from Dents Run Coal Company by deed dated January 7, 1909; from H. B. Mingle by deed dated December 17, 1908; and from Thomas Murray (Murray Estate) by deed dated March 13, 1930, and described as follows:

Beginning at the northeast corner of Warrant #5358, also being the northwest corner of Warrant #5359, also being a point on the Moshannon State Forest boundary line with Game lands #34; thence southward approximately 16,200 feet along the east lines of Warrants #5358, #5361 and #5362 to a point on the eastern boundary of Warrant #5362; thence eastward approximately 750 feet along the eastern boundary of Warrant #5362 to a point on the eastern boundary of Warrant #5362; thence southward approximately 2,700 feet along the east line of Warrant #5362 to the southeast corner of Warrant #5362; thence westward approximately 4,300 feet along the south line of Warrant #5362 to a point on the south boundary of Warrant #5362; thence in a general west-northwesterly direction approximately 5,525 feet north, 4,425 feet west, 1,200 feet south, 200 feet east, 1,800 feet south, 2,050 feet west, 1,600 feet north and 3,400 feet west to the southwest corner of Warrant #5362; thence northward approximately 14,750 feet along the west line of Warrant #5362 and through Warrants #5322 and #5325 to a point on the north line of Warrant #5325, also being a point on the Moshannon State Forest boundary; thence eastward approximately 13,400 feet along the north lines of Warrants #5325 and #5358 to the northeast corner of Warrant #5358, the place of the beginning.

Excluding from the above described lands a 294 acre parcel of privately owned land known as the Peter McGeorge Parcel located in the southwest quarter of Warrant #5358 and the southeast quarter of Warrant #5325 as shown on the Oil and Gas Tract Map, Exhibit "C," and described as follows:

Beginning at a point approximately 1,550 feet south-southeast of the junction of the Caledonia Pike Road and Knohs Road, also being a point within Warrant #5325 approximately 1,000 feet west-northwest of the southeast corner of Warrant #5325, also being the southwest corner of the privately owned parcel; thence in a clockwise direction around the parcel boundary approximately 2,600 feet north, 4,800 feet east, 2,600 feet south and 4,850 feet west to the southwest corner of the privately owned parcel, the place of the beginning.

(1-77)
Revised (12-74)
Stipulation Form

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

EXHIBIT "B"

STIPULATIONS FOR PROTECTION AND CONSERVATION
OF STATE FOREST AND PARK LANDS

The lands embraced in this lease or permit[1] are leased by the Commonwealth of Pennsylvania, acting through the Department of Environmental Resources, hereinafter designated as "Lessor" or "Department." Lessee or Permittee hereby agrees to the following stipulations:

1. ENVIRONMENTAL QUALITY CONTROL

1.1 Lessee shall take all necessary precautions and measures throughout the entire course of this lease to insure strict compliance with all pertinent laws and rules and regulations promulgated thereunder, whenever enacted, including: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119, as amended through 1968, 35 P.S. 4001, et seq.); the Clean Streams Law (Act of June 22, 1937, P.L. 1987, as amended through July 31, 1970, 35 P.S. 691.1 et seq.); the Solid Waste Management Act (Act 241, July 31, 1968); the Gas Operations Well Drilling Petroleum and Coal Mining Act (Act of November 30, 1955, P.L. 756, as amended on March 3, 1970, and known as the Act of the General Assembly No. 38); the Surface Mining Conservation and Reclamation Act (Act of May 31, 1945, P.L. 1198, as amended through November 30, 1971, Act No. 147).

1.2 Notwithstanding any provision in this lease, Lessee shall be held liable by the Commonwealth of Pennsylvania, or any agency of the Commonwealth, for the violation of any relevent laws, rules and regulations.

1.3 Before any mining, drilling or quarrying, Lessee shall acquaint itself with all of the applicable rules and regulations governed by each respective Act.

1.4 Prior to undertaking actual mining, drilling or quarrying, Lessee shall confirm in writing to Lessor that he has reviewed and thoroughly understands the applicable requirements as contained in each of the aforementioned Acts.

1.5 During mining, drilling or quarrying, Lessee shall comply with all of the current applicable rules and regulations of the foregoing Acts. Where any of the rules and regulations differ concerning abatement of pollution, the more stringent rule shall apply.

1.6 Lessee shall at all times perform its work in such a manner as to substantially minimize the possibility of polluting the air, land, or bodies of water with any materials harmful to the environment.

1.7 As development of the leased premises progresses and unforeseen circumstances arise that were not evident during the design, emergency pollution control programs may be put into effect immediately. In such cases, instructions will be issued by Lessor and will be carried out by Lessee.

1.8 The Air Pollution Control Act of the Commonwealth prohibits the burning of any refuse, rubbish, brush, etc. in the designated air basins of the State, except by approval of the Department of Environmental Resources' respective Regional Air Pollution Control Engineer. Other emissions into the atmosphere are not permitted if they are injurious or hazardous to people, animals or vegetation.

[1]When a lease is granted, it shall be understood that the terms "Lease" and "Lessee" shall apply; when a permit is granted, it shall be understood that the terms "permit" and "Permittee" shall apply.

1.9 Lessee shall strictly adhere to all rules and regulations for collection, removal, transportation, and disposal of solid wastes. Littering of the leased premises will not be permitted.

1.10 The discharge of wastes to streams within the Commonwealth will not be permitted unless such discharges meet the standards of the Department of Environmental Resources.

2. PROTECTION OF PROPERTY AND OPERATIONS

2.1 Lessee shall not use or allow to be used the State Forest lands for any other purpose than that authorized by this lease. District Forester2 will be advised when operations begin and end. Any changes in the original plans, which may be necessary subsequent to the beginning of operations, must be approved by District Forester and Lessor.

2.2 Permission to remove overburden must first be obtained from District Forester who will designate the extent of such removal.

2.3 Lessee shall carry out no actual mining, quarrying, excavating, drilling, or stripping operations within sight of publicly traveled roads, as indicated by District Forester.

3. PUBLIC LAND USE

3.1 Lessee hereby recognizes and admits that the leased premises are dedicated to the purposes set forth in Environmental, Health, Park, Fish and Game Laws, and Rules and Regulations and Department's Forest Resource Plans promulgated thereunder and Lessee agrees to conduct operations with deference to such purposes.

4. HUNTING AND FISHING

4.1 Employees of Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not engage in hunting or fishing upon said land, except as permitted by law, and shall not injure or destroy wildlife and fish.

5. ANIMALS

5.1 Lessee shall prevent access of animals to pits or excavations dug for Lessee's operations by erecting, maintaining fences, or by other means approved by Department.

6. SLUSH PIT

6.1 Each slush pit will consist of two compartments; one to contain fluids from the drilling operations and the second to contain surface runoff from the drilling site. Unless authorized by Department, all slush pits will be located at approximately the same elevation as the drilling site. Depending on the topography and slope conditions, the slush pit to contain surface runoff may be located below the drilling site and at a safe and reasonable distance from the stream in which the effluent will be discharged. The slush pit used to contain drilling fluids, mud, and water, will be lined with plastic so that no escape of these fluids will occur. If said fluids contain oil or other chemical substances which are harmful to the forest environment, Lessee shall transport these fluids from State Forest lands for disposal. All trash, rubbish, or waste materials from each drilling site will be stored in one area and may be disposed of in the slush pit prior to restoration. All pits shall be filled with earth and leveled at Lessee's expense upon completion of each well. However, nothing in this paragraph shall be construed to permit a violation of any laws, rules and regulations of the Commonwealth.

[2]When this lease is granted in whole or in part on State Park land, then the words "District Forester" shall be understood to mean "Park Superintendent," whenever the words appear in the lease and State Park lands are involved.

6.2 Before any operations commence, the location, design, construction, and maintenance of any slush pit must be approved by Lessor. Pollution potential and aesthetics shall be among the factors to be considered by Lessor.

6.3 If drilling operations are conducted by air, gas, or airfoam, Lessee shall also provide sufficient means by which dust and/or foam dispersal are abated, kept to a minimum, and shall not become a nuisance.

7. SILTATION

7.1 Lessee realizes that as a result of its operation large areas of land which will be cleared to provide for compressor stations, pipeline rights of way, and drilling sites, and which will be exposed to the forces of erosion for varying periods of time, could create siltation to nearby streams. Lessee agrees, therefore, to regrade such areas immediately and reseed to either temporary or permanent grasses. Any other type of remedial work necessary to prevent erosion on such areas shall be performed by Lessee.

7.2 Lessee shall upon initial construction of all drilling sites restore all highwalls and reseed said highwalls and downslope embankment of each drilling site immediately. Department's representative shall be consulted for final design and approval of each drilling site prior to final restoration.

7.3 Lessee's contractors and subcontractors shall not construct earthen dams across any stream to obtain a water supply for its operations unless approved by Lessor.

7.4 Lessee shall on pipeline rights of way and access roads construct water bars or similar diversion channels to carry surface runoff away from the rights of way and roads to prevent siltation. During construction if excess siltation is expected, Lessee shall construct a settling basin at the base of the right of way or road to impound runoff and allow sediments to settle prior to discharge into nearby streams.

7.5 Lessee shall construct all access roads to all drilling sites along existing pipeline rights of way which are built to service the drilling site provided that a ten percent (10%) grade can be maintained. All road locations and grades must be approved by District Forester as provided hereunder. All roads will be maintained in a passable condition.

8. WATERS

8.1 Without prior approval of Department, Lessee shall not locate any bore or core hole or any part of rig or slush pit within one hundred (100) feet of any stream or body of water on State Forest lands, and hereby agrees to prevent the contamination or pollution of springs, brooks, streams, or other waters on these lands in any manner whatsoever, by such means and measures as may be lawfully required by the Environmental Quality Board of the Commonwealth of Pennsylvania or its successors in function. Lessee shall be familiar with and abide by all rules and regulations of the Environmental Quality Board and shall promptly, when ordered by the Environmental Quality Board, comply with any specific rulings concerning its operations.

8.2 Where construction, operation, or maintenance of any of the facilities on or connected with this lease causes damage to the watershed or pollution of the water resources, Lessee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by an authorized representative of Department and to pay for any and all damage or destruction of property, fish, and wildlife resulting from operations under this lease.

8.3 The cost of said property, wildlife, or fish destroyed shall be determined by Department, Pennsylvania Game Commission, or Pennsylvania Fish Commission using recognized procedures to establish the value of damage.

8.4 Upon termination of drilling or producing operations, Lessee shall obtain a certificate from Department certifying that it has complied with all requirements of law and that it has taken all necessary measures to prevent any future contamination or pollution of waters as a result of its operations. Lessee shall continue to be liable for any such damages up to one (1) year after the cessation of operations under the provisions of this lease.

9. FOREST GROWTH

9.1 Lessee shall not cut, injure, destroy, or remove any forest growth, except that which shall be absolutely unavoidable in conducting operations and shall obtain prior approval of District Forester thirty (30) days before removal is to be commenced. The full thirty (30) days prior notice may be reduced upon the discretion of District Forester.

9.2 Lessee at option of Department shall chip all tree tops, limbs, brush, slash and any timber not to be sold or utilized by Department or Lessee which have resulted from clearing operations from strp mine sites, well sites, access roads, pipeline rights of way, and other construction sites.

9.3 Lessee at the option of Department shall bury or dispose of all tree stumps and large rocks resulting from its clearing and construction operations using a plant approved by District Forester.

9.4 Lessee shall pay for all timber damages in place in accordance with the regulations of Department. Such regulations shall be obtained from District Forester and Lessee shall further be required to dispose of said timber off the area to be cleared.

9.5 Lessee shall upon completion of its operations and at its own expense secure and plant with grasses and/or trees or shrub seedlings and/or game foods all strip mine sites, well sites, access roads, pipeline rights of way and other cleared areas using a plan appproved by District Forester.

9.6 Lessee shall make full compensation to Department to be three (3) times the value of such material cut, injured, destroyed, or removed to be computed by Department should additional damage to the Commonwealth result at any time from the work incident to this lease or the construction, operation, maintenance, or removal of facilities not herein contemplated or specifically mentioned, but which may occur as a result of said work or facilities.

10. FIRE

10.1 Lessee's employees, agents, contractors, and subcontractors, and employees of contractors and subcontractors shall do everything within their power to prevent or suppress forest fires and shall not allow fires to be set on or adjacent to State Forest lands by Lessee, his agents, contractors and subcontractors, and employees of contractors and subcontractors, except in pursuance and in accordance with the conditions prescribed in the permission first obtained from District Forester fixing the time, place, and manner of burning. The burning of refuse, brush, slash, debris, or other materials, upon approval of District Forester, shall be so conducted that no living forest growth is damaged or killed.

10.2 Should any fire set by Lessee or any of the persons mentioned above escape in any manner or damage any State Forest land or other property, Lessee shall be liable for all such damages resulting from such escape and for all costs incurred by Department in fighting such fires; and Lessee's officers, agents, and employees in the vicinity, as well as contractors and subcontractors, shall with such assistance as Lessee may have at hand, or be able to summon, render aid in fighting said fire without cost to the Commonwealth.

10.3 Lessee further agrees that during periods of abnormal forest fire danger, District Forester may suspend all or part of the drilling, or other operations on all or part of the State Forest lands until the forest fire danger subsides.

10.4 Lessee, or its employees, shall report promptly all forest fires detected by them to District Forester.

11. REPLACEMENT AND REPAIR OF IMPROVEMENTS

11.1 Lessee shall replace or repair, as Department may direct, all State Forest signs, markers, corners, fences, other structures, and service utility lines, owned or used by Department which cross or otherwise lie within the State Forest lands destroyed or damaged in any work incident to this lease.

12. ROADS, QUARRY AND DRILLING SITES

12.1 Lessee shall not construct any roads, clear any quarry or drilling sites, or excavate any trenches without prior written approval from District Forester, who shall set forth the type and grade of roads, trenches, and area to be cleared. The access roads shall be held to a maximum grade of ten percent (10%). However, if steeper grades are necessary, written approval must be obtained from District Forester prior to their construction. Any roads built at the expense of Lessee in its operations shall not be removed or destroyed and shall become a part of the road system of the State Forest lands.

12.2 Lessee recognizes that all roads and trails owned or maintained by Department, which are used in the execution of this lease, were constructed and improved for the use of Department and for the general public having business in and making use of State Forest land. Lessee, therefore, agrees that its operations will never be conducted in such a manner as to prevent, hinder, or obstruct the customary use of such roads and trails by Department or by the public.

12.3 Where roads built by Lessee cross any fence, Lessee shall construct a gate and keep it closed except when the passageway is in use. Lessee shall keep all said roads and trails free at all times from obstruction by logs, brush, or debris resulting from Lessee's operation. District Forester may require Lessee to temporarily discontinue the use of said roads whenever in his opinion such action is necessary to prevent their serious damage.

12.4 Upon termination of this lease, Lessee shall repair said roads and trails and leave them in as good condition as at the beginning of this lease of which condition Department shall be the sole judge. In addition, Lessee shall make any repairs to said roads and trails deemed necessary by District Forester to insure adequate and proper drainage, road surface conditions, horizontal alinement, and cross slope.

12.5 It is understood that the bond required, under the terms of this lease, shall cover the use and repair of said roads.

12.6 Lessee also agrees to obtain prior written approval from Department for the use of all State Forest roads off the leased premises used in its operations and to repair damage to all State Forest roads within or bordering on the leased premises and when such damage is caused by Lessee's operations; provided, however, if in the opinion of District Forester in charge, the roads or portions thereof are used by others sufficiently to warrant the apportionment of the maintenance costs, then Lessee may be relieved of the burden of sole maintenance and be required to provide only Lessee's proportionate share as decided by Department through District Forester.

12.7 Lessee recognizes the rights and privileges afforded to Grantees by rights of way and other agreements executed with Department, prior to this lease, which cross or otherwise lie within the area of this lease; and therefore, agrees to relocate at Lessee's own expense all portions adversely affected by work incident to this lease in accordance with the then current rules and orders of the Public Utility Commission of the Commonwealth of Pennsylvania. In the event, the Public Utility Commission does not have any jurisdiction, any necessary relocation shall be completed subject to the approval of Grantor.

13. BUILDINGS

13.1 Lessee shall not drill any bore or core hole, carry on operations, make excavations, or otherwise disturb the surface of the lands within two hundred (200) feet of any building. However, if a lesser distance to any building is needed, written approval must be obtained from District Forester, or from the owner of the building if not the property of the Commonwealth.

13.2 Lessee shall consult with District Forester and obtain written approval prior to the construction and erection of any storage facilities, buildings, work sheds or any other physical structure upon State Forest lands outside of the leased premises.

14. APPEARANCE

14.1 In its appearances hereunder, Lessee shall at all times maintain State Forest lands in a neat and presentable manner, removing all rubbish and debris as it accumulates and restoring each individual area within thirty (30) days to as near as possible its original condition when its use is abandoned.

15. EXPLOSIVES

15.1 Lessee shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during periods of fire danger unless permission is granted by District Forester.

15.2 Explosives shall not be used in fish spawning or rearing areas, nesting areas of wildlife concentration, during periods of intense activity or at any other time or in any manner that might damage any wildlife resource.

16. RESTORATION AND REVEGETATION

16.1 Restoration and revegetation shall be accomplished in accordance with Lessee's approved reclamation plan under the Surface Mining Conservation and Reclamation Act. However, should Lessee not qualify for licensing under this Act, as amended, then Lessee shall comply with Sections 16.2, 16.3 and 16.4 of this lease which provides for restoration and revegetation of all areas disturbed by Lessee.

16.2 Upon completion of drilling, mining, quarrying, excavating, stripping, or any other operation, the surface of the site shall be backfilled to as near as possible to the original contour of the surface. Where necessary, the top of the highwall shall be graded into the drill, mine, quarry, excavation, strip, or any other site area, so that all safety hazards to both human and wildlife have been eliminated and the highwall restored to a safe and reasonable grade. Department shall be the sole judge as to what is safe and reasonable. If terraces or benches are present upon completion of operations or if restoration of the drill site, mine site, quarry site, excavation site, strip site, or any other site, is enhanced by such terraces or benches, the terraces or benches upon approval of Department may be cut into the highwall or left standing. The backfill material from the drilling, mining, quarrying, excavating, stripping, or any other operation, shall be graded to form a gradual slope away from the highwall and all peaks and ridges shall be leveled so that water shall not accumulate in pools over the restored area.

16.3 Upon completion of drilling, mining, quarrying, excavating, stripping, and backfilling of an area or any portion thereof and after backfilling has settled so as to provide an acceptable planting site, Lessee shall revegetate all disturbed or cleared areas. Such revegetation is to be done according to a planting plan prepared by Department. Lessee guarantees an establishment of not less than an average of five hundred (500) live and growing trees per acre one (1) year after date of planting. If area is planted in grasses, or shrubs, or trees and grasses, Lessee shall guarantee an establishment of sixty-five percent (65%) survival of said grasses or shrubs one (1) year after date of planting. If such growth has not resulted, Lessee shall replant such areas unless in the opinion of Department the lack of a satisfactory growth was due to soil conditions or other causes beyond the control of Lessee. Department shall be the sole judge in determining if replanting is required and shall notify Lessee in writing of areas to be revegetated. This provision may be waived by Department upon the recommendation of District Forester.

16.4 Restoration and revegetation plans of Lessee must be approved in advance of any operations by Department or its representatives. Department shall have the sole right to determine the time of backfilling and revegetation.

17. WATER WELLS

17.1 Any plan by Lessee for the drilling of water wells on State lands, and use of any water found, must be approved in writing by Department.

17.2 A final plat will be submitted within thirty (30) days after completion of each water well showing exact location, elevation, depth of well, formations penetrated and depth, type of shows, and volume of water or hydrocarbons present.

17.3 Lessee further agrees to supply Department with any other records, memoranda, accounts, reports, cuttings, cores, or other information relative to the drilling, completion, or operation of water wells on the above described premises. This will include true copies of any electrical or radioactivity surveys made in the wells.

17.4 Lessee shall be familiar with and comply in every respect with the provisions now existing or hereafter enacted of the Water Well Drillers License Act 610 of May 29, 1956 (P.L. 1840), providing for the orderly development of the ground water resources of the Commonwealth of Pennsylvania.

18. PIPELINES

18.1 Lessee shall refill to contour all ditches or other excavations caused by the construction, operation, maintenance or removal of pipelines; construct cross ditches; lime, fertilize and seed or replant the right of way; keep the pipeline and right of way in good repair and appearance, and take such other measures as may be deemed necessary by Department to control erosion and sedimentation and to maintain or restore the natural and aesthetic values as directed by Department.

19. CONTACT WITH STATE AGENCIES

19.1 Lessee shall periodically contact the following State agencies or their successors to keep informed on up-to-date information, policies, rules and regulations applicable to this lease.

Department of Environmental Resources	Brief Statement of Agency's Jurisdiction
Bureau of Forestry, Minerals Section P. O. Box 1467 Harrisburg, Pennsylvania 17120	Leasing programs, terms, policies and geophysical regulations for State owned land and waters
District Forester Forest District (where applicable) Park Superintendent State Parks (where applicable)	Restoration and replanting of leased premises, timber damages, location of well sites, rights of way, roads, etc.
Secretary Environmental Quality Board P. O. Box 2063 Harrisburg, Pennsylvania 17120	Water encroachment regulations; disposal of water polluting materials and industrial wastes; well spacing orders and unitization
Bureau of Air Quality & Noise Control 18 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Blowing gas wells and air drilling, burning of waste materials, trash, etc.
Bureau of Soil & Water Conservation Regional Office (where applicable) or P. O. Box 1467 Harrisburg, Pennsylvania 17120	Soil Erosion & Sedimentation Control Plan
Bureau of Water Quality Management Division of Non-Point and Industrial Sources 12 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Slush pits, siltation, pollution, etc. Disposal of produced water
Bureau of Water Quality Management Water Emergency Response Team 12 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Notification of fires, breaks, leaks, spills or blowouts
Bureau of Dam Safety, Obstructions & Storm Water Management Division of Obstructions and Flood Plain Management 407 South Cameron Street Harrisburg, Pennsylvania 17120	Locating structures or pipelines in streams, rivers and lakes. Crossing streams -impoundment of stream for water supply
Bureau of Topographic & Geologic Survey Division of Oil & Gas Regulation 100 Forbes Avenue Pittsburgh, Pennsylvania 15222	Oil and gas regulations and enforcement (drilling permits, plugging, etc.)
Bureau of Surface Mine Reclamation 7 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Regulations and enforcement (when drilling in coal areas)
Bureau of Occuptional Health Division of Quarries & Explosives 6 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Blasting, seismic surveys, etc.
Pennsylvania Fish Commission	
Executive Director P. O. Box 1673 Harrisburg, Pennsylvania 17120	Regulations for the protection of fish life
Pennsylvania Game Commission	
Executive Director P. O. Box 1567 Harrisburg, Pennsylvania 17120	Regulations for the protection of wildlife

Commonwealth of Pennsylvania
Department of Conservation and Natural Resources
Bureau of Forestry, Minerals Section
P.O. Box 8552
Harrisburg, PA 17105-8552

STATE FOREST TRACT NO. 100

CONTRACT NO.
M-110100-20

OIL AND GAS LEASE FOR STATE FOREST LANDS

THIS AGREEMENT made and entered into on this 30th day of January 2009, by and between the **COMMONWEALTH OF PENNSYLVANIA**, acting through the **DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES**, hereinafter designated "Department" or "Lessor" and **SENECA RESOURCES CORPORATION**, with its principal place of business at 6363 Main Street, Williamsville, NY 14221, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH:

WHEREAS, Lessor is authorized pursuant to the Conservation and Natural Resources Act 18 of 1995 ("CNRA") Act of June 28, 1995, P.L. 89, No. 18, Section 302(a)(6), 71 P.S. §§1349.302(a)(6), to lease State Forest lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the completion of a competitive, sealed bid submission received by Department on or before September 3, 2008, and with bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

WHEREAS, State Forest Tract 100 is comprised of two parcels totaling 8,891 acres of State Forest lands in Lewis, McIntyre, and Cogan House townships, Lycoming County. Parcel A is comprised of 4,404 acres containing parts of warrants 5659, 5662, 5663, 5664, 5669, 5752, and 5785. Parcel B is comprised of 4,487 acres containing parts of warrants 5656, 5657, 5658, 5659, 5662, 5663, 5664, 5669, and 5785.

NOW THEREFORE, in consideration of the sum of **TWENTY EIGHT MILLION FOUR HUNDRED FIFTY ONE THOUSAND TWO HUNDRED DOLLARS AND NO CENTS ($28,451,200.00)** paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas and liquid hydrocarbons; and at locations subject to the approval of District

DCNR-OCC
LOG # 08-2344 Addendum B
Conversion Sites # 5-12

Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, **TRACT NO. 100** containing **8,891 acres**, more or less, shown on the Map identified as **Exhibit "A,"** and more particularly described on the Oil and Gas Lease Attachment identified as **Exhibit "B"** and as which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as **Exhibit "A"** are approximate.

1. TERM OR PERIOD

1.01 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth, particularly Section 20 (First Well) providing for the drilling of the first well within the first five (5) years of the lease, and shall continue from year-to-year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as long as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder.

2. LEASE RECORDING AND PUBLIC NOTICE

2.01 Within ninety (90) days following the receipt by Lessee of a fully executed copy of this lease, Lessee shall both record the lease in the county or counties in which the leased premises lie, and also provide a copy of the recorded lease to the Department which clearly shows the recorded reference data. Thereafter, Department shall publish at least the following information in the Pennsylvania Bulletin:

(a) The subject of this lease;
(b) the general location of the leased premises;
(c) the names of Department and Lessee; and
(d) the recording reference data for this lease.

3. RENTAL

3.01 Lessee shall pay to Department a rental for the leased premises at the following rate: the first year's rental shall consist of the bonus payment which was made by Lessee and shall be payable upon delivery of this lease to Lessee. The second, third and fourth year's rentals shall be TWENTY DOLLARS ($20.00) per acre each year, payable upon the anniversary date of this lease. For the fifth and all subsequent years thereafter, the rental shall be THIRTY-FIVE DOLLARS ($35.00) per acre each year, payable on the anniversary date of this lease.

3.02 The drilling of each well in the leased premises shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 21 (Subsequent Wells), which reduction shall become effective on the next rental date, provided the well is producing in paying quantities. If such wells are drilled on a unit created by a spacing order issued by the Department of Environmental Protection's Bureau of Oil and Gas

Management, or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3.03 If at any time there is on the leased premises a well capable of producing natural gas and the well is shut-in, suspended, or otherwise not produced and the natural gas is not used or marketed therefrom during any year ending on an anniversary date of this lease, Lessee shall pay Department at the expiration of each said year for that year a rental payment for each such well at the full rental rate per acre for the "acreage attributable to the well", as referred to in Section 21 (Subsequent Wells) of the lease.

4. GAS ROYALTY

4.01 Lessee must operate each well with a discrete well meter at the well site, which will measure all the gas produced from that well. Lessee will ensure that all meters are maintained according to industry standards.

4.02 Lessee shall pay to Department, as royalty, THIRTY-FIVE CENTS ($0.35) per thousand cubic feet (Mcf) or SIXTEEN PERCENT (16%) of the market value, whichever is higher, for all marketable natural gas, marketable casinghead gas, or other marketable gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; the amount to be paid to Department will be the royalty rate (either $0.35/Mcf or 16% of the market value; whichever is higher) multiplied by the fractional interest held by Department and shall be payable monthly at the market price received for natural gas at the sales meter at the time of delivery.

4.03 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal 16% part of all marketable gas and other marketable gaseous substances produced and saved from the leased premises; the amount to be delivered to Department will be the SIXTEEN PERCENT (16%) part of the gas produced multiplied by the fractional interest held by Department in the oil and gas rights. Lessee shall act to calculate and deliver a gas balancing statement on a quarterly basis to the Department in order to ensure that the Department does not exceed its SIXTEEN PERCENT (16%) share of the marketable gas production. Adjustments for overage or underage delivery of the Department's SIXTEEN PERCENT (16%) royalty share shall be made by reducing or increasing future delivery gas volumes to the Department's account.

5. OIL ROYALTY

5.01 Lessee shall pay to Department, as royalty, SIXTEEN PERCENT (16%) of the field price per barrel (42 U.S. Gallons) at 60° F, produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks; the amount to be paid to Department will be the SIXTEEN PERCENT (16%) royalty multiplied by the fractional interest held by Department.

5.02 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal SIXTEEN PERCENT (16%) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises; the amount to be delivered to Department will be the SIXTEEN PERCENT (16%) part of the oil produced multiplied by the fractional interest held by Department.

5.03 If oil, condensate, and other liquid hydrocarbons, each in paying quantities, should be developed from the same well, then the oil and the condensate, and other liquid hydrocarbons shall be saved.

5.04 Lessee shall provide tanks or other appropriate storage for accurately measuring any crude oil produced from the lease. Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with API Standard 2500, "Measuring, sampling, and testing crude oil," Second Edition, March 1961, or as subsequently amended by the same authority. Observed gravity at the observed temperature shall be corrected to (API) gravity and volume at sixty degrees Fahrenheit (60° F) as per the American Society for Testing Materials and the Institute of Petroleum, "ASTM-IP petroleum measurement tables" (ASTM designation No. 1250; IP designation 200).

6. PAYMENTS

6.01 Lessee shall be held responsible for the payment of all rentals and royalties. **Payments shall be mailed to:**

Commonwealth of Pennsylvania
Department of Conservation and Natural Resources
Bureau of Forestry - Minerals Section
P.O. Box 8552
Harrisburg, PA 17105-8552

All checks shall be made payable to the Commonwealth of Pennsylvania. Payments of royalties shall be made monthly within 90 days after each monthly sales period.

6.02 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products within 90 days after each monthly sales period.

6.03 Once it has been determined by Department that Lessee is in default in the payment of any sum of money payable under the provision of this lease for 30 days, Lessee agrees to pay an additional twelve percent (12%) annual interest on the defaulted amount calculated from the time of such default. This provision is in no way a waiver of the requirement to pay on time.

7. GAS MEASUREMENT

7.01 The volume of gas produced, saved, and marketed shall be measured according to American Gas Association (AGA) standards and according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

(a) The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

(b) The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, regardless of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

(c) The temperature of the gas passing the meters shall be determined by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes. If a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of sixty degrees Fahrenheit (60° F) shall be used in computing gas volume.

(d) The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, annually, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

(e) The deviation of the natural gas from Boyle's Law shall be determined by tests annually or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with recommendations of the Natural Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

(f) Gas compositional analyses by chromatograph or other approved methods shall be completed as necessary or upon written request and within a timeframe specified by the Department, for the determination of gas composition, specific gravity and BTU content. A copy of the results of all such analyses, whether completed at the specific request of the Department or not, shall be provided by the Lessee to the Department for its records within ninety (90) days of the date of the test.

(g) The following factors used in the calculation of produced gas volumes shall be clearly specified on the meter statements:

Basic orifice factor (F_b)
Reynolds number factor (F_r)
Expansion factor (Y)
Pressure base factor (F_{pb})
Temperature base factor (F_{tb})
Flowing Temperature factor (F_{tf})
Specific gravity factor (F_g)
Supercompressibility factor (F_{pv})

8. AUDITS

8.01 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the leased premises. Department may keep such charts for examination for a period not to exceed one-hundred and twenty (120) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, or other products produced from the leased premises.

8.02 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, or liquid hydrocarbons, produced from any well covered by this lease to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payment to Lessee, its heirs, administrators, executors, successors, and assigns for oil, gas, or liquid hydrocarbons from wells covered by this lease.

8.03 Lessee further grants to Department or Department's designated representative the right, at any time, to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from canceling this lease upon delivery to Lessee of written notice of Department's intention.

9. INTERPRETATION

9.01 In case of ambiguity, the lease shall always be construed in favor of Lessor and against Lessee.

10. LIMITATION ON WARRANTY

10.01 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the portion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may, with the approval of the Attorney General, enter into an escrow arrangement for future royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit

against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The royalties placed in escrow shall be refunded at the direction of the court in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

10.02 This proportionate reduction clause shall not apply to and shall not reduce the bonus payments or rents payable under this lease.

11. LAWS, RULES AND REGULATIONS

11.01 Nothing in this Lease shall in any way be so construed as to impair the powers, privileges or duties of the Commonwealth, or its representatives, in the execution of the laws of the Commonwealth or the applicable rules and regulations promulgated thereunder, now in force or hereafter enacted or adopted.

11.02 The Lessee is solely responsible for obtaining any and all local, State or Federal permits or other approvals necessary for and associated with any of the operations related to this lease, and shall be held liable by the Commonwealth of Pennsylvania, any agency of the Commonwealth, or any other local or Federal authority for the violation or non-compliance of any relevant laws, rules, and regulations, including, but not limited to the following: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119,35 P.S. 4001, *et seq.*); the Clean Streams Law, as amended (Act of June 22, 1937, P.L. 1987, 35 P .S. 691.1, *et seq.*); the Solid Waste Management Act, as amended (Act of July 7,1980, P.L. 380, No.97, 35 P.S. 6018.101, *et seq.);* the Oil and Gas Act, as amended (Act of December 19, 1984, P.L. 1140, No. 223, 58 P.S. 601.101 *et seq.);* and the Surface Mining Conservation and Reclamation Act, as amended (Act of May 31, 1945, P.L. 1198, 52 P.S. 1396.1 *et seq.).*

11.03 Lessee shall strictly adhere to all rules, regulations and requirements governing the withdrawl and use of surface and ground waters as administered by the Department of Environmental Protection, the Susquehanna River Basin Commission, the Delaware River Basin Commission, or any other river basin commission having designated jurisdiction of the waters of the Commonwealth [including, but not limited to the Water Resources Planning Act of 2002 (Act 220), 25 Pa Code Chapter 110; SRBC, 18 CFR Ch. VIII § 806.20 - § 806.25]

In addition, Lessee shall obtain written authorization from District Forester prior to using surface waters located on State Forest lands as a take point for fracing or any other well drilling or well development operations. Department reserves the right to deny any such request(s) without cause.

12. INDEMNITY

12.01 Lessee shall, at all times hereinafter, indemnify and save harmless Department from and against all detriment, damage, loss claims, demands, suits, and expenses, or other claims of any kind

whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

13. LIABILITY

13.01 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, regardless of whether or not such pollution or damage is due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause is found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises, the pollution or other damage would not have occurred; it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

13.02 Department shall not be liable to Lessee for any time during which the leased premises cannot be used.

14. ASSIGNMENTS

14.01 Lessee shall not use, or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned; and assignee thereof shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

14.02 In the event that the Lessee enters into a "Farmout Agreement" with a third party for the purpose of allowing a "Farmee" to explore, develop, or produce oil and/or gas from the leased premises, or any portion thereof, Lessee shall be liable for enforcing all the provisions of this lease, including the posting of the required plugging sureties for each and every well drilled and operated by the Farmee. Although the Department recognizes a right of the Lessee to farmout its leased premises or portions thereof from time-to-time, Department will hold the Lessee solely responsible for the enforcement of all the provisions of this lease.

15. RELATED AGREEMENTS

15.01 Upon request by the Department for its own records and to protect its own interests, Lessee shall furnish a copy of all agreements made, contracts entered into, and all letters or other memoranda made by or to the Lessee which in any way concern the development, operation, or sale of products related to this lease.

16. SURETY

16.01 PERFORMANCE SURETY - Lessee agrees to give Department a surety or collateral performance bond with evergreen provisions in a form acceptable to Department (i.e., surety bond, irrevocable letter of credit, bank certificate of deposit, etc.), in the principal sum of **TWENTY-FIVE THOUSAND DOLLARS ($25,000.00)** conditioned on the faithful performance by Lessee of the covenants of this lease. The surety shall be further conditioned that, in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells within one (1) year from the termination of this lease, Commonwealth can execute upon the surety to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the surety shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, pollution, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises and in the use of all State Forest roads off the leased premises.

16.02 PLUGGING SURETY - Additionally, prior to acquiring any existing well on the leased premises, or upon the Lessee's decision to keep a newly drilled well, Lessee shall provide Department with a surety or collateral well plugging bond with evergreen provisions in a form acceptable to Department (i.e., surety bond, irrevocable letter of credit, bank certificate of deposit, etc.), in an amount equal to or exceeding the reasonably expected estimated total cost of plugging the well one (1) year after its completion as a producer or shut-in well, said surety to remain in effect until the plugging and abandonment of the well has been completed in compliance with applicable state law, and the well site has been restored and re-vegetated to the satisfaction of District Forester. The minimum well plugging surety coverage per well acceptable to Department as of the date of this agreement is as follows and shall be based on the well's measured depth (MD), regardless of its true vertical depth (TVD):

Measured Depth (MD)	Minimum Surety Amount
Less than 5000'	$ 10,000
5000' to 8500'	$ 30,000
8500' to 10,000'	$ 50,000
10,000' and Deeper	$100,000

16.03 Every five (5) years during the term of this agreement, and effective on the anniversary date of this agreement, new surety amounts may be instituted at the option of Department by notice in writing from Department to Lessee at least six (6) months prior to the anniversary date. Such new surety amounts shall equal the original surety amounts set forth in paragraphs 16.01 and 16.02 herein adjusted for inflation so that the surety amounts will adequately cover the expected lease obligation costs prevailing at the time of adjustment. The new adjusted surety amounts will be rounded off to the nearest

ONE THOUSAND DOLLARS ($1,000.00) and will be computed by multiplying the original surety amounts set forth herein by a ratio derived from the Producers Price Index for All Commodities using a base of 1982 = 100, compiled and issued monthly by the U.S. Department of Labor's Bureau of Labor Statistics, as follows:

The numerator of the ratio shall be the index number for the item "All Commodities" for the month appearing in the issue of the index most recently preceding the anniversary when the surety adjustment is made.

The denominator of the ratio shall be the index number for the item "All Commodities" for the month of **August 2008**. The parties agree that such index number is **199.9**.

If the base period of such index should change to other than 1982 = 100, the aforementioned numerator shall be adjusted by the usual method of linkage of base periods to the end that the ratio shall accomplish its purpose; namely, to adjust the dollar amount of the surety or sureties for changes in the price level between the date of this agreement and the date when the adjustment is made.

In the event such monthly index should be discontinued, or a new or revised one substituted therefore by the Bureau of Labor Statistics or other agencies of the United States of America, such new or revised or other similar index shall be used for the purpose of computations as described in this paragraph, using such conversion factors or other devices which may be generally recognized or adopted in connection with requirements based on this index.

17. COMPREHENSIVE LIABILITY INSURANCE

17.01 Lessee shall, at its sole expense, provide and maintain in full force and effect during the term of this lease such comprehensive liability insurance in an amount not less than: Combined Bodily Injury and Property Damage Liability, TWO HUNDRED FIFTY THOUSAND DOLLARS ($250,000) each occurrence and ONE MILLION DOLLARS ($1,000,000) aggregate which shall protect Lessee and Department from claims for damages from personal injury, including accidental death, as well as claims for property damages, which may arise from operations conducted under this lease or any occurrence on or about the leased premises whether such operations are by Lessee or anyone directly, or indirectly, employed by it. The operation of automobiles or motor vehicles operated in the business of Lessee shall be included or covered by like insurance. In addition, Department shall be immediately advised should Lessee or the insurance company prior to the expiration date indicated on said policy cancel any policy. Department shall be named as additional insured on said liability insurance.

17.02 Lessee or its insurer shall be liable to Department for any damage done to Commonwealth property as the result of Lessee's operations.

17.03 Lessee shall provide Department with certificates of insurance for property damage and liability attesting to the above coverages prior to beginning its operations on the leased premises.

17.04 Department shall be immediately advised should any insurance policy or surety bond be cancelled by Lessee, the insurance company, or bonding company, prior to the expiration date on said document.

17.05 Lessee shall provide Department, upon Department's request, proof of current insurance policy in full force and effect as described in Section 17.01.

18. DEEP WELL CONTROL INSURANCE AND SAFETY – 10,000'+ TVD WELLS ONLY

18.01 Prior to the beginning of well-drilling operations on a true vertical depth (TVD) well of 10,000 feet or deeper, Lessee shall acquire well-drilling insurance coverage in an amount estimated to be sufficient to cover control of well, seepage and leakage, pollution, cleanup and contamination, unlimited redrilling and/or reworking expenses, and equipment in Lessee's care, custody and/or control. Said insurance coverage shall be continuously maintained until the cessation of any well-drilling operations, well-reworking operations, well-completion operations and well-to-pipeline-hookup operations.

18.02 Insurance in the amount of at least TWENTY MILLION DOLLARS ($20,000,000.00) will be required for drilling into the Trenton-Black River Formation unless Department waives or modifies this amount in writing upon Lessee's request.

18.03 Lessee shall provide a complete copy of the Well Control Insurance Policy to Department and shall not commence well drilling operations until Department has given its written acceptance of the Well Control Insurance Policy. Termination of the well-drilling insurance coverage must be pre-approved in writing by Department prior to its termination.

18.04 At a minimum, the Lessee-Assured shall ensure that the Well Control Insurance Policy complies with and includes the following provisions, or provide alternate provisions which are acceptable to the Department:

(1) A minimum of a 10,000 psi double ram and a 5,000 psi annular blowout preventer and a fully operational remote closing device should be used for the well operation and tested successfully at least every thirty (30) days.

(2) No well should be drilled ahead unless the "leak off" pressure determined by the most recent casing shoe test or formation integrity test (as measured by mud weight equivalent in pounds per gallon) exceeds the hydrostatic pressure extended by the actual mud weight in use by at least 0.5 pounds per gallon.

(3) No wells should be drilled with an open hole section of length greater than 8,000 feet.

(4) When the Assured is the Operator of a producing or shut-in well insured hereunder, the Assured should not allow casing pressure which exceeds seventy-five percent (75%) of the rated burst pressure for a continuous period of greater than three (3) months.

(5) When the Assured is the Operator of the well insured hereunder, the Assured should conduct a reasonable review of the drilling and/or workover contractor's personnel and equipment, to ensure that:

(a) The contractor's equipment is of adequate size capacity and pressure rating to perform all anticipated operations;

(b) The contractor has crews with a reasonable level of experience and maintains at least one employee with well-control certification on location at all times; and

(c) The contractor's tubulars, choke manifold and other pressure-rated equipment are tested satisfactorily prior to commencement of operations.

19. OPERATIONS, PROTECTION AND CONSERVATION

19.01 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up-to-date oil and gas field practices.

19.02 Lessee is responsible for conducting its operations in such a manner so as not to interfere with the rights of other Grantees, Licensees, and Lessees of the Commonwealth, or any other third parties who may have an interest in the State Forest lands located in the vicinity of the area covered by this Lease, including areas of ingress and egress.

19.03 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department of Environmental Protection or applicable County Conservation District office. A copy of the plan shall be forwarded to the District Forester upon request.

19.04 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

19.05 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as **Exhibit "C"**, attached hereto and made a part hereof.

19.06 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the INVASIVE PLANTS AND REVEGETATION GUIDELINES FOR STATE FOREST LANDS, identified as **Exhibit "D"**, attached hereto and made a part hereof.

19.07 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the OIL AND GAS LEASE ACCESS ROAD SPECIFICATIONS FOR STATE FOREST LANDS, identified as **Exhibit "E"**, attached hereto and made a part hereof.

20. FIRST WELL

20.01 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well ("FIRST WELL") on the leased premises, or on unitized acreage containing a portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, this lease shall be automatically terminated in its entirety, unless the Department, at its sole discretion, grants in writing to the Lessee a continuation of the lease in effect on a year-to-year basis. Said extention shall be granted only when the Department considers it to be in the best interests of the Commonwealth. Said extension must be granted in writing by the Department to the Lessee at least thirty (30) days prior to the fifth anniversary date of this lease.

20.02 The rental rate provision of the lease shall not be affected by such extension of the 5-year first-well deadline. Additionally, the granting of such extension period shall in no way affect the anniversary dates of this lease, or the rights and responsibilities of Department and Lessee associated therewith.

21. SUBSEQUENT WELLS

21.01 If the "FIRST WELL" drilled by Lessee, or any subsequent well, is productive of oil and/or gas, and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises but not necessarily on the portion of the leased premises contained within the unit, if such a well would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If Lessee concludes an additional well is not justified, then Lessee shall submit to Department the information upon which its conclusion is based. Upon review of such information, if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within two (2) years from Department's determination or releasing all of the acreage covered by the lease except for the following:

(a) forty (40) acres around each well from which oil is produced as the principal product;

(b) three-hundred twenty (320) acres around each well completed above the top of the Onondaga Formation from which gas is being produced as the principal product;

(c) six-hundred forty (640) acres around each well completed below the top of the Onondaga Formation from which gas is being produced as the principal product; or

(d) that amount of leased acreage actually contained within an established unit, whichever is less.

21.02 Lessee shall not be required under this provision, to drill more wells than required or allowed under any spacing order, rule, or regulation of the Department of Environmental Protection's

Bureau of Oil and Gas Management, or in the absence of any such order, more than one well for each well completion depth horizon described in Section 21.01 above.

21.03. The amount of acreage around the subsurface location where oil and gas enters the well bore, commonly referred to as the "take point", included in a spacing unit ordered by the Department of Environmental Protection's Bureau of Oil and Gas Management, or in the absence of any such order, the well completion depth horizons described in Section 21.01 above, shall be referred to elsewhere in the lease as "acreage attributable to a well," which comprises acreage directly above the subsurface "take point."

22. DEVELOPMENT AND WELL SPACING

22.01 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

22.02 Lessee is limited to THIRTY FIVE (35) well pad locations of reasonable dimensions on the leased premises. Lessee shall have the option to drill vertical or horizontal well(s), or a combination thereof, from a single well pad location. Multiple wells drilled on the same well pad location may target different depths and horizons.

22.03 Upon written request by Lessee, Department may waive, in writing, the number of well pad locations specified in Section 22.02 above if, in Department's judgment, such a waiver is justified and in its best interests.

23. DRILLING RESTRICTIONS

23.01 Under Department's multiple use policy, the leased premises is continuously used for recreation, conservation and other purposes, and many other Department-authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions.

(a) No drilling or well site clearing is permitted within 200 feet of any building.

(b) No drilling or well site clearing is permitted within 200 feet of any stream or body of water.

(c) No drilling or well site clearing is permitted within 300 feet of any stream or other body of water designated by the Department of Environmental Protection's Environmental Quality Board as being Exceptional Value Waters.

(d) No drilling or well site clearing is permitted within 300 feet of any picnic area or sheltered area which has been so designated by Department.

(e) No drilling or well site clearing is permitted within 300 feet of any trail, road or existing right-of-way.

(f) No drilling or well site clearing is permitted within 300 feet of any area of historic value, tree plantation, designated overlook, designated vista or fire tower site.

(g) No drilling or well site clearing is permitted within 300 feet of the boundary line of the leased premises.

(h) No drilling or well site clearing is permitted within 600 feet of the boundary line of State Park lands or of designated Wild and Natural Areas on State Forest lands.

(i) In addition the following specific restrictions for this lease shall also apply:

At the time of issuance of this lease agreement, the Department has identified certain Areas of Special Consideration on the leased premises as described in **Exhibit "I".** Additionally, due to the changing nature of the Department's databases, such as the Pennsylvania Natural Heritage Program (PNHP), the Lessee should check with the District Forester before any construction project is initiated to avoid potential conflicts.

23.02 Upon written request by Lessee, Department may waive in writing, any portion of the above restrictions if, in Department's judgment, such a waiver is justified and in its best interests.

23.03 No drilling or production activity, including but not limited to well drilling and construction, pipeline construction, compressor station placement and construction, or road construction shall be permitted, nor shall they be subject to waivers, on the surface of State Parks, State Forest Wild Areas, and State Forest Natural Areas.

24. DRILLING OPERATIONS

24.01 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before drilling thereof is commenced, and no well shall be commenced until a permit has been issued by Department of Environmental Protection's Bureau of Oil and Gas Management.

24.02 A legible sign listing the name and address of the well operator, the permit number, the farm name, and well number shall be placed in a conspicuous place near where the access road enters the well location. In addition, a legible sign listing the name of the operator and well number shall be attached or painted on the pumping unit, wellhead or meter box of each well.

24.03 Except where Lessee intentionally drills a deviated well to a bottomhole location not vertically beneath the well site, Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical

drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

24.04 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth, if requested by Department.

24.05 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

24.06 Lessee shall maintain, at all times, the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells which are shallower than ten-thousand (10,000) feet shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled, and tested to at least ten-thousand (10,000) psia for wells deeper than ten-thousand (10,000) feet that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall, at all times, be available for efficient operations. Blowout control equipment must be capable, in case of an emergency, to shut in the well at a point at least fifty (50) feet from the wellhead. For wells being serviced, blowout protection equipment shall be of sufficient capacity to control pressures and flow rates measured in the wells being serviced.

24.07 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head, or leaking oil or gas between the producing string or next larger size casing string when such pressure or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

24.08 Lessee shall test control equipment daily, to the extent possible, without causing premature removal of drill pipe from the hole while drilling, and record the results of such tests daily.

24.09 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

24.10 Drilling mud or salt water of sufficient weight to prevent oil, gas, or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

24.11 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

24.12 Lessee shall use a casing program which complies with oil and gas statutes, and rules and regulations of the Commonwealth, and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies, and blowouts.

24.13 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

24.14 The production casing shall be of new or reconditioned pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(a) The maximum anticipated rock pressure, at any point in the casing string, shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield, as shown in A.P.I. Bulletin 5-C-2, dated April, 1972, or later amendments.

(b) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated, at any point in the casing, does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield, as shown in A.P.I. Bulletin 5-C-2, or later amendments.

24.15 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If, at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After corrective operation, the casing shall again be tested in the same manner.

24.16 All surface casing and production casing shall be cemented in the ground with good quality cement equaling or exceeding A.P.I. specification in the manner hereinafter described.

24.17 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department. Sufficient centralizers shall be attached to the casing to keep it centered in the hole during cementing.

24.18 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In cementing the surface casing, cement of sufficient quantity shall be used to fill the calculated annular space plus twenty percent (20%) back of the casing shoe to the surface. In the event that the cement cannot be circulated to the surface, due to the presence of fractures or other lost circulation zones, Lessee shall determine, as accurately as possible, the depth of the top of the cement in the annular space behind the surface casing and record it on the well record.

24.19 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another, or to the surface, does not occur behind the casing.

24.20 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval by the Department.

24.21 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors, shall not allow the well to blow open, except in case of an emergency, over twenty-four (24) hours after drilling-in. Lessee will pay Department, at the regular royalty rate, for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations, after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

24.22 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Method (USBM Monograph 7) or by other methods standard to the industry and approved by Department.

24.23 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

24.24 Annually or when requested in writing by Department, Lessee will determine the open flow potential of each producing well as required in Section 24.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive, in writing, all or parts of this requirement if, during any calendar year, production averages less than sixty (60) Mcf per day and/or the pressure tests show reservoir pressures to be less than one hundred (100) psi.

24.25 Lessee shall, at all times, conduct prudent drilling operations including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

24.26 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

24.27 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

24.28 In areas where H_2S is known to be present in the formations that are to be drilled, Lessee shall:

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety

equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) Make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) After H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) Use special steel pipe and casing which is resistant to H_2S gas stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) Quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) Post warning signs around all well sites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to, and at a safe distance from, all facilities handing the H_2S gas, including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) Install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

24.29 During well drilling and production operations, in order to reduce night lighting pollution in designated dark sky areas, Lessee is required to utilize drilling rigs equipped with fully shielded lighting consistent with Occupational Safety & Health Administration (OSHA) regulations.

24.30 Upon written request by Lessee, Department may waive, in writing, any portion of the above drilling requirements if, in the Department's judgment, such a waiver is justified by new technology or knowledge and/or will be in the best interest of the Commonwealth.

25. WELL RECORDS, LOGS AND REPORTS

25.01 Lessee shall keep a daily drilling record which describes the formations penetrated, and the depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. An accurate well location plat and any other data that are acquired during the drilling and completion operations for each well, including but not limited to those items listed in Section 26.01 (Confidentiality), shall be provided to the Department within ninety (90) days of the data's collection, or upon oral or written request by the Department and within a timeframe specified by the Department. All above-described data shall be submitted in both hard-copy and digital forms. Digital well logs shall be submitted in .LAS format.

25.02 Upon Department's request, samples of all formations penetrated and parts of cores taken, accurately labeled with the API number of the well and depth interval of collection, shall be furnished to Department at Lessee's expense within one (1) year after completion of each well.

25.03 If the Lessee collects rock samples including but not limited to whole rock core, parts of core, and cuttings from any well borehole(s) on the leased premises and no longer plans to retain said samples at its own or contracted storage facility, Lessee must first offer said rock samples to the Department before their disposal or sale. The rock samples shall be accurately labeled with the API number of the well and depth interval of collection. The Department shall make arrangements for the collection and transport of the rock samples at its own expense.

25.04 Upon written request and within a timeframe specified by the Department, Lessee shall provide Department with production and pressure test data, production and pressure decline curves, gas analysis data including BTU value determinations, water and waste disposal records, well stimulation and treatment records, maintenance records and reports, and/or any other data or records for any well(s) which the Department deems necessary to protect its interests.

26. CONFIDENTIALITY

26.01 To the extent of applicable law, Department intends to keep the following well related documents confidential for a period of three years from the date the well is spud:

(a) all drill time logs
(b) all electric well logs
(c) all nuclear well logs
(d) all acoustic or sonic well logs
(e) all caliper or hole diameter measurement logs
(f) all cement bond or integrity logs
(g) all mud or geologic well logs
(h) all dip measurement well logs
(i) all well flow or production test data
(j) all well completion data
(k) all well fracturing and stimulation data
(l) all well pressure tests or pressure data
(m)all record of lost circulation zones and caving strata
(n) all well casing records
(o) all core analysis, mud log analysis
(p) all well perforation records
(q) all lithologic well logs
(r) all written well history
(s) all well cutting samples requested by Department
(t) drill stem tests and charts
(u) formation water analysis
(v) and any other geophysical well data not specifically named

26.02 To the extent of applicable law, Department intends to keep the following seismic related documents confidential in perpetuity from the date of acquisition, and further acknowledges that the seismic data submitted to the Department are the sole property of the Lessee and considered to be business or trade secrets:

(a) all raw preprocessed data on tapes, discs, or other storage devices
(b) all processed data on tapes, discs, or other storage devices
(c) all paper or reproducible copies of stacked seismic data presentations
(d) all paper or reproducible copies of migrated seismic data presentations
(e) all paper or reproducible copies of relative amplitude seismic data presentations
(f) all paper or reproducible copies of premigrated stacked seismic data presentations
(g) all paper or reproducible copies of depth conversion seismic data presentations
(h) all paper or reproducible copies of amplitude versus offset seismic data presentations
(i) all paper or reproducible copies of any attribute seismic data presentations
(j) all post plot sh ot point and receiver location maps
(k) all time-depth conversion charts or calculations
(l) all velocity charts and calculations
(m)all sonic/acoustic well charts and data calculated from well logs
(n) all synthetic seismograms
(o) all seismic models for tuning and velocity variation
(p) and all other incidental or miscellaneous seismic related data or presentations.

26.03 To the extent of applicable law, Department intends to keep the following business documents confidential for the life of the lease agreement from the date of acquisition, and further acknowledges that the business documents submitted to the Department are the sole property of the Lessee and considered to be business or trade secrets:

(a) meter charts
(b) all third party statements related to Commonwealth's royalty volumes and payments
(c) all internal account statements of Lessee or third party related to Commonwealth's royalty volumes and payments
(d) all business books of the Lessee or third parties provided to the Commonwealth to substantiate Commonwealth's royalty volumes and payments
(e) all Lessee and third party contracts related to the Commonwealth's royalty volumes and payments
(f) all production agreements between Lessee and third parties related to Commonwealth's royalty volumes and payments
(g) all farmout agreements between Lessee and third parties related to Commonwealth's royalty volumes and payments
(h) all purchase and sale agreements between Lessee and potential purchaser of the leased premises
(i) all agreements providing for areas of mutual interest between Lessee and third pa rties
(j) and all other business documents and agreements provided to the Commonwealth that Lessee or a third party consider confidential trade secrets.

27. UNITIZATION

27.01 Lessee shall have the right, at any time or times, to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering with the owners and/or

lessees, into joint operating agreements providing for the joint operation and development of the leased premises, or portions thereof, with adjoining lands to prevent the drilling of an excessive number of wells, or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

27.02 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises, provided that the Lessee is the owner of the off-lease property.

27.03 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area, and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

28. OFFSETS

28.01 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth which is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, any well drilled on lands not owned by the Commonwealth which is completed within one-thousand six-hundred and seventeen (1617') feet (i.e., 60 acres) of the boundary line of the lease premises and from which gas is being produced as the principal product, or any well drilled on lands not owned by the Commonwealth which is completed within the radius of the drainage areas set by an order of the Department of Environmental Protection's Bureau of Oil and Gas Management; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may, at its discretion, relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except:

(a) forty (40) acres around each well from which oil is being produced as the principal product;

(b) three hundred twenty (320) acres around each well from which gas is being produced as the principal product; or

(c) that acreage attributable to a well by an order of the Department of Environmental Protection's Bureau of Oil and Gas Management if the affected acreage falls within an area subject to such a spacing order.

28.02 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on lands not owned by the Commonwealth and, if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression, as long as safety and environmental integrity are maintained.

28.03 In cases where the offset drilling obligations of this section conflict with the drilling restriction provisions of Section 23, then the drilling restriction provisions of Section 23 shall take precedence and prevail unless waived in writing by Department.

29. OIL AND GAS PIPELINES

29.01 No large diameter, high-capacity natural gas transmission pipelines shall be constructed on the leased premises. Any pipeline that exceeds twelve inches (12") in diameter shall be considered a main transmission line for the purpose of this lease, regardless of its intended use.

29.02 Lessee is herewith granted the right to lay any necessary oil or gas gathering pipelines on or under the leased premises; however, a route map for each line shall be submitted, upon request and for approval, to the District Forester as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, Lessee must enter into the customary pipeline right-of-way agreement with Department.

29.03 Lessee does hereby agree that it will, at all times during the continuance and delivery of oil, gas, and liquid hydrocarbons to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

30. GAS STORAGE RIGHTS

30.01 No gas storage rights are demised to the Lessee by this lease.

30.02 If the Lessee wishes to develop the leased premises for gas storage, Lessee must first obtain a Gas Storage Lease from the Department.

30.03 If the Lessee does not wish to develop the leased premises for gas storage, but in the Department's opinion the leased premises exhibit characteristics which indicates its potential for a gas storage reservoir, Department will so inform the Lessee in writing prior to the final plugging and abandonment of the wells and removal of the surface support equipment.

30.04 Any well and equipment identified by Department as necessary for the development of a gas storage facility on the leased premises and which is not planned for development by the Lessee shall first be offered to Department or its nominee or assignee in writing, at the then fair market value of the

well and attendant equipment, at least one hundred twenty (120) days before Lessee begins abandonment procedures.

31. SEISMIC SURVEYS

31.01 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit for approval to the District Forester, a map showing the proposed location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to Lessee, Lessee must obtain the customary Seismic Survey Agreement from Department. The performance bond required in Section 16 (Bonding) of this lease shall, hereafter, be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

31.02 A final plat will be submitted to Department within ninety (90) days after completion of any seismic survey showing the location, elevation, and depth of shot holes drilled; and indicating which holes contained ground water, at what depth it occurred, and an estimate of the amount of flow.

31.03 During the term of this lease, a copy of all seismic data gathered or obtained from any seismic survey conducted on the leased premises will be made available to Department for review at any time after a period of one (1) year of the date of completion of each individual seismic survey. The Department may examine the information gathered in the seismic survey at the location where such information is normally maintained and worked by the Lessee during regular business hours. The Department hereby agrees that none of the seismic information examined by the Department's staff will be copied or taken from the Lessee's premises without the express written permission of the Lessee.

31.04 Upon termination of this lease, or earlier with approval of the Lessee, the Lessee shall submit to the Department a copy of all seismic data collected by the Lessee or the Lessee's agent which represents the leased premises, including but not limited to those items specified in Section 26.02 above. The submitted data may be in digital form, hard copy form (paper), or in a reproducible form (film or Mylar), and said data will be the "processed" version of the data. The presentation will include the stacked, migrated, and relative amplitude presentations in time as well as depth, if any or all of these presentations are generated from the processing procedures. Special processing, such as amplitude versus offset or any attribute processing, will be supplied in hard copy form only. All hard copies will be in industry standard format, and the digital copy will be presented in the format available or in a format Department requests, as long as it is an industry standard format. The Lessee will not be required to submit interpreted versions of the seismic data.

31.05 If a seismic survey is begun but not completed, any data collected even though incomplete shall be submitted to the Department within 30 days after the seismic effort has been terminated. If the seismic effort is suspended for more than 90 days, all data collected to the date the effort was suspended shall be submitted to the Department.

31.06 A "post plot" map will accompany both the hard copy and digital versions of the data identified in Sections 31.04 and 31.05 above, wherein the shot points are clearly marked on the map in reference to known landmarks or other reference points so that the location of all shot points can be

clearly located. If multiple survey lines are completed during one survey, all lines will be shown on the post plot map in their correct relationship to one another with tie points clearly marked on the map as well as the seismic lines. All post plot maps will be provided at no cost to Department.

31.07 A Data Transmittal Listing is required by Department, to accompany the seismic information identified in Sections 31.04 and 31.05 above which shall be transmitted to Department. Department will acknowledge in writing its receipt of the transmitted information.

32. TEST OF WELL ECONOMY

32.01 For purposes of this lease, if a gas well does not produce more than an average of one (1) Mcf/day of natural gas in a calendar year (calculated by dividing its annual production in Mcf by 365 days), it shall be considered uneconomic (i.e., not in paying quantities) to maintain and operate; and if during the following calendar year gas production from the well also fails to exceed a one (1) Mcf/day average, Lessee shall plug and abandon the well as per Section 33 (Plugging), and restore the wellsite and access road to the satisfaction of District Forester, all no later than six (6) months after the end of said following calendar year.

This provision shall apply to all wells drilled or operated by Lessee on the leased premises, whether the wells are shut-in or producing, unless the Department has informed the Lessee that a well or wells falls under the provisions of Section 30 (Gas Storage Rights).

Department may, at its sole option and in writing, waive all or part of the requirements of this provision to Lessee, if in Department's judgment such a waiver is warranted by economic conditions or other circumstances, and is deemed to be in the best interest of the Commonwealth.

33. PLUGGING

33.01 Lessee shall properly and effectively plug all wells on the leased premises before abandoning, in accordance with the regulations of the Department of Environmental Protection's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth, and in accordance with the DCNR's Standard Well Plugging Procedures as described in **Exhibit "F,"** attached hereto and made a part hereof, or provide an alternative plugging method acceptable to the Department before plugging operations commence, to be approved by the Department in writing beforehand. A copy of the Certificate of Well Plugging showing the plugging procedure used and submitted to the Bureau of Oil and Gas Management shall be supplied to the Minerals Section, Bureau of Forestry for each well plugged and abandoned. In addition to the above-mentioned requirement, upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements may be reason for cancellation of this lease, in which case the posted surety would be forfeited to fund the proper plugging of the well or wells by Department.

34. DEPARTMENT'S TERMINATION

34.01 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) calendar days after Lessee's receipt of demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

34.02 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) calendar days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant, and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a Writ of Possession waiving all stay and exemption laws and release of errors.

35. LESSEE'S TERMINATION

35.01 Lessee may, at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

35.02 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 21 (Subsequent Wells). Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation, including but not limited to the plugging and abandonment of wells, which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

36. FORCE MAJEURE

36.01 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance therewith is prevented by, or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If, at the end of the primary term hereof, such term has not been extended by production or drilling, as in this lease provided; and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the

rental provision hereof shall be extended automatically from year to year for a period not to exceed ten (10) additional years, unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises, by reason of any of the above recited causes, this lease shall remain in full force and effect.

37. REMOVAL

37.01 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to plug and abandon all wells; remove all buildings, machinery, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations; to fill and level all pits; and to the extent practicable, to restore the property to the same condition as when received.

38. RIGHTS RESERVED BY DEPARTMENT

38.01 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

38.02 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

38.03 Department reserves the right to approve, in writing, all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises unless, upon due cause shown, Department waives the thirty (30) day requirement and allows a shorter, but reasonable, time for review.

38.04 The surface rights of Department shall be considered dominant and the oil and gas leasehold rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

39. THIRD PARTIES' RIGHTS

39.01 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) has hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature as defined within the lease agreement, Section 26 (Confidentiality).

40. DISPUTE RESOLUTION

40.01 In the event that Lessee wishes to dispute a decision made by Department, the following procedure shall be used to dispute Department's decision:

(a) Department shall fix a time and place for a conference within ten (10) business days from the date of the Department's receipt of the Lessee's written request for a conference.

(b) The conference shall be held within thirty (30) days of the Department's receipt of the Lessee's written request for a conference, unless Department and Lessee agree to an extension of time for the conference.

(c) At such conference, the Director of the Bureau of Forestry or his/her representative shall represent Department.

(d) Department may continue the conference if supplemental data, maps or other information are required to evaluate the basis for Lessee's objections, if further review is needed to ascertain whether a mutually agreed upon settlement is consistent with the terms of the lease agreement, or if all parties to the conference agree that a continuance is beneficial to the resolution of the objection.

(e) Any agreement(s) reached at the conclusion of said conference or follow-up discussions shall be consistent with the provisions of the lease agreement. A record of such agreement(s) shall be documented in writing by the Department, copies of which shall be provided to the Lessee, the appropriate District Forester, and all other parties involved.

41. INTEGRITY PROVISIONS

41.01 Lessee agrees to comply with the CONTRACTOR INTEGRITY PROVISIONS FOR COMMONWEALTH CONTRACTS, attached hereto as **Exhibit "G"**, and made a part hereof.

42. NONDISCRIMINATION CLAUSE

42.01 Lessee agrees to comply with the NONDISCRIMINATION CLAUSE, attached hereto as **Exhibit "H"**, and made a part hereof.

43. RELEASE

43.01 Lessee shall not be granted a final release from the terms of this lease until all records and reports and other data described above have been provided to the Department, all wells required by the Department to be plugged have been plugged and plugging certificates provided, all other terms of this lease have been met, and the District Forester has met with Lessee's field engineer or other authorized representative on the ground, inspected the premises, and both parties have signed a Statement of Release indicating that any necessary site restoration has been completed. Said release shall not be unreasonably withheld by the Department. In the absence of a two-party signed Statement of Release,

the Department shall accept the District Forester's findings based on his/her independent inspection of the leased premises. A copy of the release statement will be provided to the Minerals Section, Bureau of Forestry.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be dully executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

James R. Grace, PhD
Deputy Secretary for Parks & Forestry

ATTEST:

SENECA RESOURCES CORPORATION

Secretary/~~Treasurer~~ (signature) (Seal)

President/Vice President (signature)

Typed Name: Barry L. McMahan

(Typed Name) John P. McGinnis

Federal Identification No.:

APPROVED AS TO LEGALITY AND FORM:

OFFICE OF ATTORNEY GENERAL

OFFICE OF GENERAL COUNSEL

CHIEF/ASSISTANT COUNSEL
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

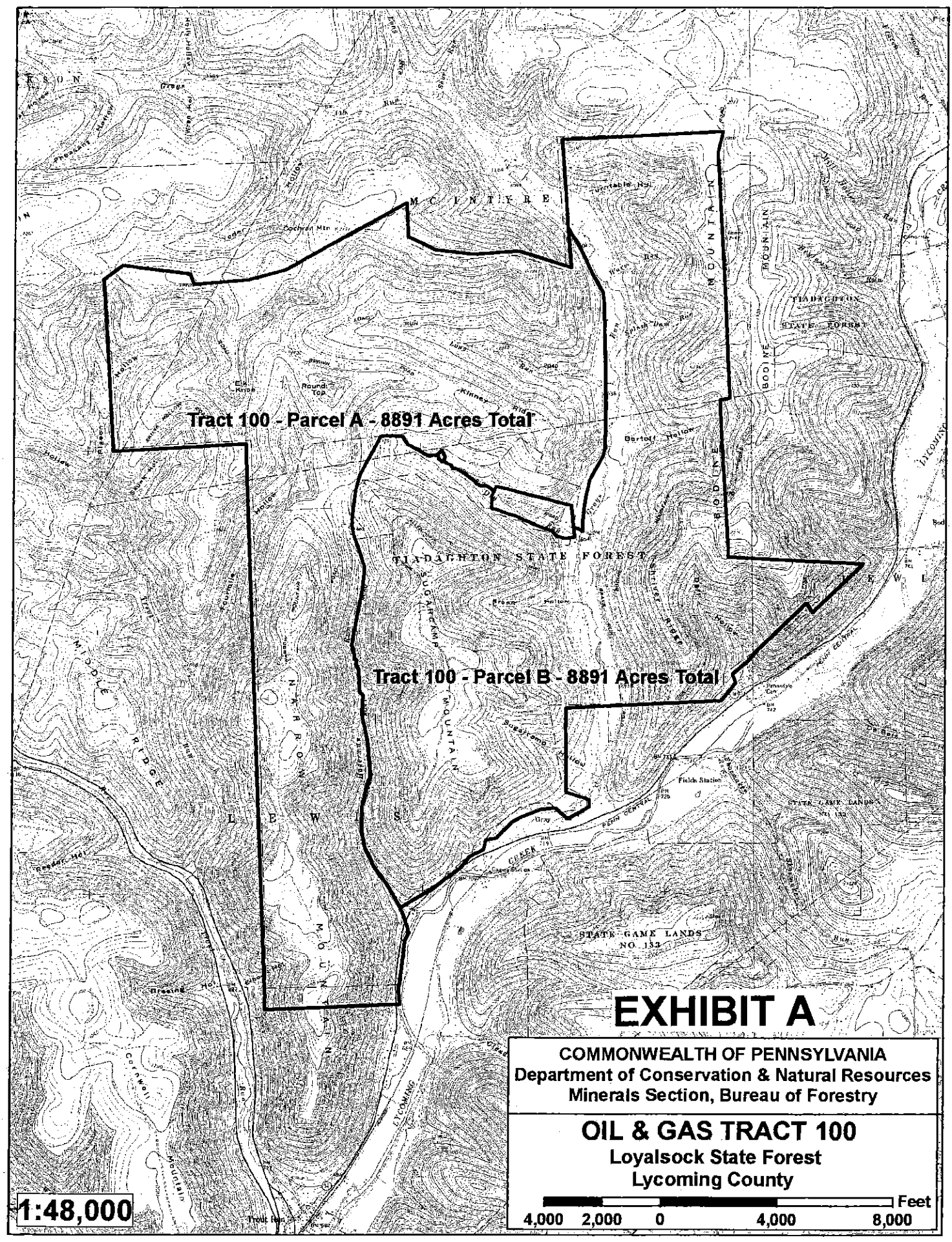
COMMONWEALTH OF PENNSYLVANIA, :
: ss.
COUNTY OF DAUPHIN :

On this the 30 day of January, 2009 before me, the undersigned officer, personally appeared James R. Grace, Deputy Secretary for Parks and Forestry, Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, known to me to be the person described in the foregoing instrument, and acknowledged that he executed the same in the capacity therein stated and for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Gene F. Odato
Notary Public

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
GENE F. ODATO, Notary Public
City of Harrisburg, Dauphin County
My Commission Expires March 29, 2012


Tract 100 - Parcel A - 8891 Acres Total
Tract 100 - Parcel B - 8891 Acres Total
TIADAGHTON STATE FOREST
STATE GAME LANDS NO. 133
EXHIBIT A
COMMONWEALTH OF PENNSYLVANIA
Department of Conservation & Natural Resources
Minerals Section, Bureau of Forestry
OIL & GAS TRACT 100
Loyalsock State Forest
Lycoming County
Feet
4,000 2,000 0 4,000 8,000
1:48,000

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "B"

Attached to and made a part of Oil and Gas Lease For State Forest Lands, No. M-10100-20, by and between: COMMONWEALTH OF PENNSYLVANIA and SENECA RESOURCES CORPORATION.

Tract 100

State Tract 100 containing 8,891 acres of Loyalsock State Forest land consisting of 2 parcels: Parcel "A" (4,404 acres) comprising parts of Warrants 5659. 5662, 5663, 5664, 5669, 5752 and 5785 in Lewis and McIntyre Townships; and Parcel "B" (4,487 acres) comprising parts of Warrants 5656, 5657, 5658, 5659, 5662, 5663, 5664, 5669 and 5785 in Lewis, McIntyre and Cogan House Townships; all in Lycoming County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania, Parcel "A" from Thomas B. Albert: by deed dated September 24, 1924; from Charles Bartles and George Hoover by deed dated November 6, 1908; from John Hall by deed dated November 6, 1908; from Fred Lehman by deed dated September 21, 1948; from Mary Mahaffey by deed dated November 6, 1908; from John G. Newman by deed recorded April 17, 1970; and from Asher D. Updegraff by deed dated November 21, 1916; and Parcel "B" from Josephine Allen by deed dated May 6, 1914; from Charles Bartles and George Hoover by deed dated November 6, 1908; from J. Henry Cochran, et al, by deed dated November 6, 1908; from Grays Run Club and Pennsylvania Game Commission by deed dated November 21, 1936; from John L. Hall by deed dated November 6, 1908; from Mary Mahaffey by deed dated November 6, 1908; from John G. Newman by deed recorded April 17, 1970; and from Asher D. Updegraff by deed dated November 21, 1916; and described as follows:

Parcel A

Beginning at a point formed by the, Loyalsock State Forest boundary and the centerline of Hagerman Run Road within Warrant 5785; also being a point approximately 11,900' north 18° east of the junction of US Route 15 and State Route 14 at Trout Run, Pennsylvania; also being a point approximately 700' west-northwest of the junction of Hagerman Run and Lycoming Creek west of State Route I4; thence in a general northerly direction approximately 17,000' along the centerline of Hagerman Run Road through Warrants 5785, 5669 and 5664 to a point formed by the junction of the centerlines of Hagerman Run Road , and Dry Run Road; thence in a general southeasterly direction approximately 4700' along the centerline of Dry Run Road through Warrants 5664 and 5663 to a point on the Loyalsock State forest boundary with an "interior holding" of privately owned land; thence southward approximately 600' along the Loyalsock State Forest boundary within Warrant 5663 to a corner point on the Loyalsock State Forest boundary; also being the southwest corner of the privately owned "interior

holding" parcel of land; thence in a general southeasterly direction approximately 3200' along the Loyalsock State Forest within warrants 5663 and 5662 (?) to a corner point on the Loyalsock State Forest boundary; also being the southeast corner of the privately owned "interior holding" parcel of land; thence northward approximately 300' along the Loyalsock State Forest boundary within Warrant 5662 (?) to a point on the centerline of the Dry Run Road; thence southeastward approximately 200' along the centerline of Dry Run Road within Warrant 5662 to a point formed by the intersection of the centerlines of Dry Run Road and Grays Run Road; thence in a general northerly direction approximately 10,700' along the centerline of Grays Run Road within Warrants 5662 and 5659 to a point on the Loyalsock State Forest boundary; also being a point on the west line of Warrant 5659; thence northward approximately 3000' along the Loyalsock State Forest boundary which follows the west line of Warrant 5659 to a corner point on the Loyalsock State Forest boundary; also being the northwest corner of Warrant 5659; thence eastward approximately 5400' along the Loyalsock State Forest boundary which follows the north line of Warrant 5659 to a corner point on the Loyalsock State Forest boundary; also being the northeast corner of Warrant 5659; thence southward approximately 9502' along the east line of Warrant 5659 (which follows in part the west side of the Bodine Mountain Road) to the southeast corner of Warrant 5659; also being a point on the Lewis-McIntyre Township line; thence westward approximately 300' along the south line of Warrant 5659 which coincides with the Lewis-McIntyre Township line to a point on the south line of Warrant 5659; also being the northeast corner of Warrant 5662; thence southward approximately 5313' along the east line of Warrant 5662 to a point on the east line of Warrant 5662; also being the northwest corner of Warrant 5752; thence eastward approximately 4455' along the north line of Warrant 5752 to a point on the Loyalsock State Forest boundary; thence in a general southwesterly direction approximately 2294' southwest, 347' northwest, 3531' southwest, 282' south-southeast, 780' southwest, 5300' west (along the south line of Warrant 5662), 2850' south, 800' east-southeast, 250' south, 800' southwest (along Grays Run Road); 600' northwest, and 6600' generally southwest along the Loyalsock State Forest boundary through Warrants 5752, 5662 and 5785 to a corner point on the Loyalsock State Forest boundary; also being a point formed by the junction of the Loyalsock State Forest boundary and the centerline of Hagerman Run Road within Warrant 5785; the place of the beginning.

Parcel B

Beginning at a point formed by the Loyalsock State Forest boundary and the centerline of Hagerman Run Road within Warrant 5785; also being a point approximately 11,900' north 18° east of the junction of US Route 15 and State Route 14 at Trout Run, Pennsylvania; also being a point approximately 700' west-northwest of the junction of Hagerman Run and Lycoming Creek west of State Route 14; thence in a general northerly direction approximately 17,000' along the centerline of Hagerman Run Road through Warrants 5785, 5669 and 5664 to a point formed by the junction of the centerlines of Hagerman Run Road and Dry Run Road; thence in a general southeasterly direction approximately 2300' along the centerline of Dry Run Road through Warrants 5664 and 5663 to a point on the Loyalsock State Forest boundary with a small 1.5 acre "interior holding" of privately owned land; thence northeastward approximately 178'

along the Loyalsock State Forest boundary to a corner point on the Loyalsock State Forest boundary; also being the north corner of the 1.5 acre "interior holding" parcel of privately owned land; thence southeastward approximately 276' along the Loyalsock State Forest boundary to a corner point on the Loyalsock State Forest boundary; thence southwestward approximately 150' along the Loyalsock State Forest boundary to a point on the centerline of Dry Run Road; thence southeastward approximately 2100' along the centerline of Dry Run Road within Warrant 5663 to a point on the Loyalsock State Forest boundary with an "interior holding" of privately owned land; thence north-northeastward approximately 150' along the Loyalsock State Forest boundary to a corner point on the Loyalsock State Forest boundary; also being the northwest corner of the "interior holding" parcel of privately owned land; thence east-southeastward approximately 2800' along the Loyalsock State Forest boundary within Warrant 5663 and 5662 (?) to a corner point on the Loyalsock State Forest boundary; also being the northeast corner of the "interior holding" parcel of privately owned land; thence southward approximately 1300' along the Loyalsock State Forest boundary within Warrant 5662 (?) to a point on the centerline of Dry Run Road; thence southeastward approximately 200' along the centerline of Dry Run Road within Warrant 5662 to a point formed by the intersection of the center lines of Dry Run Road and Grays Run Road; thence in a general northerly direction approximately 10,700' along the centerline of Grays Run Road within Warrants 5662 and 5659 to a point on the Loyalsock State Forest boundary; also being a point on the west line of Warrant 5659; thence southward approximately 1350' along the Loyalsock State Forest boundary which follows the west line of Warrant 5659 to a corner point on the Loyalsock State Forest boundary also being a point on the east line of Warrant 5658; thence in a general westerly direction approximately 6000' west-northwest along the Loyalsock State Forest boundary across Warrant 5658 to a corner point on the Loyalsock State Forest boundary; also being a point on the west line of Warrant 5658; also being a point on the east line of Warrant 5657; thence northward approximately 1200' along the Loyalsock State Forest boundary which follows the east line of Warrant 5657 to a corner point on the Loyalsock State Forest boundary; thence in a general west-southwesterly direct ion approximately 8000' along the Loyalsock State Forest boundary within Warrants 5657 and 5656 to a corner point on the Loyalsock State Forest boundary; also being a point within Warrant 5656; thence in a general westerly direction approximately 350' north-northwest, 2400' west-northwest and 800' southwest along the Loyalsock State Forest boundary within Warrant 5656 to a corner point on the Loyalsock State Forest boundary; also being a point on the west line of Warrant 5656; thence southward approximately 5900' along the Loyalsock State Forest boundary which follows the west line of Warrant 5656 to a corner point on the Loyalsock State Forest boundary; also being the southwest corner of Warrant 5656; thence eastward approximately 4500' along the Loyalsock State Forest boundary which follows the south line of Warrant 5656 to a corner point on the Loyalsock State Forest boundary, also being the southeast corner of Warrant 5656; also being the northwest corner of Warrant 5664; thence southward approximately 19,400' along the Loyalsock State Forest boundary which follows the west lines of Warrants 5664 and 5669 to a corner point on the Loyalsock State Forest boundary; also being the southeast corner of Warrant 5669; thence eastward approximately 4600' along the Loyalsock State Forest boundary which follows the south line of Warrant 5669 to a corner point on the Loyalsock State Forest boundary on the

west bank of Lycoming Creek; also being at or near the southeast corner of Warrant 5669; also being at or near the south corner of Warrant 5785; thence in a general north-northeasterly direction approximately 2500' along the Loyalsock State Forest boundary which follows the west bank of Lycoming Creek within Warrant 5785 to a corner point on the Loyalsock State Forest boundary; thence north-northwestward approximately 900' along the Loyalsock State Forest boundary within Warrant 5785 to a corner point on the Loyalsock State Forest boundary; 'also being a point formed by the Loyalsock State Forest boundary and the centerline of Hagerman Run Road within Warrant 5785; the place of the beginning.

AREAS OF SPECIAL CONSIDERATION

Tract 100 contains approximately 351 acres more or less of high value standing timber as shown on Exhibit "I". Lessee is required to carefully coordinate and pre-plan all exploration and development activities within these areas with District Forester to prevent unnecessary harvesting of high value timber wherever possible.

WELL SITES

Thirty-five (35) well pad sites will be permitted on Tract 100. Well pad site size and location are subject to the terms of the lease agreement and the approval of the District Forester.

MODIFICATION OF OIL AND GAS LEASE

THIS AGREEMENT made and entered into on this 22nd day of December, 2003, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, hereinafter designated "Department" and PPL LAND HOLDINGS LLC, a Pennsylvania limited liability company, with its principal place of business at 2 North Ninth Street, Allentown, Pennsylvania 18101 ("PPL"), and Pennsylvania General Energy, Corp., a Pennsylvania corporation, with its principal place of business at 208 Liberty Street, Warren, Pennsylvania 16365, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter collectively designated "Lessee."

WITNESSETH:

WHEREAS, Department is authorized pursuant to the Conservation and Natural Resources Act 18 of 1995 ("CNRA") Act of June 28, 1995, P.L. 89, No. 18, Section 302(a)(6), 71 P.S. §§ 1349.302(a)(6), to lease in the best interest of the Commonwealth; and

WHEREAS, Emporium Lumber Company entered into an Oil and Gas Lease with East Penn Development Company dated May 25, 1931, recorded in Lease Book 10 at Page 175 in the Recorder's Office of Potter County ("The Lease"); and

WHEREAS, East Penn Development Company, through merger and acquisition, is now PPL; and

WHEREAS, Department's predecessor, the Department of Forest and Waters, and Lessee's predecessor, The Emporium Lumber Company, executed an Agreement and Quit-claim Deed on January 1, 1969, which was recorded on December 2, 1970, in Potter County, Deed Book 185 page 179 modifying The Lease; and

WHEREAS, PPL has assigned said Lease to Pennsylvania General Energy, Corp. in accordance with the terms and conditions of said Assignment dated March 5, 2002; and

WHEREAS, the parties desire to amend certain portions of said Agreement herein, with all provisions of the existing Agreement that are not amended by or otherwise inconsistent with the terms this Modification, remaining in full force and effect.

NOW THEREFORE, in consideration of the mutual covenants and agreements herein contained and for other good and lawful consideration, intending to be legally bound hereby, the parties hereto agree that The Lease shall be modified as follows:

1. **TERM OR PERIOD**

1.01 It is agreed that The Lease shall remain in force for a term of fifteen (15) years from the date first written above, and shall continue from year to year thereafter so long as oil or gas produced in paying quantities (as described in Paragraph 3.02) from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder.

2004 FEB 5 PM 4 25
RECORDER OF DEEDS

2. **REMOVAL**

2.01 Lessee shall have six (6) months after termination, abandonment, or surrender of The Lease, or any part thereof, in which to plug and abandon all wells, remove structures, and restore the site in accordance with the regulations of the Department of Environmental Protection Bureau of Oil and Gas Management and all applicable laws of the Commonwealth.

3. **PLUGGING**

3.01 Lessee shall properly and effectively plug all wells on the leased premises before abandoning, in accordance with the regulations of the Department of Environmental Protection's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth.

3.02 If a gas well does not produce more than an average of one (1) Mcf/day of natural gas in a calendar year (calculated by dividing its annual production in Mcf by 365 days), it shall be considered uneconomic (i.e., not paying quantities) to maintain and operate; and if during the following calendar year gas production from the well fails to exceed a one (1) Mcf/day average, Lessee shall plug and abandon the well in accordance with the regulations of the Department of Environmental Protection's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth, all no later than six (6) months after the end of said following calendar year.

Department may at its sole option waive all or part of the requirements of this provision by letter to Lessee, if in Department's judgment such a waiver is warranted by economic conditions or other circumstances.

4. **ORIGINAL AGREEMENT**

4.01 In all other respects, the terms and conditions of The Lease as modified are ratified and confirmed.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be dully executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

Michael DiBerardinis
Secretary

WITNESS:

PPL LAND HOLDINGS LLC
By _____
John F. Sipics

_____
President

PENNSYLVANIA GENERAL ENERGY, CORP.
By _____
Douglas E. Kuntz

ATTEST:

_____
Secretary/~~Treasurer~~ (Seal)

_____
~~President~~/Vice President

APPROVED AS TO LEGALITY AND FORM:

_____
OFFICE OF ATTORNEY GENERAL

_____
CHIEF/~~ASSISTANT~~ COUNSEL
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

APPROVED:

_____
Governor

COMMONWEALTH OF PENNSYLVANIA :
: SS:
COUNTY OF DAUPHIN :

On this, the 5th day of December, 2003, before me, a Notary Public, the undersigned officer, personally appeared Michael DiBerardinis, who acknowledged himself to be the Secretary, Department of Conservation and Natural Resources, and that he as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the Pennsylvania Department of Conservation and Natural Resources by himself as Secretary.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Dennis A. Kelly
Notary Public

COMMONWEALTH OF PENNSYLVANIA:

: SS:

COUNTY OF LEHIGH :

On this, the 22nd day of DECEMBER, 2003, before me, a Notary Public, the undersigned officer, personally appeared JOHN C SIPICS, who acknowledged himself to be the PRESIDENT of PPL Land Holdings LLC, a Pennsylvania limited liability company, and that he as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the company by himself as PRESIDENT.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

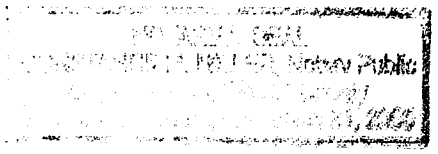
Bruce A Sampson
Notary Public

NOTARIAL SEAL
BRUCE A. SAMPSON, NOTARY PUBLIC
FAIRFIELD TWP., LYCOMING COUNTY
MY COMMISSION EXPIRES FEB. 4, 2006

COMMONWEALTH OF PENNSYLVANIA:
: SS:
COUNTY OF WARREN :

On this, the 23rd day of December, 2003, before me, a Notary Public, the undersigned officer, personally appeared Douglas E. Kuntz, who acknowledged himself to be the Vice-Pres. of Pennsylvania General Energy, Corp., a Pennsylvania corporation, and that he as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the corporation by himself as Vice Pres.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.



Constance M. Miller
Notary Public

BK0017PG0762

RECEIPT FOR PAYMENT

Potter County - Recorder of Deeds
Courthouse: One East 2nd St.
Coudersport, Pa 16915

Receipt Date: 2/05/2004
Receipt Time: 10:46:33
Receipt No.: 139308

Instrument Number: 2004-000386

Paid By Remarks: CHESTER SMITH

Receipt Distribution

Fee/Tax Description	Payment Amount	Payee Name
LEASE	13.00	POTTER COUNTY GENERAL FUND
LEASE - WRIT	.50	BUREAU OF RECEIPTS & CNTR MD
CO IMPROVEMENT FND	2.00	POTTER CO IMPROVEMENT FUND
REC IMPRVMT FUND	3.00	RECORDERS IMPROVEMENT FUND
EXTRA PAGES	4.00	POTTER COUNTY GENERAL FUND
Cash	$22.50	
Total Received.....	$22.50	

State of Pennsylvania
County of Potter

Recorded in the Office for Recording of Deeds, in and for the County of Potter at Record Book 17 Page 756

Witness my hand and Seal of Office
This day of February 5, 2004
Priscilla Lexton Deputy
Recorder of Deeds

COPY

THIS LEASE AGREEMENT, made this 24 day of [illegible], 1931, between the EMPORIUM LUMBER COMPANY, a Pennsylvania Corporation, with its principal office in Galeton, Pennsylvania, as Lessor, and the EAST PENN DEVELOPMENT COMPANY, a Delaware Corporation, with an office in Port Allegany, Pennsylvania, as Lessee,

WITNESSETH: That for and in consideration of the sum of One Dollar, to it in hand paid by the Lessee (the receipt of which is hereby acknowledged) as well as for and in consideration of the rentals and other payments, covenants and conditions herein agreed to be paid, kept and performed by the Lessee, the Lessor does hereby grant, demise and let unto the Lessee all those certain tracts or parcels of land situate in the East Fork District and Wharton Township, Potter County, Pennsylvania, (listed immediately hereafter), for the sole and exclusive right to drill and operate thereon for oil and/or gas, and the right to use sufficient water and gas from the premises to drill and operate thereon and such other rights and privileges as are reasonably necessary for conducting said operations and the right to remove at any time all of the property placed thereon by the Lessee.

Being the following Warrants, to-wit:- 4766, 4769, 4770, 4754, 4701, 4703, 4704, 4715, 4765, 4696, 4697, North ½ of 5154, 5920, Ives 4, Ives 5, Ives 6, 5917, 5148, 5912, 4753, 4714, Ives 2 and Ives 3. As the same are described in a Deed dated the first day of January, 1929, wherein the Lessor herein was Grantor and the Commonwealth of Pennsylvania, Grantee, recorded in Potter County in Deed Book 108, page 186, (The Lessor herein reserving the oil and gas), and to which reference may be had for a full and complete description of each of said warrants enumerated herein.

EXCEPTING AND RESERVING THEREFROM, the following:-

(a) A tract of eighty-nine (89) acres ninety-six (96) perches, claimed by H.B. Walker.

COPY

(b) A tract of One hundred ninety-three (193) acres thirty-two (32) perches, claimed by Minerva McFall.

(c) A tract of one hundred fifteen (115) acres claimed by Indra Williams.

(d) A tract of thirty (30) acres, claimed by Ruben Ward.

(e) A tract of forty-seven (47) acres sixty-four (64) perches, claimed by Jane Williams.

(f) A tract of one (1) acre, claimed by Ora Nichols.

(g) A right-of-way of thirty-six (36) acres, twenty (20) perches, claimed by the B.& S. Railroad Company.

The above Warrants, after deducting the exceptions and reservations herein recited, CONTAIN approximately and for the purpose of this Lease, Twenty-three Thousand (23,000) Acres.

TO HAVE AND TO HOLD, the same unto the Lessee, for the purpose herein set forth, for and during the term of Ten (10) years from the date hereof and as much longer as oil and/or gas is found in paying quantities or as operations for oil and/or gas are being conducted on the premises, but not to extend beyond the reserved right of the Lessor to drill and operate for oil and gas as set out in the Deed from the Lessor to the Commonwealth of Pennsylvania dated January 1st, 1929, and recorded in Potter County, Pennsylvania in Deed Book 108, page 186. It being the intention of this Lease to grant to the Lessee (if it so elects) the same tenure as the Lessor has in the lands described herein and with the same rights as to the development of the lands for oil and gas and no greater, and subject to the terms, covenants and conditions hereof. The reserved right in said Deed reads as follows:-

"'H'. EXCEPTING AND RESERVING the oil and gas under all of the lands herein conveyed with the right to drill, bore and prospect for the same; and if found, to produce, store and transport the same, for and during the term of TWENTY YEARS (20), and if at the expiration of that time oil and/or gas is produced, in paying quantities, a further term of twenty (20) years is excepted herefrom, TOGETHER with the use of any part of the surface in the

operation, development, production and transportation of any oil and/or gas therein found according to such rules and regulations as may be, from time to time, adopted by the Secretary of Forest & Waters, but such rules shall at all times be reasonable rules and in harmony with the usual methods of operating and producing oil and/or gas in the Bradford Field."

"The Lessee hereby agrees to pay as rental for the first year the sum of Twenty-five Cents ($.25) per acre, and to be paid in full upon the execution and delivery of this Lease. For each subsequent year, the Lessee agrees to pay the sum of Thirty-five Cents ($.35) per acre, payable quarterly in advance, and it further agrees to pay the additional consideration of one-eighth (1/8) of all oil produced to be delivered free of expense into tanks or oil lines; and one-eighth (1/8) of the market price of each one-thousand (1,000) feet of gas produced and marketed off said premises, said market price to be the average price received by producers in the Tioga Field. The gas shall be measured by orifice meter or meters (furnished by the Lessee) and the coefficient for said meter or meters shall be based on a 10 oz. pressure, specific gravity of the gas, and a flowing temperature of 60 degrees Fahrenheit. The quantity of gas produced and marketed shall be compiled on the 10th of each month, and payment made therefor on or before the 20th of that month. The Lessor or its agents shall have the right to read and inspect the meter charts and to examine, check or test the meters at its own cost. Lessee to pay seven-eighths (7/8) of the increased Taxes.

The Lessee does hereby covenant and agreed that it will start to drill one (1) well on the premises on or before September 1st, 1931, and proceed with all due diligence into the Oriskany sand. And if gas is found therein and in paying quantities, it covenants and agrees that during the calendar year 1932, and each calendar year thereafter, to drill at least two (2) additional wells into the same sand until there

is at least one (1) well into this sand for each Five Hundred (500) acres of land leased, or undrilled land abandoned. Provided the first, or the second, or the third, and each subsequent well drilled into the Oriskany Sand shows gas in paying quantities, and provided further, that the market will absorb the gas.

IT IS FURTHER UNDERSTOOD AND AGREED that nothing herein, however, shall be construed as prohibiting the Lessee from drilling, producing and marketing oil and/or gas found in any other sand, of lesser depth, should the Oriskany sand be not found, or if found, prove unproductive in paying quantities. And it is agreed that in case the said lands are developed for the oil and/or gas in any other sand, the Lessee will, during the calendar year thereafter, drill at least four (4) additional wells into the said sand, until there is at least one (1) well for each two hundred (200) acres of land leased or undrilled land abandoned, provided that the market will absorb the gas.

Provided the Lessee is not in default in its rentals or other payments, it is hereby agreed that the Lessee shall have the right to surrender this Lease at any time and any advance rentals paid thereon shall be kept by the Lessor as stipulated damages. It is further agreed that the Lessee shall have the right to abandon all undrilled area, (being all the land leased saving and excepting only five -hundred (500) acres around each and every well drilled to a depth of twenty-five hundred (2500) feet, or more, and two-hundred (200) acres around each and every well drilled to a depth of less than twenty-five-hundred (2500) feet). Upon the surrender of this Lease, said Lessee shall be released from any subsequent accrued rentals, payments or charges to the said Lessor, and on the abandonment of the undrilled area, the Lessee shall be released from all subsequent rentals on the area abandoned. The Lessee agrees to give to the said Lessor thirty (30) days' notice in writing of its exercise of either of the said rights

to surrender or to abandon, and hereby grants to the said Lessor the right or option within the thirty-day notice period to purchase the equipment or material in any well to be abandoned and at a price to be agreed on, and if not purchased, the Lessee will comply with all requirements of the State, statutory or otherwise, in plugging or otherwise caring for the well.

THE PARTIES DO FURTHER COVENANT AND AGREE that each and every well drilled to a depth of twenty-five-hundred (2500) feet, or more, will reduce the annual rental herein agreed to be paid the sum of One Hundred Seventy-five ($175.00) Dollars, and for each and every well drilled to a depth less than twenty-five-hundred (2500) feet, the annual sum of Seventy ($70.00) Dollars. "

IT IS FURTHER AGREED that the Lessee has a right of ingress and egress on, over and across the lands of the Lessor adjacent to the lands leased for rights-of-way as fully as the Lessor may have (under its reserved rights in the Deed to the Commonwealth of Pennsylvania), to properly develop and operate the same; and the Lessor reserves the right of ingress and egress for rights-of-way for itself and its assigns over the lands leased to develop and operate its oil, gas and mineral rights.

ALL payments of rental or royalty are to be made by check to the Lessor by mail to CONIFER, N. Y., or such other place as it may direct in writing and ten days grace shall be allowed on all payments that may become due under the provisions of this Lease.

IT IS ALSO UNDERSTOOD AND AGREED that if there is now or at any time any outstanding interest in said oil and/or gas not owned by the said Lessor, the royalty herein provided to be made to the Lessor shall be reduced accordingly.

AS A MATTER OF INFORMATION it is agreed that the Lessee

will keep an accurate log of its drilling and give to the Lessor a copy of the same as the work progresses, together with a map showing the location of wells, lines, at cetera, or other working charts, as may be used by the Lessee in the development of said land.

Failure to start the well before September 1st, 1931, shall make this lease null and void. Failure to pay any of the rentals as herein agreed to be paid shall make this Lease null and void. Failure to pay the agreed Royalty as the same becomes due and payable shall make this Lease null and void. Failure to keep and perform any of the covenants herein agreed to be done, kept and performed, by the Lessee, shall make this Lease null and void. Upon any of the said defaults said Lessor may declare this Lease forfeited with the right to re-enter and repossess itself of the same.

THIS LEASE AGREEMENT inures to the benefit of, and is binding on, the parties hereto and on their respective successors and assigns, hereby giving to the said Lessee the right to sublet the lands or any portion thereof, subject to the terms and conditions hereof.

The Emporium Lumber Company does hereby constitute and appoint E. J. JONES, to be its Attorney, for it and in its name and for its corporate act and deed to acknowledge this Lease before any person having authority by the laws of the Commonwealth of Pennsylvania to take such acknowledgement to the intent that the same may be duly recorded.

IN WITNESS WHEREOF the parties have caused the execution of this Agreement in duplicate the day and year first above written.

ATTEST:

Secretary.

EMPORIUM LUMBER COMPANY

By:

President.

ATTEST:

Asst Secretary

EAST PENN DEVELOPMENT COMPANY

By:

Vice President.

STATE OF PENNSYLVANIA)
) SS:
COUNTY OF McKEAN)

I hereby certify that on this 27th day of May, 1931, before me the subscriber, a Notary Public in and for said State and County, personally appeared E. J.JONES, the Attorney named in the foregoing Agreement, and by virtue and in pursuance of the authority therein conferred upon him, acknowledged the said deed to be the act of the said Emporium Lumber Company.

WITNESS my hand and notarial seal the day and year aforesaid.

Ada P. Duffee
Notary Public

My Comm.Exp: May 9, 1935

STATE OF PENNSYLVANIA)
) SS:
COUNTY OF McKEAN)

On the 29th day of May, 1931, before me personally came O.H. Schumacher, to me known, who, being duly sworn, did depose and say that he resides in Pittsburgh, Pa that he is Vice President of the EAST PENN DEVELOPMENT COMPANY, the company described and which executed the above instrument; that he knows the seal of said company, that the seal affixed to said instrument is such corporate seal, that it was so affixed by the order of the board of directors of said corporation, and that he signed his name thereto by like order.

IN WITNESS WHEREOF, I have hereunto set my hand and seal of office in the County and State aforesaid the day and year aforesaid.

Richard M. Edgar
Notary Public

My Comm. Exp:

INDEX OF LEASE CONTENTS FOR TRACT 594

COPY

1. Term or Period
2. Lease Recording and Public Notice
3. Rental
4. Gas Royalty
5. Oil Royalty
6. Payments
7. Gas Measurement
8. Audits

9. Interpretation
10. Limitation on Warranty
11. Laws, Rules and Regulations
12. Indemnity
13. Liability
14. Assignments
15. Related Agreements

16. Surety
17. Comprehensive Liability Insurance
18. Deep Well Control Insurance and Safety – 10,000'+ TVD wells only

19. Operations, Protection and Conservation
20. First Well
21. Subsequent Wells (includes acreage attributable to a well)
22. Development and Well Spacing
23. Drilling Restrictions
24. Drilling Operations
25. Well Records, Logs and Reports
26. Confidentiality
27. Unitization
28. Offsets
29. Oil and Gas Pipelines
30. Gas Storage Rights
31. Seismic Surveys

32. Test of Well Economy
33. Plugging

34. Department's Termination
35. Lessee's Termination
36. Force Majeure
37. Removal

38. Rights Reserved by Department
39. Third Parties' Rights
40. Dispute Resolution
41. Integrity Provisions
42. Non-Discrimination Clause
43. Release

Exhibit A – Map of Tract
Exhibit B – Legal Description of Tract
Exhibit C – Stipulations for Protection and Conservation of State Forest Lands
Exhibit D – Invasive Plants and Revegetation Guidelines for State Forest Lands
Exhibit E – Oil and Gas Lease Access Road Specifications for State Forest Lands
Exhibit F – DCNR's Standard Well Plugging Procedures
Exhibit G – Contractor Integrity Provisions for Commonwealth Contracts
Exhibit H – Non-Discrimination/Sexual Harassment Provisions for Commonwealth Contracts
Exhibit I – Area(s) of Special Consideration

Commonwealth of Pennsylvania
Department of Conservation and Natural Resources
Bureau of Forestry, Minerals Section
P.O. Box 8552
Harrisburg, PA 17105-8552

STATE FOREST TRACT NO. 594

CONTRACT NO.
M-110594-16

OIL AND GAS LEASE FOR STATE FOREST LANDS

THIS AGREEMENT made and entered into on this 30th day of January 2009, by and between the **COMMONWEALTH OF PENNSYLVANIA**, acting through the **DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES**, hereinafter designated "Department" or "Lessor" and **FORTUNA ENERGY, INC.**, with its principal place of business at 337 Daniel Zenker Drive, Horseheads, NY 14845, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH:

WHEREAS, Lessor is authorized pursuant to the Conservation and Natural Resources Act 18 of 1995 ("CNRA") Act of June 28, 1995, P.L. 89, No. 18, Section 302(a)(6), 71 P.S. §§1349.302(a)(6), to lease State Forest lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the completion of a competitive, sealed bid submission received by Department on or before September 3, 2008, and with bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder, and

WHEREAS, State Forest Tract 594 is comprised of two parcels of Tioga State Forest land comprising two separate parcels of land, Parcel A containing 3,545 acres in parts of Warrants 1183, 1184, 1868, 5054, 5055 and 5914; and Parcel B containing 53 acres in Warrant 5903, all in Bloss, Liberty and Hamilton Townships, Tioga County, Pennsylvania.

NOW THEREFORE, in consideration of the sum of **FIFTEEN MILLION SEVEN HUNDRED NINETEEN THOUSAND ONE HUNDRED TWENTY TWO DOLLARS AND THIRTY CENTS ($15,719,122.30)** paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations,

and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, **TRACT NO. 594** containing **3,598 acres**, more or less, shown on the Map identified as **Exhibit "A,"** and more particularly described on the Oil and Gas Lease Attachment identified as **Exhibit "B"** and as which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as **Exhibit "A"** are approximate.

1. TERM OR PERIOD

1.01 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth, particularly Section 20 (First Well) providing for the drilling of the first well within the first five (5) years of the lease, and shall continue from year-to-year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as long as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder.

2. LEASE RECORDING AND PUBLIC NOTICE

2.01 Within ninety (90) days following the receipt by Lessee of a fully executed copy of this lease, Lessee shall both record the lease in the county or counties in which the leased premises lie, and also provide a copy of the recorded lease to the Department which clearly shows the recorded reference data. Thereafter, Department shall publish at least the following information in the Pennsylvania Bulletin:

(a) The subject of this lease;
(b) the general location of the leased premises;
(c) the names of Department and Lessee; and
(d) the recording reference data for this lease.

3. RENTAL

3.01 Lessee shall pay to Department a rental for the leased premises at the following rate: the first year's rental shall consist of the bonus payment which was made by Lessee and shall be payable upon delivery of this lease to Lessee. The second, third and fourth year's rentals shall be TWENTY DOLLARS ($20.00) per acre each year, payable upon the anniversary date of this lease. For the fifth and all subsequent years thereafter, the rental shall be THIRTY-FIVE DOLLARS ($35.00) per acre each year, payable on the anniversary date of this lease.

3.02 The drilling of each well in the leased premises shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 21 (Subsequent Wells), which reduction shall become effective on the next rental date, provided the well is producing in paying quantities. If such wells are drilled on a unit created by a spacing order issued by the Department of Environmental Protection's Bureau of Oil and Gas Management, or on a unit created by a voluntary unitization agreement entered into with the approval of

Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3.03 If at any time there is on the leased premises a well capable of producing natural gas and the well is shut-in, suspended, or otherwise not produced and the natural gas is not used or marketed therefrom during any year ending on an anniversary date of this lease, Lessee shall pay Department at the expiration of each said year for that year a rental payment for each such well at the full rental rate per acre for the "acreage attributable to the well", as referred to in Section 21 (Subsequent Wells) of the lease.

4. GAS ROYALTY

4.01 Lessee must operate each well with a discrete well meter at the well site, which will measure all the gas produced from that well. Lessee will ensure that all meters are maintained according to industry standards.

4.02 Lessee shall pay to Department, as royalty, THIRTY-FIVE CENTS ($0.35) per thousand cubic feet (Mcf) or SIXTEEN PERCENT (16%) of the market value, whichever is higher, for all marketable natural gas, marketable casinghead gas, or other marketable gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; the amount to be paid to Department will be the royalty rate (either $0.35/Mcf or 16% of the market value; whichever is higher) multiplied by the fractional interest held by Department and shall be payable monthly at the market price received for natural gas at the sales meter at the time of delivery.

4.03 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal 16% part of all marketable gas and other marketable gaseous substances produced and saved from the leased premises; the amount to be delivered to Department will be the SIXTEEN PERCENT (16%) part of the gas produced multiplied by the fractional interest held by Department in the oil and gas rights. Lessee shall act to calculate and deliver a gas balancing statement on a quarterly basis to the Department in order to ensure that the Department does not exceed its SIXTEEN PERCENT (16%) share of the marketable gas production. Adjustments for overage or underage delivery of the Department's SIXTEEN PERCENT (16%) royalty share shall be made by reducing or increasing future delivery gas volumes to the Department's account.

5. OIL ROYALTY

5.01 Lessee shall pay to Department, as royalty, SIXTEEN PERCENT (16%) of the field price per barrel (42 U.S. Gallons) at 60° F, produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks; the amount to be paid to Department will be the SIXTEEN PERCENT (16%) royalty multiplied by the fractional interest held by Department.

5.02 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal

SIXTEEN PERCENT (16%) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises; the amount to be delivered to Department will be the SIXTEEN PERCENT (16%) part of the oil produced multiplied by the fractional interest held by Department.

5.03 If oil, condensate, and other liquid hydrocarbons, each in paying quantities, should be developed from the same well, then the oil and the condensate, and other liquid hydrocarbons shall be saved.

5.04 Lessee shall provide tanks or other appropriate storage for accurately measuring any crude oil produced from the lease. Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with API Standard 2500, "Measuring, sampling, and testing crude oil," Second Edition, March 1961, or as subsequently amended by the same authority. Observed gravity at the observed temperature shall be corrected to (API) gravity and volume at sixty degrees Fahrenheit (60° F) as per the American Society for Testing Materials and the Institute of Petroleum, "ASTM-IP petroleum measurement tables" (ASTM designation No. 1250; IP designation 200).

6. PAYMENTS

6.01 Lessee shall be held responsible for the payment of all rentals and royalties. **Payments shall be mailed to:**

Commonwealth of Pennsylvania
Department of Conservation and Natural Resources
Bureau of Forestry - Minerals Section
P.O. Box 8552
Harrisburg, PA 17105-8552

All checks shall be made payable to the Commonwealth of Pennsylvania. Payments of royalties shall be made monthly within 90 days after each monthly sales period.

6.02 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products within 90 days after each monthly sales period.

6.03 Once it has been determined by Department that Lessee is in default in the payment of any sum of money payable under the provision of this lease for 30 days, Lessee agrees to pay an additional twelve percent (12%) annual interest on the defaulted amount calculated from the time of such default. This provision is in no way a waiver of the requirement to pay on time.

7. GAS MEASUREMENT

7.01 The volume of gas produced, saved, and marketed shall be measured according to American Gas Association (AGA) standards and according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

(a) The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

(b) The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, regardless of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

(c) The temperature of the gas passing the meters shall be determined by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes. If a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of sixty degrees Fahrenheit (60° F) shall be used in computing gas volume.

(d) The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, annually, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

(e) The deviation of the natural gas from Boyle's Law shall be determined by tests annually or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with recommendations of the Natural Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

(f) Gas compositional analyses by chromatograph or other approved methods shall be completed as necessary or upon written request and within a timeframe specified by the Department, for the determination of gas composition, specific gravity and BTU content. A copy of the results of all such analyses, whether completed at the specific request of the Department or not, shall be provided by the Lessee to the Department for its records within ninety (90) days of the date of the test.

(g) The following factors used in the calculation of produced gas volumes shall be clearly specified on the meter statements:

Basic orifice factor (F_b)
Reynolds number factor (F_r)
Expansion factor (Y)
Pressure base factor (F_{pb})
Temperature base factor (F_{tb})
Flowing Temperature factor (F_{tf})
Specific gravity factor (F_g)
Supercompressibility factor (F_{pv})

8. AUDITS

8.01 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the leased premises. Department may keep such charts for examination for a period not to exceed one-hundred and twenty (120) days. Lessee shall furnish or secure for Department

promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, or other products produced from the leased premises.

8.02 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, or liquid hydrocarbons, produced from any well covered by this lease to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payment to Lessee, its heirs, administrators, executors, successors, and assigns for oil, gas, or liquid hydrocarbons from wells covered by this lease.

8.03 Lessee further grants to Department or Department's designated representative the right, at any time, to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from canceling this lease upon delivery to Lessee of written notice of Department's intention.

9. INTERPRETATION

9.01 In case of ambiguity, the lease shall always be construed in favor of Lessor and against Lessee.

10. LIMITATION ON WARRANTY

10.01 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the portion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may, with the approval of the Attorney General, enter into an escrow arrangement for future royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The royalties placed in

escrow shall be refunded at the direction of the court in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

10.02 This proportionate reduction clause shall not apply to and shall not reduce the bonus payments or rents payable under this lease.

11. LAWS, RULES AND REGULATIONS

11.01 Nothing in this Lease shall in any way be so construed as to impair the powers, privileges or duties of the Commonwealth, or its representatives, in the execution of the laws of the Commonwealth or the applicable rules and regulations promulgated thereunder, now in force or hereafter enacted or adopted.

11.02 The Lessee is solely responsible for obtaining any and all local, State or Federal permits or other approvals necessary for and associated with any of the operations related to this lease, and shall be held liable by the Commonwealth of Pennsylvania, any agency of the Commonwealth, or any other local or Federal authority for the violation or non-compliance of any relevant laws, rules, and regulations, including, but not limited to the following: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119,35 P.S. 4001, *et seq.*); the Clean Streams Law, as amended (Act of June 22, 1937, P.L. 1987, 35 P .S. 691.1, *et seq.*); the Solid Waste Management Act, as amended (Act of July 7,1980, P.L. 380, No.97, 35 P.S. 6018.101, *et seq.);* the Oil and Gas Act, as amended (Act of December 19, 1984, P.L. 1140, No. 223, 58 P.S. 601.101 *et seq.);* and the Surface Mining Conservation and Reclamation Act, as amended (Act of May 31, 1945, P.L. 1198, 52 P.S. 1396.1 *et seq.).*

11.03 Lessee shall strictly adhere to all rules, regulations and requirements governing the withdrawl and use of surface and ground waters as administered by the Department of Environmental Protection, the Susquehanna River Basin Commission, the Delaware River Basin Commission, or any other river basin commission having designated jurisdiction of the waters of the Commonwealth [including, but not limited to the Water Resources Planning Act of 2002 (Act 220), 25 Pa Code Chapter 110; SRBC, 18 CFR Ch. VIII § 806.20 - § 806.25]

In addition, Lessee shall obtain written authorization from District Forester prior to using surface waters located on State Forest lands as a take point for fracing or any other well drilling or well development operations. Department reserves the right to deny any such request(s) without cause.

12. INDEMNITY

12.01 Lessee shall, at all times hereinafter, indemnify and save harmless Department from and against all detriment, damage, loss claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

13. LIABILITY

13.01 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, regardless of whether or not such pollution or damage is due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause is found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises, the pollution or other damage would not have occurred; it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

13.02 Department shall not be liable to Lessee for any time during which the leased premises cannot be used.

14. ASSIGNMENTS

14.01 Lessee shall not use, or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned; and assignee thereof shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

14.02 In the event that the Lessee enters into a "Farmout Agreement" with a third party for the purpose of allowing a "Farmee" to explore, develop, or produce oil and/or gas from the leased premises, or any portion thereof, Lessee shall be liable for enforcing all the provisions of this lease, including the posting of the required plugging sureties for each and every well drilled and operated by the Farmee. Although the Department recognizes a right of the Lessee to farmout its leased premises or portions thereof from time-to-time, Department will hold the Lessee solely responsible for the enforcement of all the provisions of this lease.

15. RELATED AGREEMENTS

15.01 Upon request by the Department for its own records and to protect its own interests, Lessee shall furnish a copy of all agreements made, contracts entered into, and all letters or other

memoranda made by or to the Lessee which in any way concern the development, operation, or sale of products related to this lease.

16. SURETY

16.01 PERFORMANCE SURETY - Lessee agrees to give Department a surety or collateral performance bond with evergreen provisions in a form acceptable to Department (i.e., surety bond, irrevocable letter of credit, bank certificate of deposit, etc.), in the principal sum of **TWENTY-FIVE THOUSAND DOLLARS ($25,000.00)** conditioned on the faithful performance by Lessee of the covenants of this lease. The surety shall be further conditioned that, in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells within one (1) year from the termination of this lease, Commonwealth can execute upon the surety to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the surety shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, pollution, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises and in the use of all State Forest roads off the leased premises.

16.02 PLUGGING SURETY - Additionally, prior to acquiring any existing well on the leased premises, or upon the Lessee's decision to keep a newly drilled well, Lessee shall provide Department with a surety or collateral well plugging bond with evergreen provisions in a form acceptable to Department (i.e., surety bond, irrevocable letter of credit, bank certificate of deposit, etc.), in an amount equal to or exceeding the reasonably expected estimated total cost of plugging the well one (1) year after its completion as a producer or shut-in well, said surety to remain in effect until the plugging and abandonment of the well has been completed in compliance with applicable state law, and the well site has been restored and re-vegetated to the satisfaction of District Forester. The minimum well plugging surety coverage per well acceptable to Department as of the date of this agreement is as follows and shall be based on the well's measured depth (MD), regardless of its true vertical depth (TVD):

Measured Depth (MD)	Minimum Surety Amount
Less than 5000'	$ 10,000
5000' to 8500'	$ 30,000
8500' to 10,000'	$ 50,000
10,000' and Deeper	$100,000

16.03 Every five (5) years during the term of this agreement, and effective on the anniversary date of this agreement, new surety amounts may be instituted at the option of Department by notice in writing from Department to Lessee at least six (6) months prior to the anniversary date. Such new surety amounts shall equal the original surety amounts set forth in paragraphs 16.01 and 16.02 herein adjusted for inflation so that the surety amounts will adequately cover the expected lease obligation costs prevailing at the time of adjustment. The new adjusted surety amounts will be rounded off to the nearest ONE THOUSAND DOLLARS ($1,000.00) and will be computed by multiplying the original surety amounts set forth herein by a ratio derived from the Producers Price Index for All Commodities using a base of 1982 = 100, compiled and issued monthly by the U.S. Department of Labor's Bureau of Labor Statistics, as follows:

The numerator of the ratio shall be the index number for the item "All Commodities" for the month appearing in the issue of the index most recently preceding the anniversary when the surety adjustment is made.

The denominator of the ratio shall be the index number for the item "All Commodities" for the month of **August 2008**. The parties agree that such index number is **199.9**.

If the base period of such index should change to other than 1982 = 100, the aforementioned numerator shall be adjusted by the usual method of linkage of base periods to the end that the ratio shall accomplish its purpose; namely, to adjust the dollar amount of the surety or sureties for changes in the price level between the date of this agreement and the date when the adjustment is made.

In the event such monthly index should be discontinued, or a new or revised one substituted therefore by the Bureau of Labor Statistics or other agencies of the United States of America, such new or revised or other similar index shall be used for the purpose of computations as described in this paragraph, using such conversion factors or other devices which may be generally recognized or adopted in connection with requirements based on this index.

17. COMPREHENSIVE LIABILITY INSURANCE

17.01 Lessee shall, at its sole expense, provide and maintain in full force and effect during the term of this lease such comprehensive liability insurance in an amount not less than: Combined Bodily Injury and Property Damage Liability, TWO HUNDRED FIFTY THOUSAND DOLLARS ($250,000) each occurrence and ONE MILLION DOLLARS ($1,000,000) aggregate which shall protect Lessee and Department from claims for damages from personal injury, including accidental death, as well as claims for property damages, which may arise from operations conducted under this lease or any occurrence on or about the leased premises whether such operations are by Lessee or anyone directly, or indirectly, employed by it. The operation of automobiles or motor vehicles operated in the business of Lessee shall be included or covered by like insurance. In addition, Department shall be immediately advised should Lessee or the insurance company prior to the expiration date indicated on said policy cancel any policy. Department shall be named as additional insured on said liability insurance.

17.02 Lessee or its insurer shall be liable to Department for any damage done to Commonwealth property as the result of Lessee's operations.

17.03 Lessee shall provide Department with certificates of insurance for property damage and liability attesting to the above coverages prior to beginning its operations on the leased premises.

17.04 Department shall be immediately advised should any insurance policy or surety bond be cancelled by Lessee, the insurance company, or bonding company, prior to the expiration date on said document.

17.05 Lessee shall provide Department, upon Department's request, proof of current insurance policy in full force and effect as described in Section 17.01.

18. DEEP WELL CONTROL INSURANCE AND SAFETY – 10,000'+ TVD WELLS ONLY

18.01 Prior to the beginning of well-drilling operations on a true vertical depth (TVD) well of 10,000 feet or deeper, Lessee shall acquire well-drilling insurance coverage in an amount estimated to be sufficient to cover control of well, seepage and leakage, pollution, cleanup and contamination, unlimited redrilling and/or reworking expenses, and equipment in Lessee's care, custody and/or control. Said insurance coverage shall be continuously maintained until the cessation of any well-drilling operations, well-reworking operations, well-completion operations and well-to-pipeline-hookup operations.

18.02 Insurance in the amount of at least TWENTY MILLION DOLLARS ($20,000,000.00) will be required for drilling into the Trenton-Black River Formation unless Department waives or modifies this amount in writing upon Lessee's request.

18.03 Lessee shall provide a complete copy of the Well Control Insurance Policy to Department and shall not commence well drilling operations until Department has given its written acceptance of the Well Control Insurance Policy. Termination of the well-drilling insurance coverage must be pre-approved in writing by Department prior to its termination.

18.04 At a minimum, the Lessee-Assured shall ensure that the Well Control Insurance Policy complies with and includes the following provisions, or provide alternate provisions which are acceptable to the Department:

(1) A minimum of a 10,000 psi double ram and a 5,000 psi annular blowout preventer and a fully operational remote closing device should be used for the well operation and tested successfully at least every thirty (30) days.

(2) No well should be drilled ahead unless the "leak off" pressure determined by the most recent casing shoe test or formation integrity test (as measured by mud weight equivalent in pounds per gallon) exceeds the hydrostatic pressure extended by the actual mud weight in use by at least 0.5 pounds per gallon.

(3) No wells should be drilled with an open hole section of length greater than 8,000 feet.

(4) When the Assured is the Operator of a producing or shut-in well insured hereunder, the Assured should not allow casing pressure which exceeds seventy-five percent (75%) of the rated burst pressure for a continuous period of greater than three (3) months.

(5) When the Assured is the Operator of the well insured hereunder, the Assured should conduct a reasonable review of the drilling and/or workover contractor's personnel and equipment, to ensure that:

(a) The contractor's equipment is of adequate size capacity and pressure rating to perform all anticipated operations;

(b) The contractor has crews with a reasonable level of experience and maintains at least one employee with well-control certification on location at all times; and

(c) The contractor's tubulars, choke manifold and other pressure-rated equipment are tested satisfactorily prior to commencement of operations.

19. OPERATIONS, PROTECTION AND CONSERVATION

19.01 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up-to-date oil and gas field practices.

19.02 Lessee is responsible for conducting its operations in such a manner so as not to interfere with the rights of other Grantees, Licensees, and Lessees of the Commonwealth, or any other third parties who may have an interest in the State Forest lands located in the vicinity of the area covered by this Lease, including areas of ingress and egress.

19.03 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department of Environmental Protection or applicable County Conservation District office. A copy of the plan shall be forwarded to the District Forester upon request.

19.04 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

19.05 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as **Exhibit "C"**, attached hereto and made a part hereof.

19.06 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the INVASIVE PLANTS AND REVEGETATION GUIDELINES FOR STATE FOREST LANDS, identified as **Exhibit "D"**, attached hereto and made a part hereof.

19.07 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the OIL AND GAS LEASE ACCESS ROAD SPECIFICATIONS FOR STATE FOREST LANDS, identified as **Exhibit "E"**, attached hereto and made a part hereof.

20. FIRST WELL

20.01 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well ("FIRST WELL") on the leased premises, or on unitized acreage containing a portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above

mentioned five (5) year period, this lease shall be automatically terminated in its entirety, unless the Department, at its sole discretion, grants in writing to the Lessee a continuation of the lease in effect on a year-to-year basis. Said extention shall be granted only when the Department considers it to be in the best interests of the Commonwealth. Said extension must be granted in writing by the Department to the Lessee at least thirty (30) days prior to the fifth anniversary date of this lease.

20.02 The rental rate provision of the lease shall not be affected by such extension of the 5-year first-well deadline. Additionally, the granting of such extension period shall in no way affect the anniversary dates of this lease, or the rights and responsibilities of Department and Lessee associated therewith.

21. SUBSEQUENT WELLS

21.01 If the "FIRST WELL" drilled by Lessee, or any subsequent well, is productive of oil and/or gas, and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises but not necessarily on the portion of the leased premises contained within the unit, if such a well would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If Lessee concludes an additional well is not justified, then Lessee shall submit to Department the information upon which its conclusion is based. Upon review of such information, if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within two (2) years from Department's determination or releasing all of the acreage covered by the lease except for the following:

(a) forty (40) acres around each well from which oil is produced as the principal product;

(b) three-hundred twenty (320) acres around each well completed above the top of the Onondaga Formation from which gas is being produced as the principal product;

(c) six-hundred forty (640) acres around each well completed below the top of the Onondaga Formation from which gas is being produced as the principal product; or

(d) that amount of leased acreage actually contained within an established unit, whichever is less.

21.02 Lessee shall not be required under this provision, to drill more wells than required or allowed under any spacing order, rule, or regulation of the Department of Environmental Protection's Bureau of Oil and Gas Management, or in the absence of any such order, more than one well for each well completion depth horizon described in Section 21.01 above.

21.03 The amount of acreage around the subsurface location where oil and gas enters the well bore, commonly referred to as the "take point", included in a spacing unit ordered by the Department of Environmental Protection's Bureau of Oil and Gas Management, or in the absence of any such order, the well completion depth horizons described in Section 21.01 above, shall be referred to elsewhere in the

lease as "acreage attributable to a well," which comprises acreage directly above the subsurface "take point."

22. DEVELOPMENT AND WELL SPACING

22.01 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

22.02 Lessee is limited to FOURTEEN (14) well pad locations of reasonable dimensions on the leased premises. Lessee shall have the option to drill vertical or horizontal well(s), or a combination thereof, from a single well pad location. Multiple wells drilled on the same well pad location may target different depths and horizons.

22.03 Upon written request by Lessee, Department may waive, in writing, the number of well pad locations specified in Section 22.02 above if, in Department's judgment, such a waiver is justified and in its best interests.

23. DRILLING RESTRICTIONS

23.01 Under Department's multiple use policy, the leased premises is continuously used for recreation, conservation and other purposes, and many other Department-authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions.

(a) No drilling or well site clearing is permitted within 200 feet of any building.

(b) No drilling or well site clearing is permitted within 200 feet of any stream or body of water.

(c) No drilling or well site clearing is permitted within 300 feet of any stream or other body of water designated by the Department of Environmental Protection's Environmental Quality Board as being Exceptional Value Waters.

(d) No drilling or well site clearing is permitted within 300 feet of any picnic area or sheltered area which has been so designated by Department.

(e) No drilling or well site clearing is permitted within 300 feet of any trail, road or existing right-of-way.

(f) No drilling or well site clearing is permitted within 300 feet of any area of historic value, tree plantation, designated overlook, designated vista or fire tower site.

(g) No drilling or well site clearing is permitted within 300 feet of the boundary line of the leased premises.

(h) No drilling or well site clearing is permitted within 600 feet of the boundary line of State Park lands or of designated Wild and Natural Areas on State Forest lands.

(i) In addition the following specific restrictions for this lease shall also apply:

At the time of issuance of this lease agreement, the Department has identified certain Areas of Special Consideration on the leased premises as described in **Exhibit "I".** Additionally, due to the changing nature of the Department's databases, such as the Pennsylvania Natural Heritage Program (PNHP), the Lessee should check with the District Forester before any construction project is initiated to avoid potential conflicts.

23.02 Upon written request by Lessee, Department may waive in writing, any portion of the above restrictions if, in Department's judgment, such a waiver is justified and in its best interests.

23.03 No drilling or production activity, including but not limited to well drilling and construction, pipeline construction, compressor station placement and construction, or road construction shall be permitted, nor shall they be subject to waivers, on the surface of State Parks, State Forest Wild Areas, and State Forest Natural Areas.

24. DRILLING OPERATIONS

24.01 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before drilling thereof is commenced, and no well shall be commenced until a permit has been issued by Department of Environmental Protection's Bureau of Oil and Gas Management.

24.02 A legible sign listing the name and address of the well operator, the permit number, the farm name, and well number shall be placed in a conspicuous place near where the access road enters the well location. In addition, a legible sign listing the name of the operator and well number shall be attached or painted on the pumping unit, wellhead or meter box of each well.

24.03 Except where Lessee intentionally drills a deviated well to a bottomhole location not vertically beneath the well site, Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

24.04 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth, if requested by Department.

24.05 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

24.06 Lessee shall maintain, at all times, the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells which are shallower than ten-thousand (10,000) feet shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled, and tested to at least ten-thousand (10,000) psia for wells deeper than ten-thousand (10,000) feet that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall, at all times, be available for efficient operations. Blowout control equipment must be capable, in case of an emergency, to shut in the well at a point at least fifty (50) feet from the wellhead. For wells being serviced, blowout protection equipment shall be of sufficient capacity to control pressures and flow rates measured in the wells being serviced.

24.07 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head, or leaking oil or gas between the producing string or next larger size casing string when such pressure or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

24.08 Lessee shall test control equipment daily, to the extent possible, without causing premature removal of drill pipe from the hole while drilling, and record the results of such tests daily.

24.09 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

24.10 Drilling mud or salt water of sufficient weight to prevent oil, gas, or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

24.11 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

24.12 Lessee shall use a casing program which complies with oil and gas statutes, and rules and regulations of the Commonwealth, and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies, and blowouts.

24.13 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

24.14 The production casing shall be of new or reconditioned pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(a) The maximum anticipated rock pressure, at any point in the casing string, shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield, as shown in A.P.I. Bulletin 5-C-2, dated April, 1972, or later amendments.

(b) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated, at any point in the casing, does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield, as shown in A.P.I. Bulletin 5-C-2, or later amendments.

24.15 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If, at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After corrective operation, the casing shall again be tested in the same manner.

24.16 All surface casing and production casing shall be cemented in the ground with good quality cement equaling or exceeding A.P.I. specification in the manner hereinafter described.

24.17 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department. Sufficient centralizers shall be attached to the casing to keep it centered in the hole during cementing.

24.18 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In cementing the surface casing, cement of sufficient quantity shall be used to fill the calculated annular space plus twenty percent (20%) back of the casing shoe to the surface. In the event that the cement cannot be circulated to the surface, due to the presence of fractures or other lost circulation zones, Lessee shall determine, as accurately as possible, the depth of the top of the cement in the annular space behind the surface casing and record it on the well record.

24.19 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another, or to the surface, does not occur behind the casing.

24.20 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval by the Department.

24.21 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors, shall not allow the well to blow open, except in case of an emergency, over twenty-four (24) hours after drilling-in. Lessee will pay Department, at the regular royalty rate, for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations, after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

24.22 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Method (USBM Monograph 7) or by other methods standard to the industry and approved by Department.

24.23 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

24.24 Annually or when requested in writing by Department, Lessee will determine the open flow potential of each producing well as required in Section 24.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive, in writing, all or parts of this requirement if, during any calendar year, production averages less than sixty (60) Mcf per day and/or the pressure tests show reservoir pressures to be less than one hundred (100) psi.

24.25 Lessee shall, at all times, conduct prudent drilling operations including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

24.26 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

24.27 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

24.28 In areas where H_2S is known to be present in the formations that are to be drilled, Lessee shall:

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) Make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) After H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) Use special steel pipe and casing which is resistant to H_2S gas stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) Quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) Post warning signs around all well sites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to, and at a safe distance from, all facilities handing the H_2S gas, including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) Install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

24.29 During well drilling and production operations, in order to reduce night lighting pollution in designated dark sky areas, Lessee is required to utilize drilling rigs equipped with fully shielded lighting consistent with Occupational Safety & Health Administration (OSHA) regulations.

24.30 Upon written request by Lessee, Department may waive, in writing, any portion of the above drilling requirements if, in the Department's judgment, such a waiver is justified by new technology or knowledge and/or will be in the best interest of the Commonwealth.

25. WELL RECORDS, LOGS AND REPORTS

25.01 Lessee shall keep a daily drilling record which describes the formations penetrated, and the depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. An accurate well location plat and any other data that are acquired during the drilling and completion operations for each well, including but not limited to those items listed in Section 26.01 (Confidentiality), shall be provided to the Department within ninety (90) days of the data's collection, or upon oral or written request by the Department and within a timeframe specified by the Department. All above-described data shall be submitted in both hard-copy and digital forms. Digital well logs shall be submitted in .LAS format.

25.02 Upon Department's request, samples of all formations penetrated and parts of cores taken, accurately labeled with the API number of the well and depth interval of collection, shall be furnished to Department at Lessee's expense within one (1) year after completion of each well.

25.03 If the Lessee collects rock samples including but not limited to whole rock core, parts of core, and cuttings from any well borehole(s) on the leased premises and no longer plans to retain said samples at its own or contracted storage facility, Lessee must first offer said rock samples to the Department before their disposal or sale. The rock samples shall be accurately labeled with the API number of the well and depth interval of collection. The Department shall make arrangements for the collection and transport of the rock samples at its own expense.

25.04 Upon written request and within a timeframe specified by the Department, Lessee shall provide Department with production and pressure test data, production and pressure decline curves, gas analysis data including BTU value determinations, water and waste disposal records, well stimulation and treatment records, maintenance records and reports, and/or any other data or records for any well(s) which the Department deems necessary to protect its interests.

26. CONFIDENTIALITY

26.01 To the extent of applicable law, Department intends to keep the following well related documents confidential for a period of three years from the date the well is spud:

(a) all drill time logs
(b) all electric well logs
(c) all nuclear well logs
(d) all acoustic or sonic well logs
(e) all caliper or hole diameter measurement logs
(f) all cement bond or integrity logs
(g) all mud or geologic well logs
(h) all dip measurement well logs
(i) all well flow or production test data
(j) all well completion data
(k) all well fracturing and stimulation data
(l) all well pressure tests or pressure data
(m) all record of lost circulation zones and caving strata
(n) all well casing records
(o) all core analysis, mud log analysis
(p) all well perforation records
(q) all lithologic well logs
(r) all written well history
(s) all well cutting samples requested by Department
(t) drill stem tests and charts
(u) formation water analysis
(v) and any other geophysical well data not specifically named.

26.02 To the extent of applicable law, Department intends to keep the following seismic related documents confidential in perpetuity from the date of acquisition, and further acknowledges that the seismic data submitted to the Department are the sole property of the Lessee and considered to be business or trade secrets:

(a) all raw preprocessed data on tapes, discs, or other storage devices
(b) all processed data on tapes, discs, or other storage devices
(c) all paper or reproducible copies of stacked seismic data presentations
(d) all paper or reproducible copies of migrated seismic data presentations
(e) all paper or reproducible copies of relative amplitude seismic data presentations

(f) all paper or reproducible copies of premigrated stacked seismic data presentations
(g) all paper or reproducible copies of depth conversion seismic data presentations
(h) all paper or reproducible copies of amplitude versus offset seismic data presentations
(i) all paper or reproducible copies of any attribute seismic data presentations
(j) all post plot shot point and receiver location maps
(k) all time-depth conversion charts or calculations
(l) all velocity charts and calculations
(m)all sonic/acoustic well charts and data calculated from well logs
(n) all synthetic seismograms
(o) all seismic models for tuning and velocity variation
(p) and all other incidental or miscellaneous seismic related data or presentations.

26.03 To the extent of applicable law, Department intends to keep the following business documents confidential for the life of the lease agreement from the date of acquisition, and further acknowledges that the business documents submitted to the Department are the sole property of the Lessee and considered to be business or trade secrets:

(a) meter charts
(b) all third party statements related to Commonwealth's royalty volumes and payments
(c) all internal account statements of Lessee or third party related to Commonwealth's royalty volumes and payments
(d) all business books of the Lessee or third parties provided to the Commonwealth to substantiate Commonwealth's royalty volumes and payments
(e) all Lessee and third party contracts related to the Commonwealth's royalty volumes and payments
(f) all production agreements between Lessee and third parties related to Commonwealth's royalty volumes and payments
(g) all farmout agreements between Lessee and third parties related to Commonwealth's royalty volumes and payments
(h) all purchase and sale agreements between Lessee and potential purchaser of the leased premises
(i) all agreements providing for areas of mutual interest between Lessee and third parties
(j) and all other business documents and agreements provided to the Commonwealth that Lessee or a third party consider confidential trade secrets.

27. UNITIZATION

27.01 Lessee shall have the right, at any time or times, to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises, or portions thereof, with adjoining lands to prevent the drilling of an excessive number of wells, or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit

agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

27.02 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises, provided that the Lessee is the owner of the off-lease property.

27.03 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area, and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

28. OFFSETS

28.01 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth which is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, any well drilled on lands not owned by the Commonwealth which is completed within one-thousand six-hundred and seventeen (1617') feet (i.e., 60 acres) of the boundary line of the lease premises and from which gas is being produced as the principal product, or any well drilled on lands not owned by the Commonwealth which is completed within the radius of the drainage areas set by an order of the Department of Environmental Protection's Bureau of Oil and Gas Management; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may, at its discretion, relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except:

(a) forty (40) acres around each well from which oil is being produced as the principal product;

(b) three hundred twenty (320) acres around each well from which gas is being produced as the principal product; or

(c) that acreage attributable to a well by an order of the Department of Environmental Protection's Bureau of Oil and Gas Management if the affected acreage falls within an area subject to such a spacing order.

28.02 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on lands not owned by the Commonwealth and, if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression, as long as safety and environmental integrity are maintained.

28.03 In cases where the offset drilling obligations of this section conflict with the drilling restriction provisions of Section 23, then the drilling restriction provisions of Section 23 shall take precedence and prevail unless waived in writing by Department.

29. OIL AND GAS PIPELINES

29.01 No large diameter, high-capacity natural gas transmission pipelines shall be constructed on the leased premises. Any pipeline that exceeds twelve inches (12") in diameter shall be considered a main transmission line for the purpose of this lease, regardless of its intended use.

29.02 Lessee is herewith granted the right to lay any necessary oil or gas gathering pipelines on or under the leased premises; however, a route map for each line shall be submitted, upon request and for approval, to the District Forester as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, Lessee must enter into the customary pipeline right-of-way agreement with Department.

29.03 Lessee does hereby agree that it will, at all times during the continuance and delivery of oil, gas, and liquid hydrocarbons to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

30. GAS STORAGE RIGHTS

30.01 No gas storage rights are demised to the Lessee by this lease.

30.02 If the Lessee wishes to develop the leased premises for gas storage, Lessee must first obtain a Gas Storage Lease from the Department.

30.03 If the Lessee does not wish to develop the leased premises for gas storage, but in the Department's opinion the leased premises exhibit characteristics which indicates its potential for a gas storage reservoir, Department will so inform the Lessee in writing prior to the final plugging and abandonment of the wells and removal of the surface support equipment.

30.04 Any well and equipment identified by Department as necessary for the development of a gas storage facility on the leased premises and which is not planned for development by the Lessee shall first be offered to Department or its nominee or assignee in writing, at the then fair market value of the well and attendant equipment, at least one hundred twenty (120) days before Lessee begins abandonment procedures.

31. SEISMIC SURVEYS

31.01 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit for approval to the District Forester, a map showing the proposed location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to Lessee, Lessee must obtain the customary Seismic Survey Agreement from Department. The performance bond required in Section 16 (Bonding) of this lease shall, hereafter, be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

31.02 A final plat will be submitted to Department within ninety (90) days after completion of any seismic survey showing the location, elevation, and depth of shot holes drilled; and indicating which holes contained ground water, at what depth it occurred, and an estimate of the amount of flow.

31.03 During the term of this lease, a copy of all seismic data gathered or obtained from any seismic survey conducted on the leased premises will be made available to Department for review at any time after a period of one (1) year of the date of completion of each individual seismic survey. The Department may examine the information gathered in the seismic survey at the location where such information is normally maintained and worked by the Lessee during regular business hours. The Department hereby agrees that none of the seismic information examined by the Department's staff will be copied or taken from the Lessee's premises without the express written permission of the Lessee.

31.04 Upon termination of this lease, or earlier with approval of the Lessee, the Lessee shall submit to the Department a copy of all seismic data collected by the Lessee or the Lessee's agent which represents the leased premises, including but not limited to those items specified in Section 26.02 above. The submitted data may be in digital form, hard copy form (paper), or in a reproducible form (film or Mylar), and said data will be the "processed" version of the data. The presentation will include the stacked, migrated, and relative amplitude presentations in time as well as depth, if any or all of these presentations are generated from the processing procedures. Special processing, such as amplitude versus offset or any attribute processing, will be supplied in hard copy form only. All hard copies will be in industry standard format, and the digital copy will be presented in the format available or in a format Department requests, as long as it is an industry standard format. The Lessee will not be required to submit interpreted versions of the seismic data.

31.05 If a seismic survey is begun but not completed, any data collected even though incomplete shall be submitted to the Department within 30 days after the seismic effort has been terminated. If the seismic effort is suspended for more than 90 days, all data collected to the date the effort was suspended shall be submitted to the Department.

31.06 A "post plot" map will accompany both the hard copy and digital versions of the data identified in Sections 31.04 and 31.05 above, wherein the shot points are clearly marked on the map in reference to known landmarks or other reference points so that the location of all shot points can be clearly located. If multiple survey lines are completed during one survey, all lines will be shown on the post plot map in their correct relationship to one another with tie points clearly marked on the map as well as the seismic lines. All post plot maps will be provided at no cost to Department.

31.07 A Data Transmittal Listing is required by Department, to accompany the seismic information identified in Sections 31.04 and 31.05 above which shall be transmitted to Department. Department will acknowledge in writing its receipt of the transmitted information.

32. TEST OF WELL ECONOMY

32.01 For purposes of this lease, if a gas well does not produce more than an average of one (1) Mcf/day of natural gas in a calendar year (calculated by dividing its annual production in Mcf by 365 days), it shall be considered uneconomic (i.e., not in paying quantities) to maintain and operate; and if during the following calendar year gas production from the well also fails to exceed a one (1) Mcf/day average, Lessee shall plug and abandon the well as per Section 33 (Plugging), and restore the wellsite and access road to the satisfaction of District Forester, all no later than six (6) months after the end of said following calendar year.

This provision shall apply to all wells drilled or operated by Lessee on the leased premises, whether the wells are shut-in or producing, unless the Department has informed the Lessee that a well or wells falls under the provisions of Section 30 (Gas Storage Rights).

Department may, at its sole option and in writing, waive all or part of the requirements of this provision to Lessee, if in Department's judgment such a waiver is warranted by economic conditions or other circumstances, and is deemed to be in the best interest of the Commonwealth.

33. PLUGGING

33.01 Lessee shall properly and effectively plug all wells on the leased premises before abandoning, in accordance with the regulations of the Department of Environmental Protection's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth, and in accordance with the DCNR's Standard Well Plugging Procedures as described in **Exhibit "F**," attached hereto and made a part hereof, or provide an alternative plugging method acceptable to the Department before plugging operations commence, to be approved by the Department in writing beforehand. A copy of the Certificate of Well Plugging showing the plugging procedure used and submitted to the Bureau of Oil and Gas Management shall be supplied to the Minerals Section, Bureau of Forestry for each well plugged and abandoned. In addition to the above-mentioned requirement, upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements may be reason for cancellation of this lease, in which case the posted surety would be forfeited to fund the proper plugging of the well or wells by Department.

34. DEPARTMENT'S TERMINATION

34.01 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) calendar days after Lessee's receipt of demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

34.02 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) calendar days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant, and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a Writ of Possession waiving all stay and exemption laws and release of errors.

35. LESSEE'S TERMINATION

35.01 Lessee may, at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

35.02 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 21 (Subsequent Wells). Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation, including but not limited to the plugging and abandonment of wells, which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

36. FORCE MAJEURE

36.01 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance therewith is prevented by, or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If, at the end of the primary term hereof, such term has not been extended by production or drilling, as in this lease provided; and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the

rental provision hereof shall be extended automatically from year to year for a period not to exceed ten (10) additional years, unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises, by reason of any of the above recited causes, this lease shall remain in full force and effect.

37. REMOVAL

37.01 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to plug and abandon all wells; remove all buildings, machinery, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations; to fill and level all pits; and to the extent practicable, to restore the property to the same condition as when received.

38. RIGHTS RESERVED BY DEPARTMENT

38.01 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

38.02 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

38.03 Department reserves the right to approve, in writing, all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises unless, upon due cause shown, Department waives the thirty (30) day requirement and allows a shorter, but reasonable, time for review.

38.04 The surface rights of Department shall be considered dominant and the oil and gas leasehold rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

39. THIRD PARTIES' RIGHTS

39.01 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) has hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature as defined within the lease agreement, Section 26 (Confidentiality).

40. DISPUTE RESOLUTION

40.01 In the event that Lessee wishes to dispute a decision made by Department, the following procedure shall be used to dispute Department's decision:

(a) Department shall fix a time and place for a conference within ten (10) business days from the date of the Department's receipt of the Lessee's written request for a conference.

(b) The conference shall be held within thirty (30) days of the Department's receipt of the Lessee's written request for a conference, unless Department and Lessee agree to an extension of time for the conference.

(c) At such conference, the Director of the Bureau of Forestry or his/her representative shall represent Department.

(d) Department may continue the conference if supplemental data, maps or other information are required to evaluate the basis for Lessee's objections, if further review is needed to ascertain whether a mutually agreed upon settlement is consistent with the terms of the lease agreement, or if all parties to the conference agree that a continuance is beneficial to the resolution of the objection.

(e) Any agreement(s) reached at the conclusion of said conference or follow-up discussions shall be consistent with the provisions of the lease agreement. A record of such agreement(s) shall be documented in writing by the Department, copies of which shall be provided to the Lessee, the appropriate District Forester, and all other parties involved.

41. INTEGRITY PROVISIONS

41.01 Lessee agrees to comply with the CONTRACTOR INTEGRITY PROVISIONS FOR COMMONWEALTH CONTRACTS, attached hereto as **Exhibit "G"**, and made a part hereof.

42. NONDISCRIMINATION CLAUSE

42.01 Lessee agrees to comply with the NONDISCRIMINATION CLAUSE, attached hereto as **Exhibit "H"**, and made a part hereof.

43. RELEASE

43.01 Lessee shall not be granted a final release from the terms of this lease until all records and reports and other data described above have been provided to the Department, all wells required by the Department to be plugged have been plugged and plugging certificates provided, all other terms of this lease have been met, and the District Forester has met with Lessee's field engineer or other authorized representative on the ground, inspected the premises, and both parties have signed a Statement of Release indicating that any necessary site restoration has been completed. Said release shall not be unreasonably withheld by the Department. In the absence of a two-party signed Statement of Release,

the Department shall accept the District Forester's findings based on his/her independent inspection of the leased premises. A copy of the release statement will be provided to the Minerals Section, Bureau of Forestry.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be dully executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

James R. Grace, PhD
Deputy Secretary for Parks & Forestry

ATTEST:

Asst. Secretary/Treasurer (signature) (Seal)

Typed Name: Mark C. Scheuerman
Assistant Secretary

FORTUNA ENERGY, INC.

President/Vice President (signature)

(Typed Name) James F. O'Driscoll
President

Federal Identification No.:

APPROVED AS TO LEGALITY AND FORM:

OFFICE OF ATTORNEY GENERAL

OFFICE OF GENERAL COUNSEL

CHIEF/ASSISTANT COUNSEL
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

COMMONWEALTH OF PENNSYLVANIA,

: ss.

COUNTY OF DAUPHIN :

On this the 30 day of January, 2009 before me, the undersigned officer, personally appeared James R. Grace, Deputy Secretary for Parks and Forestry, Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, known to me to be the person described in the foregoing instrument, and acknowledged that he executed the same in the capacity therein stated and for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Gene F. Odato

Notary Public

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
GENE F. ODATO, Notary Public
City of Harrisburg, Dauphin County
My Commission Expires March 29, 2012

ACKNOWLEDGEMENT

State of New York)
)
County of Chemung) ss.:
)
)

On the 4 day of December in the year 2008 before me, the undersigned, a Notary Public in and for said State, personally appeared Dana F. O'Briecke, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

My commission expires 11-3-11 DEBORAH A. BETZ Notary Public - State of New York No. 01BE6100903 Qualified in Steuben County My Commission Expires 11-3-11

Signature: Deborah A Betz

Commission Number _____

Office: _____

ACKNOWLEDGEMENT OUTSIDE NEW YORK STATE (RPL 309-b)

State of _____)
)
County of _____) ss.:
)
)

On the _____ day of _____ in the year _____ before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

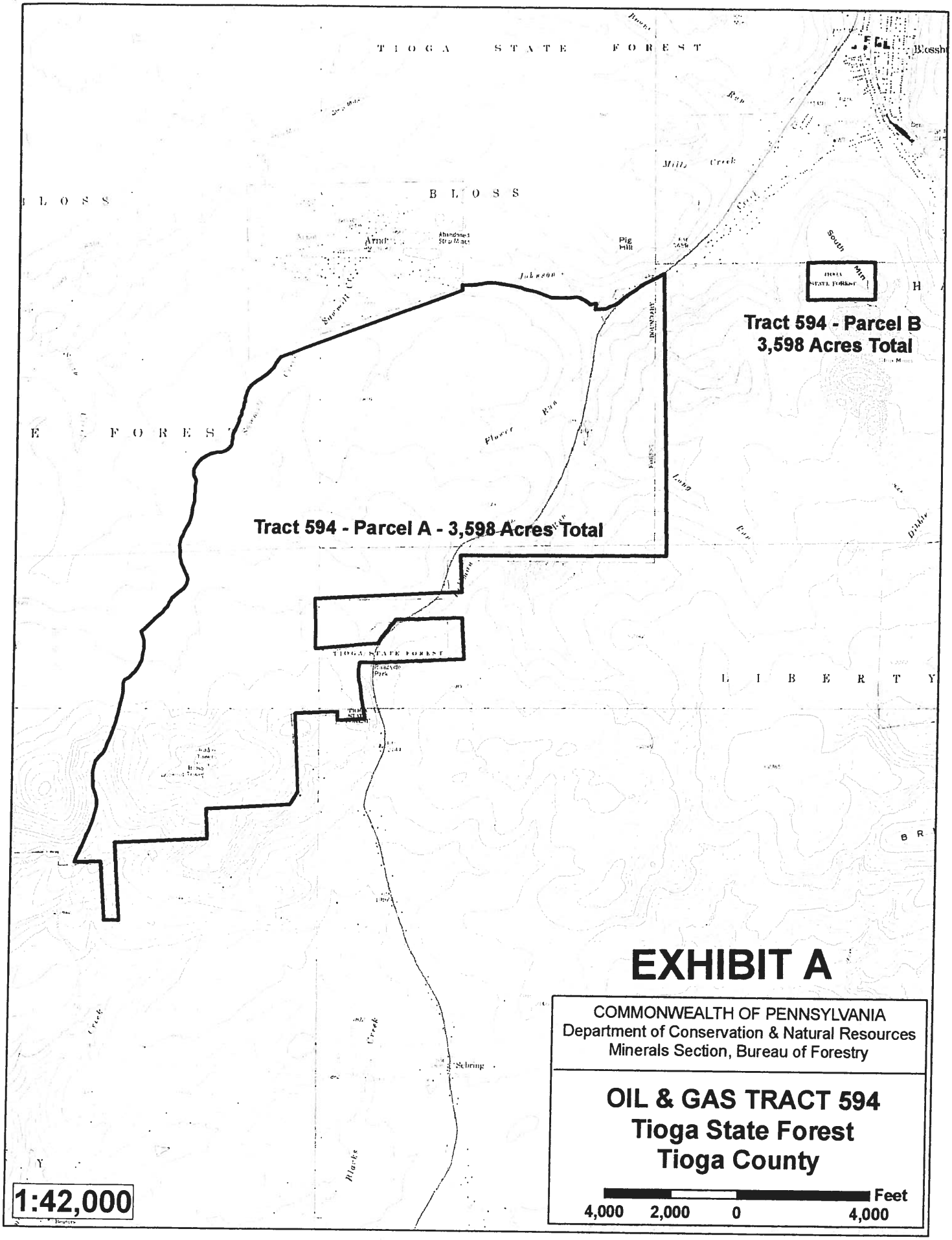
My commission expires _____

Signature: _____

Commission Number _____

Office: _____

* The term "person" means any corporation, joint stock company, estate, general partnership (including any registered limited liability partnership or foreign limited liability partnership), limited liability company (including a professional service limited liability company), foreign limited liability company (including a foreign professional service limited liability company), joint venture, limited partnership, natural person, attorney in fact, real estate investment trust, business trust or other trust, custodian, nominee or any other individual or entity in its own or any representative capacity.



Addendum B
Conversion Site # 17

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION & NATURAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "B"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-ll0594-l6, by and between: COMMONWEALTH OF PENNSYLVANIA and FORTUNA ENERGY, INC.

Tract 594

State Tract 594 containing 3,598 acres of Tioga State Forest land comprising two separate parcels of land, Parcel A containing 3,545 acres in parts of Warrants 1183, 1184, 1868, 5054, 5055 and 5914; and Parcel B containing 53 acres in Warrant 5903, all in Bloss, Liberty and Hamilton Townships, Tioga County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from Northwestern Mining and Exchange Company by deed dated April 15, 1981 (oil, gas and gas storage rights only); and from Blossburg Coal Company by deed dated November 10, 1954 (surface only) and described as follows:

Parcel A

Beginning at a point formed by the intersection of the Tioga State Forest boundary and the centerline of U. S. Route 15 approximately 1.5 miles east of Arnot, Pennsylvania, also being a point on the east line of Warrant 5914, approximately 20,150 feet north 43° east of the Bloss Mountain Firetower; thence in a general south-westerly direction approximately 1,500 feet along the centerline of U. S. Route 15 within Warrant 5914 to a point formed by the junction of the centerlines of U. S. Route 15 and an unnamed road leading west to Arnot; thence in a general westerly direction approximately 5,200 feet along the centerline of the unnamed road within Warrant 5914 to a point on the west line of Warrant 5914, also being a point on the Tioga State Forest boundary; thence southward approximately 100 feet along the Tioga State Forest boundary to a corner point on the Tioga State Forest boundary, also being a point on the west line of Warrant 5914, also being a point on the east line of Warrant 5055; thence southwestward approximately 5,900 feet along the Tioga State Forest boundary within Warrant 5055 to a point on the centerline of an unnamed road; thence in a general south-southwesterly direction approximately 17,200 feet along the centerline of the unnamed road through Warrants 5055, 5054, 1184, and 1183 to a point on the Tioga State Forest boundary, also being a point within Warrant 1183; thence in a general northeasterly direction along the Tioga State Forest boundary through Warrants 1183, approximately 800 feet east, 1,700 feet south, 450 feet east, 2,300 feet north, 2,800 feet east, 900 feet north, 2,600 feet east, 550 feet northeast, 2,200 feet north and 350 feet east to the northeast corner of Warrant 1183, also being a point on the westline of Warrants 1868, also being a point on the Tioga State Forest boundary; thence in a general northeasterly

direction through Warrant 1868 approximately 900 feet east, 300 feet south, 1,200 feet east, 1,850 feet north (along U. S. Route 15), 2,800 feet east, 1,200 feet north, 2,150 feet west, 550 feet southwest, 350 feet south, 1,900 feet west, 1,480 feet north, 4,400 feet east and 1,050 feet north to a point on the east line of Warrant 1868; also being a corner point on the Tioga State Forest boundary, also being the southwest corner of Warrant 5914; thence eastward approximately 6,100 feet along the Tioga State Forest boundary also being the south line of Warrant 5914 to the southeast corner of Warrant 5914, also being a corner point on the Tioga State Forest boundary; thence northward approximately 8,600 feet along the Tioga State Forest boundary which follows the east line of Warrant 5914 to a point formed by the intersection of the Tioga State Forest boundary and the centerline of U. S. Route 15, the place of the beginning.

EXCLUDING from the above described premises a privately owned cemetery lot comprising 1.13 acres more or less, known as the "Swedish Cemetery Lot", as shown on DER Purchase Map #2606, located within Warrant 5055 approximately 735 feet south of the village of Arnot reservation boundary, on the east side of State Route 216, described as follows:

Beginning at a point on the east side of State Route 216, approximately 735 feet south of the village of Arnot reservation boundary, also being the northwest corner of the privately owned cemetery lot; thence clockwise around the boundary of the cemetery lot, approximately 260 feet east, 187 feet south, 261 feet west and 193 feet north to the northwest corner of the cemetery lot, the place of the beginning.

Parcel B

Beginning at a corner point on the Tioga State Forest boundary approximately 6,100 feet south 8° west of the junction of the centerlines of Johnson Creek and the Tioga River at Blossburg, Pennsylvania, also being the northwest corner of Warrant 5903, as shown on DER Purchase Map #2087, also being the southeast corner of Warrant 5982, also being a corner on the north boundary of Warrant 5955, also being the northwest corner of Parcel B which apparently includes all of the rectangular Warrant 5903; thence in a clockwise direction around the boundary of the parcel, 2,046 feet east, 1,122 feet south, 2,046 feet west and 1,122 feet north to the northwest corner of the Parcel B, the place of the beginning.

NON-DEVELOPMENT AREA

No surface disturbance or development of any nature shall be allowed within the 590 acres more or less delineated as *Non-Development Area* and shown on Exhibit "I"

AREAS OF SPECIAL CONSIDERATION

Tract 594 contains approximately 95 acres more or less of special ecological features as shown on Exhibit "I". Lessee is required to carefully coordinate and pre-plan all exploration and development activities within these areas with District Forester and

Ecological Services to prevent the unnecessary destruction of species, habitat, or a combination thereof. Additionally, due to the changing nature of the Department's environmental databases, such as the Pennsylvania Natural Heritage Program (PNHP), Lessee should check with District Forester before any construction project initiated to avoid potential conflicts as these areas are subject to change without notice.

Tract 594 contains approximately 2,810 acres more or less of high value standing timber as shown on Exhibit "I". Lessee is required to carefully coordinate and pre-plan all exploration and development activities within these areas with District Forester to prevent unnecessary harvesting of high value timber wherever possible.

WELL SITES

Fourteen (14) well pad sites will be permitted on Tract 594. Well pad site size and location are subject to the terms of the lease agreement and the approval of the District Forester.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

EXHIBIT "C"

STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS

The lands embraced in this lease are leased by the Commonwealth of Pennsylvania, acting through the Department of Conservation and Natural Resources, hereinafter designated as "Lessor" or "Department." Lessee hereby agrees to the following stipulations:

1. Environmental Quality Control

1.01 Lessee shall take all necessary precautions and measures throughout the entire course of this lease to ensure strict compliance with all applicable Federal, state, and local laws and rules and regulations promulgated thereunder, whenever enacted, including but not limited to the following state statutes: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119,35 P.S. 4001, *et seq.*); the Clean Streams Law, as amended (Act of June 22, 1937, P.L. 1987, 35 P .S. 691.1, *et seq.*); the Solid Waste Management Act, as amended (Act of July 7,1980, P.L. 380, No.97, 35 P.S. 6018.101, *et seq.);* the Oil and Gas Act, as amended (Act of December 19, 1984, P.L. 1140, No. 223, 58 P.S. 601.101 *et seq.);* and the Surface Mining Conservation and Reclamation Act, as amended (Act of May 31, 1945, P.L. 1198, 52 P.S. 1396.1 *et seq.).*

Lessee shall strictly adhere to all rules, regulations and requirements governing the withdrawal and use of surface and ground waters as administered by the Department of Environmental Protection, the Susquehanna River Basin Commission, the Delaware River Basin Commission, or any other river basin commission having designated jurisdiction of the waters of the Commonwealth [including, but not limited to the Water Resources Planning Act of 2002 (Act 220), 25 Pa Code Chapter 110; SRBC, 18 CFR Ch. VIII § 806.20 - § 806.25]

1.02 Notwithstanding any provision in this lease, Lessee shall be held liable by the Commonwealth of Pennsylvania, or any agency of the Commonwealth, for the violation of any relevant laws, rules, and regulations.

1.03 Before any surface or subsurface disturbance, Lessee shall acquaint itself with all of the applicable rules and regulations governed by each respective Act.

1.04 Prior to undertaking actual mining, drilling, or quarrying, Lessee shall confirm, in writing, to Lessor that it has reviewed and thoroughly understands the applicable requirements as contained in each of the aforementioned Acts.

1.05 During mining, drilling, or quarrying, Lessee shall comply with all of the current applicable rules and regulations of the foregoing Acts. Where any of the rules and regulations differ concerning abatement of pollution the more stringent rules shall apply.

1.06 Lessee shall, at all times, perform its work in such a manner as to substantially minimize the possibility of polluting the air land or waters of the Commonwealth with any materials harmful to the environment.

1.07 As development of the leased premises progresses and unforeseen circumstances arise that were not evident during the design, emergency pollution control programs shall be put into effect immediately by the Lessee. In such cases further instructions will be issued by Lessor and will be carried out by Lessee.

1.08 The Air Pollution Control Act of the Commonwealth prohibits the burning of any refuse, rubbish, brush, etc. in the designated air basins of the state, except by approval of the Department of Environmental Protection's respective Regional Air Pollution Control Engineer. Other emissions into the atmosphere are not permitted if they are injurious or hazardous to people, animals, or vegetation.

1.09 Lessee shall strictly adhere to all rules and regulations for collection, removal, transportation, and disposal of solid wastes. Littering of the leased premises will not be permitted.

1.10 The discharge of wastes to streams within the Commonwealth will not be permitted unless such discharges meet the standards of the Department of Environmental Protection.

2. Protection of Property and Operations

2.01 Lessee shall not use or allow to be used the State Forest lands for any other purpose than that authorized by this lease. District Forester will be advised when operations begin and end. Any changes in the original plans, which may be necessary subsequent to the beginning of operations, must be approved by District Forester and Lessor.

2.02 Permission to remove overburden must first be obtained from District Forester who will designate the extent of such removal.

2.03 Lessee shall not conduct any mining, quarrying, excavating, drilling, or stripping operations within sight of publicly traveled roads, unless specifically directed to by District Forester.

3. Public Land Use

3.01 Lessee hereby recognizes and admits that the leased premises are dedicated to the purposes set forth in Environmental, Health, Park, Fish and Game Laws, and Rules and Regulations and Department's Forest Resource Plans promulgated thereunder and Lessee agrees to conduct operations with deference to such purposes.

4. Hunting and Fishing

4.01 Employees of Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not engage in hunting or fishing upon said land, except as permitted by law.

5. Animals

5.01 Lessee shall prevent access of wildlife to pits or excavations dug for Lessee's operations by erecting and maintaining fences, or by other means approved by Department.

6. Slush Pit

6.01 Each slush pit will consist of two compartments; one to contain fluids from the drilling operations and the second to contain surface runoff from the drilling site. Unless authorized by Department, all slush pits will be located at approximately the same elevation as the drilling site.

Depending on the topography and slope conditions, the slush pit to contain surface runoff may be located below the drilling site and a safe and reasonable distance from the stream to which the effluent will be discharged. The slush pit used to contain drilling fluids, mud, and water, will be lined with plastic so that no escape of these fluids will occur. If said fluids contain oil or other chemical substances which are harmful to the forest environment, Lessee shall transport these fluids from State Forest lands for disposal. All waste materials from each drilling site will be disposed of at an approved disposal site. All pits shall be filled with earth and leveled at Lessee's expense upon completion of each well. However, nothing in this paragraph shall be construed to permit a violation of any laws, rules and regulations of the Commonwealth.

6.02 Before any operations commence, the location, design, construction, and maintenance of any slush pit must be approved by Department. Pollution potential and aesthetics shall be among the factors to be considered by Lessor.

6.03 If drilling operations are conducted with air, gas, or airfoam, Lessee shall also provide sufficient means by which dust and/or foam dispersal are abated, kept to a minimum, and shall not become a nuisance.

7. **Siltation**

7.01 Lessee agrees to have on site an approved site-specific Erosion and Sedimentation Control Plan in accordance with the Department of Environmental Protection's Rules and Regulations, Title 25, Chapter 102. Lessee realizes that, as a result of its operation, large areas of land which will be cleared to provide for compressor stations, pipeline rights-of-way, and drilling sites, and which will be exposed to the forces of erosion for varying periods of time could create siltation to nearby streams. Lessee agrees, therefore, to regrade such areas immediately and reseed to either temporary or permanent grasses. Any other type of remedial work necessary to prevent erosion on such areas shall be performed by Lessee.

7.02 Lessee shall, upon initial construction of all drilling sites, restore all highwalls and reseed said highwalls and down slope embankment of each drilling site immediately. Department's representative shall be consulted for final design and approval of each drilling site prior to final restoration.

7.03 Lessee's contractors and subcontractors shall not construct earthen dams across any stream to obtain a water supply for its operations unless approved by Department.

7.04 Lessee shall, on pipeline rights-of-way and access roads, construct water bars or similar diversion channels to carry surface runoff away from the rights-of-way and roads to prevent siltation. During construction, if excess siltation is expected, Lessee shall construct a settling basin at the base of the right-of-way or road to impound runoff and allow sediment to settle prior to discharge into nearby streams.

7.05 Lessee shall construct all access roads to all drilling sites along existing pipeline rights-of-way, where applicable, which are built to service the drilling site, provided that a ten percent (10%) grade can be maintained. All road locations and grades must be approved by District Forester as provided hereunder. All roads will be maintained in a passable condition as per Exhibit E (Access Road Specifications) unless modified by District Forester.

7.06 Lessee shall be responsible for the performance of maintenance of all erosion and sedimentation control facilities and devices.

8. Waters

8.01 Without prior approval of Department, Lessee shall not locate any bore or core hole or any part of rig or slush pit within one hundred (100) feet, or more if required by District Forester, of any stream or body of water on State Forest lands, and hereby agrees to prevent the contamination or pollution of springs, brooks, streams, or other waters on these lands in any manner whatsoever.

8.02 Where construction, operation, or maintenance of any of the facilities on or connected with this lease causes damage to the watershed or pollution of the water resources, Lessee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by an authorized representative of Department and to pay for any and all damage or destruction of property, fish, and wildlife resulting from operations under this lease.

8.03 The cost of said property, wildlife, or fish destroyed shall be determined by Department, Pennsylvania Game Commission, or Pennsylvania Fish and Boat Commission using recognized procedures to establish the value of damage.

9. Forest Growth

9.01 Lessee shall not cut, injure, destroy, or remove any forest growth, except that which shall be absolutely unavoidable in conducting its operations and shall obtain proper approval of District Forester ninety (90) days before removal is to be commenced. The full ninety (90) days prior notice may be reduced upon the discretion of District Forester.

9.02 Lessee, under the direction of Department, shall dispose of all tree tops, limbs, brush, slash, and any other forest growth not to be sold or utilized by Department or Lessee which have resulted from clearing operations from strip mine sites, well sites, access roads, pipeline rights-of-way, and other construction sites, according to a plan approved by District Forester.

9.03 Lessee shall dispose of all tree stumps and large rocks resulting from its clearing and construction operations using a plan approved by District Forester.

9.04 Lessee shall pay Department for all forest growth cut or injured on State Forest land as a result of Lessee's operations, regardless of the ownership of the oil, gas, mineral, or surface support rights. Even though Department has been paid for the damage by Lessee, the title to all forest growth will still belong to the Commonwealth, except as provided in Paragraph 9.06. Damage is defined as the cutting or injuring of the forest growth by clearing a site so that personnel and equipment can be brought onto the location to establish a base from which Lessee can undertake its operation.

9.05 Prior to the clearing of the forest growth by Lessee, District Forester will mark and/or designate the area from which forest growth will be removed. The value of the forest growth that will be cut or damaged for the clearing of a road, drilling site, or area to be mined, will be determined by Department based upon timber type, size, and market data, or upon replacement value, for young stands or plantations. Lessee shall then be invoiced for the value as determined by Department. Payment to Department of said invoice must be made before any forest growth may be cut or damaged.

9.06 Lessee shall pay for the forest growth damage at two (2) times its value, as determined by Department; the forest growth shall then become Lessee's property, which then must be removed and sold by Lessee as job requirements dictate. Ownership of the forest growth, not removed and sold by Lessee under this subsection, shall revert to Department six (6) months after invoicing unless modified in writing by District Forester. The minimum forest growth damage charge shall be FIVE THOUSAND DOLLARS ($5,000.00) per acre or as determined above whichever is greater.

9.07 Lessee shall, at direction of District Forester and at its own expense, secure, plant and maintain grasses and/or trees or shrub seedlings and/or game foods on all strip mine sites, well sites, access roads, pipeline rights-of-way and other cleared areas using a plan approved by District Forester. Timing shall be determined by District Forester. Revegetation should be periodically maintained (i.e., liming or fertilizing).

9.08 Lessee shall make full compensation to Department at three (3) times the value of such forest growth cut, injured, destroyed, or removed, to be computed by Department, should additional damage result at any time from the work incident to this lease or the construction, operation, maintenance, or removal of facilities not herein contemplated or specifically mentioned, but which may occur as a result of said work or facilities, or should any forest growth be cut, injured, destroyed or removed prior to payment thereof under Paragraph 9.05 hereof, or due to negligence or unauthorized activities.

10. Fire

10.01 Lessee's employees, agents, contractors, and subcontractors, and employees of contractors and subcontractors shall do everything within their power to prevent or suppress forest fires and shall not allow fires to be set on or adjacent to State Forest lands by Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors, except in pursuance to and in accordance with the conditions prescribed in the permission first obtained from District Forester fixing the time, place, and manner of burning. The burning of refuse, brush, slash, debris, or other materials, shall be conducted as approved by District Forester, and shall be so conducted that no living forest growth is damaged or killed.

10.02 Should any fire set by Lessee or any of the persons mentioned above escape in any manner or damage any State Forest land or other property, Lessee shall be liable for all such damages resulting from such escape and for all costs incurred by Department in fighting such fires; and Lessee's officers, agents, and employees in the vicinity, as well as contractors and subcontractors, shall with such assistance as Lessee may have at hand, or be able to summon, render aid in fighting said fire without cost to the Commonwealth.

10.03 Lessee further agrees that during periods of abnormal forest fire danger, District Forester may suspend all or part of the drilling, or other operations on all or part of the State Forest lands until the forest fire danger subsides.

10.04 Lessee, or its employees, shall report promptly all forest fires detected by them to District Forester.

11. Replacement and Repair of Improvements

11.01 Lessee shall replace or repair, as Department may direct, all State Forest signs, markers, corners, fences, other structures, and service utility lines owned or used by Department, which cross or otherwise lie within the State Forest lands destroyed or damaged in any work incident to this lease.

12. Roads, Quarry, and Drilling Sites

12.01 Before drilling sites and access roads are constructed, Lessee shall obtain the District Forester's approval of its plans for such activities. Any roads built at the expense of Lessee in its operations shall not be removed or destroyed and shall become a part of the road system of the State Forest lands, unless otherwise directed by District Forester.

12.02 Lessee recognizes that all roads and trails owned or maintained by Department, which are used in the execution of this lease, were constructed and improved for the use of Department and for the general public having business in and making use of State Forest land. Lessee, therefore, agrees that its operations will not be conducted in such a manner as to prevent, hinder, or obstruct the customary use of such roads and trails by Department or by the public.

12.03 Where roads built by Lessee cross any fence, Lessee shall construct a gate and keep it closed except when the passageway is in use. Lessee shall keep all said roads and trails free at all times from obstruction by logs, brush, or debris resulting from Lessee's operation. District Forester may require Lessee to temporarily discontinue the use of said roads whenever, in his opinion, such action is necessary to prevent their serious damage.

12.04 Upon termination of this lease, Lessee shall repair said roads and trails and leave them in as good condition as at the beginning of this lease of which condition Department shall be the sole judge. In addition, Lessee shall make any repairs to said roads and trails deemed necessary by District Forester to insure adequate and proper drainage, road surface conditions, horizontal alignment, and cross slope.

12.05 Lessee, in its operations, is hereby granted the right to use all State Forest roads, both on or off the leased premises, provided that Lessee agrees to obtain prior written approval from District Forester and to repair any damage to all State Forest roads, on or off the leased premises, when such damage is caused by Lessee's operations; provided, however, if in the opinion of the District Forester in charge, the roads or portions thereof are used by others sufficiently to warrant the apportionment of the maintenance costs, then Lessee may be relieved of the burden of sole maintenance and be required to provide only Lessee's proportionate share as decided by Department through District Forester.

12.06 It is understood that the bond required, under the terms of this lease, shall cover the use and repair of all State Forest roads, bridges and culverts on and off the leased premises utilized by Lessee in conduct of operations under this lease.

12.07 Lessee recognizes the rights and privileges afforded to Grantees by rights-of-way and other agreements executed with Department, prior to this lease, which cross or otherwise lie within the area of this lease; and, therefore, agrees to relocate at Lessee's own expense, all portions adversely affected by work incident to this lease in accordance with the then current rules and orders of the Public Utility Commission of the Commonwealth of Pennsylvania. In the event the Public Utility Commission does not have any jurisdiction, any necessary relocation shall be completed subject to the approval of Grantor.

13. Buildings

13.01 Lessee shall not drill any bore or core hole, carry on operations, make excavations, or otherwise disturb the surface of the lands within two hundred (200) feet of any building. However, if a lesser distance to any building is needed, written approval must be obtained from District Forester.

13.02 Lessee shall consult with District Forester and obtain written approval prior to the construction and erection of any storage facilities, buildings, work sheds, or any other physical structure upon State Forest lands.

14. Appearance

14.01 Lessee shall, at all times, maintain State Forest lands in a neat and presentable manner, removing all rubbish and debris as it accumulates and restoring each individual area or facility within thirty (30) days to as near as possible its original condition as directed by District Forester.

15. Explosives

15.01 Lessee shall not use explosives at any time or in any manner unless approved by District Forester.

16. Restoration and Revegetation

16.01 Restoration and revegetation shall be accomplished in accordance with Lessee's reclamation revegetation plan as approved in advance by District Forester in advance.

17. Water Wells

17.01 Department must approve, in writing, any plan by Lessee, including drilling specifications, for the drilling and development of water wells on state lands.

17.02 A final plat will be submitted within thirty (30) days after completion of each water well showing exact location, elevation, depth of well, lithology penetrated and thickness of discrete lithologic units, depth to water-bearing horizons, estimates of flow rates, results of draw down tests, and results of chemical and bacteriological analyses if such tests are conducted by Lessee.

17.03 Lessee further agrees to supply Department with any other records, driller's logs, memoranda, accounts, reports, cuttings, cores, or other information relative to the drilling, completion, or operation of water wells on the above-described premises. This will include true copies of any electrical or radioactivity surveys made in the wells.

17.04 Lessee shall be familiar with and comply in every respect with the provisions now existing or hereafter enacted of the Water Well Drillers License Act 6 10 of May 29, 1956 (P.L. 1840), providing for the orderly development of the ground water resources of the Commonwealth of Pennsylvania.

17.05 Department reserves the right to use water from wells drilled by Lessee on State Forest land provided such use does not interfere with Lessee's operations.

17.06 Lessee shall contact the District Forester before plugging any water well. Water wells must be plugged from bottom to top with clay, cement, or other impervious materials approved by Department. Any water wells that are of no further use in Lessee's operations, but are deemed viable for Bureau of Forestry uses, may be acquired by Department at its request, at no cost to Department. Lessee, upon relinquishing rights to said water wells, in writing, and upon acceptance of said wells by Department, shall be relieved of any and all plugging responsibility.

18. Pipelines

18.01 Lessee shall refill to contour all ditches or other excavations caused by the construction, operation, and maintenance, or removal of pipelines; construct cross ditches; lime, fertilize, and seed or replant the right-of-way; keep the pipeline and right-of-way in good repair and appearance, and take such other measures as may be deemed necessary by Department to control erosion and sedimentation and to maintain or restore the natural and aesthetic values as directed by Department.

19. Rare and Endandangered Species

19.01 The Pennsylvania Natural Diversity Index (PNDI) shall be searched prior to any earth disturbance to determine possible presence of rare and endangered flora and fauna species of concern.

19.02 If in the course of its operations, Lessee encounters any fauna or flora listed on Federal or state registers of threatened or endangered species, or habitat critical to their survival, Lessee shall immediately cease operations and contact the District Forester so that arrangements can be made with Bureau of Forestry specialists to field check the site to make all necessary preparations to protect and preserve the fauna and flora which may be endangered.

20. Historical and Archaeological Sites

20.01 If in the course of its operations, Lessee encounters any historical or archaeological sites, Lessee shall immediately cease operations and contact the District Forester so that arrangements can be made with Pennsylvania Historical and Museum Commission specialists to field check the site to make all necessary preparations to protect and preserve the artifacts which may be endangered.

21. Contacts with State Agencies

21.01 Lessee shall periodically contact the following state agencies or their successors to keep informed on up-to-date information, policies, rules, and regulations applicable to this lease:

STATE AGENCY	AGENCY'S JURISDICTION ON LEASED PREMISES
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES	
• Bureau of Forestry Minerals Section P.O. Box 8552 Harrisburg, PA 17105-8552 Phone #: 717-787-4835 FAX: 717-783-5109	Leasing programs, terms, policies, and geophysical regulations for state-owned land and waters. Rare and endangered species, road use, right-of-way, and seismic agreements.
Forest District Name & District Number District Forester Name	Site restoration and revegetation, timber damages, location of well sites, rights-of-way, roads, **notification of wild fires**, etc.
#12 TIADAGHTON Jeffery S. Prowant 423 East Central Avenue S. Williamsport, PA 17702-7425 570-327-3450 FAX: 570-327-3444	Clinton, Lycoming, Tioga and Union Counties
#16 TIOGA Roy A. Siefert One Nessmuk Lane Wellsboro, PA 16901 570-724-2868 FAX: 570-724-6575	Tioga, Bradford and Lycoming Counties
#20 LOYALSOCK Richard A. Glinski 274 Arbutus Park Road Bloomsburg, PA 17815 570-387-4255868 FAX: 570-387-4298	Bradford, Sullivan and LycomingCounties
• Bureau of State Parks Division of Resources Management P.O. Box 8551 Harrisburg, PA 17105-8551 717-787-6674	State Park management policies.
• Bureau of Topographic and Geologic Survey Subsurface Geology Section 400 Waterfront Drive Pittsburgh, PA 15222-4745 412-442-4230	Instructions for delivery of well cuttings and core samples, if requested.

DEPARTMENT OF ENVIRONMENTAL PROTECTION	
• Bureau of Oil and Gas Management Northwest Regional Office 230 Chestnut Street Meadville, PA 16335-3481 814-332-6860 FAX: 814-332-6121	Oil and gas laws, regulations, and enforcement (drilling permits, plugging, etc.), contacts with oil and gas program inspectors for northern counties in PA, including Lycoming and Tioga Counties.
• Bureau of Mining and Reclamation P.O. Box 8461 Harrisburg, PA 17105-8461 717-787-5103	Regulations and enforcement related to coal and non-coal mining operations, including but not limited to blasting, drilling, water discharges, etc.
• Bureau of Land Recycling & Waste Management P.O. Box 8471 Harrisburg, PA 17105-8471 717-783-7816	Disposal and handling of municipal, residual and hazardous wastes; remediation of contaminated soil and water.
• Bureau of Air Quality P.O. Box 8468 Harrisburg, PA 17105-8468 717-787-9702	Blowing gas wells and air drilling, burning of waste materials, trash, emissions, etc.
• DEP Northcentral Regional Office 208 West Third Street, Suite 101 Williamsport, PA 17701 **570-327-3636 (24 hour emergency phone)** **1-800-541-2050 (24 hour emergency phone)**	Notification of spills or accidental releases of regulated substances to soil, surface water or ground water from storage tanks, slush pits, pipeline leaks, blowouts, etc.
• Bureau of Watershed Management Division of Waterways, Wetlands and Stormwater Mgmt. P.O. Box 8555 Harrisburg, PA 17105-8775 717-772-5986	Locating structures or pipelines in streams, rivers, and lakes (i.e., stream encroachment), certain erosion and sedimentation plans.
• Bureau of Waterways Engineering Division of Dam Safety P.O. Box 8554 Harrisburg, PA 17105-8775 717-772-5951	Impoundment of streams for water supplies.

TIOGA COUNTY CONSERVATION DISTRICT	
Director 50 Plaza Lane Wellsboro, PA 16901 570-724-1801	Erosion and Sedimentation Control Plans and issues for projects located in Tioga County.
LYCOMING COUNTY CONSERVATION DISTRICT	
Director 542 County Farm Road Suite 202 Montoursville, PA 17754 570-433-3003	Erosion and Sedimentation Control Plans and issues for projects located in Lycoming County.
SUSQUEHANNA RIVER BASIN COMMISSION	
Executive Director 1721 North Front Street Harrisburg, PA 17102 717-238-0423	Conservation, utilization, allocation, development and management of water resources within the Susquehanna River Basin, including Tioga and Lycoming Counties.

PENNSYLVANIA FISH AND BOAT COMMISSION	
Executive Director P.O. Box 67000 Harrisburg, PA 17106-7000 717-705-7801	Regulation for the protection of fish life and snakes.
PENNSYLVANIA GAME COMMISSION	
Bureau of Land Management 2001 Elmerton Avenue Harrisburg, PA 17110-9797 717-787-4250	Regulations for protection of wildlife, oil and gas leasing on PA State Game Commission lands.
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION	
Executive Director State Museum Building 300 North Street Harrisburg, PA 17120 717-787-3362	Protection and documentation of historical and archaeological sites.

LYCOMING COUNTY EMERGENCY MANAGEMENT	
570-433-3166 (24 hour emergeny phone)	**Wildfire notification**, other emergencies.
TIOGA COUNTY EMERGENCY MANAGEMENT	
570-724-4666 (24 hour emergency phone)	**Wildfire notification**, other emergencies.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

EXHIBIT "D"

INVASIVE PLANTS AND REVEGETATION GUIDELINES FOR STATE FOREST LANDS

1. Pre-construction Inventory and Mapping

1.1 Lessee may elect to perform a pre-construction inventory of invasive plants present on the portion of the leased premises where construction is planned to determine appropriate prevention methods, predict control needs, and assess its level of responsibility for management of invasive species and populations. The inventory objective is to locate established invasive plant species populations.

1.2 If Lessee elects to undertake an inventory as described in Section 1.1, all areas which may be disturbed by the planned construction activity should be inventoried for the plant species listed in *DCNR's Invasive Plants* brochure during the growing season from May through September by a qualified botanist.

1.3 Inventory data should be collected from the entire area of the planned construction on state forest land and any buffer areas that may be appropriate, in grid cells no greater than 150' x 150' in size. The established grid should be digitized into a GIS layer and printed on maps that will be used for field data accumulation. Standard information including date, surveyor name, and grid cell number should always be recorded prior to beginning the actual survey. During the field study the center of each grid cell should be located using GPS, and an inventory created by noting the presence of any invasive plant species or the complete absence of any invasive species within the specified grid cell and a note of the dominant species per plant type (e.g., herbaceous, shrub, tree) should be recorded. For each invasive species occurrence, the cover class within each grid cell should be recorded as trace, low, moderate, or high, according to the *Montana Noxious Weed Survey and Mapping System.* All trace and low occurrence locations should be located by GPS to aid in relocation and treatment. For each invasive species in each grid cell, the average growth stage should be recorded as seedling, bolt, bud, flower, seed set, or mature, according to the *Montana Noxious Weed Survey and Mapping System.*

1.4 If Lessee elects to forego the above described pre-construction survey for invasive species, Lessee shall be responsible for all occurrences of post-construction infestations of invasive species that may be found in the construction area regardless of origin or amount and will be required to perform management and control activity as described in Section 3 below.

2. Prevention

2.1 Where no invasive plants are detected, Lessee should use only PA Department of Agriculture certified seed and weed free soil, dirt, and mulch whenever feasible. If materials certified as weed free cannot readily be obtained, the source of materials being used shall be inspected for invasive plants during the growing season by a qualified botanist and used only if deemed weed-free.

2.2 Mulching with straw rather than hay is recommended to reduce the possibility of introducing invasive species propagules.

2.3 Where heavy infestations of Japanese stiltgrass (*Microstegium vimineum*) are detected during pre-construction surveys, a seed mix of Autumn bentgrass (*Agrostis perrenans*) and deer tongue (*Dichanthelium clandestinum*) should be planted as aggressive competition against the seed-banked invasive Japanese stiltgrass. Seeding specifications will be provided by the District Forester. As an alternative, application of herbicide to large patches of Japanese stiltgrass during the summer with a 2% glyphosate solution in water mixed with surfactant may be utilized at the direction of the District Forester.

2.4 Lessee at its option may, prior to bringing equipment into un-invaded areas or onto state forest land, clean its equipment in an appropriate manner (see http://www.fs.fed.us/eng/pubs/pdf/05511203.pdf) to remove plant parts such as rhizomes and seeds that might be carried on tires and the equipment undercarriage, which may help prevent the spread of invasive species onto adjacent lands.

2.5 Pre-treatment of identified invasive species infestations of herbaceous species or species that reproduce prolifically from rhizome/root segments with herbicides prior to construction may be performed at the direction of the District Forester.

3. Management

3.1 Management and control of established invasive plant populations shall be planned on a species by species basis to determine the best method of control. Lessee and its consultant shall submit a "Management and Control Plan" to District Forester no fewer than three (3) months after the conclusion of all construction activity.

3.2 Lessee shall include a post-construction invasive survey report with the same survey parameters as described in Section 1 above, in the Management and Control Plan. The District Forester and Ecological Services Section will assist Lessee in the development of appropriate management methods by species and/or invasive occurrence.

3.3 Post-construction invasive species surveys along access roads shall be limited to areas where gravel was placed or the existing road was widened for Lessee use. After a period of two growing seasons, any new invasive populations will be assumed to be the result of sources other than the Lessee's construction materials and equipment. Control and monitoring of invasive species found along access roads within two growing seasons post-construction will continue until populations are eradicated.

3.4 Lessee and the Bureau of Forestry will coordinate with the other jurisdictional agencies about species of special concern and the potential impacts invasive species management activity may produce.

4. Monitoring

4.1 Lessee shall make provisions to monitor for invasive species within the area(s) disturbed by the construction activity for a period of five (5) years following construction or until invasive species are not observed on-site for two consecutive years, whichever is longer.

4.2 Lessee shall perform an annual survey for the presence of invasive species within the construction area, as described in 4.1 above, following major construction. The annual survey should follow the same methods as the pre-construction survey method described in Section 1. The only exception to the method described in Section 1 is the grid cell boundaries only need to be checked occasionally with the GPS to ensure that monitoring alignment is consistent with the original inventory alignment.

5. Reporting

5.1 The results of all Lessee annual invasive surveys shall be summarized into a report, which shall include the following elements: methods, a summary of invasive species detected, abundance of each species, number of new populations per species, number of eradicated populations by species, and management recommendations for management and control. Report and raw electronic observation data shall be submitted to District Forester and Ecological Services within 60 days following completion of the report. Submission of any electronic data should occur simultaneously with the written report submission. Data recording and management should be consistent year-to-year so data can easily be compared by grid cell number. The Department reserves the right to audit the findings of the Lessee's reports and as a result of any audit, Department may require alternate methods of management and control.

5.2 Department may publish reports, raw data, or articles summarizing invasive species management and monitoring efforts from time to time. Lessee will be consulted prior to publication of any reports or raw data for comment.

6. Revegetation Plan Guidelines

6.1 Lessee shall utilize a native grass and herb mix for cover and stabilization within the disturbed construction areas. The required seed mix will provide for immediate stabilization and reduce the chance of invasive species establishment. Lessee shall provide for a cover crop to be mixed in with the native grass and herb mix. The cover crop will be either oats or barley if the seeding takes place in the spring or wheat or rye if the seeding takes place in the fall. The cover crop seed mix may be applied at the same time as the native grass and herb mix described below. Hydro-seeding of all seed mixes is acceptable. The cover crop should be applied at 30 lbs/acre. The detail components of the native grass and herb mix are listed below:

Native Grass and Herb Mix
20% Little Bluestem PA ecotype (Andropogon scorparius)
10% Big Bluestem variety "Niagara" (Andropogon gerardii) (genetic origin is NY)
15% Virginia Wild Rye PA ecotype (Elymus virginicus)
10% Indiangrass PA ecotype (Sorghastrum nutans)
10% Deertongue variety "Tioga" (Panicum clandestinum)
5% Swithchgrass variety "Shelter" (panicum virgatum) (genetic origin is WV)
5% Partridge Pea PA ecotype (Chamaecrista fasciculate)
3% Showy Tick Trefoil PA ecotype (Desmodium canadense)
5% Ox-eye sunflower PA ecotype (Heliopsis helianthoides)
2% Autumn bentgrass PA ecotype (Agrostis perennans)
2% Woolgrass PA ecotype (Scirpus cyperinus)
3% Soft Rush PA ecotype (Juncus effuses)
5% Pennsylvania smartweed PA ecotype (Polygonum pensylvanicum)
5% Common Milkweed PA ecotype (Asclepias syriaca)

6.2 The recommended seeding rate for the native grass and herb mix is 15.0 lb/acre. No lime or fertilizer is needed for the Native Grass and Herb Mix. Topsoil should be utilized when possible. Seeding may be accomplished by the broadcast, hydro seeding or drill seeding methods. The Native Grass and Herb mix will be mulched with 1.5 ton/acre of straw mulch.

6.3 The Bureau of Forestry has the right to change the components of the Native Grass and Herb Mix as needed to reflect species that may be more appropriate to the region or habitat that is being altered.

6.4 The use of conifers and shrub plantings for revegetation of well pad sites will be used if determined appropriate by the District Forester. As directed by the District Forester, the disturbed work area will be revegetated with conifers and pockets of shrubs where topography allows. The conifer species include white pine (*Pinus strobus*), Pitch pine (*Pinus rigida*), Virginia Pine (*Pinus virginiana*) (south of route 80) and Red Pine (*Pinus resinosa*) (north of route 80). Pockets of shrubs should be planted

approximately every 100 feet. These pockets of shrub plantings will comprise approximately 200 square feet (10' X 20'). Each pocket will be planted with 10 -15 shrubs using seedlings. Seedlings to be planted include any mix of staghorn sumac (*Rhus typhina*), smooth sumac (*Rhus glabra*), red and black chokeberry (*Aronia arbutifolia* and *A. melanocarpa*), New Jersey tea (*Ceanothus americanus*), flowering dogwood (*Cornus florida*), Virginia creeper (*Parthenocissus quinquefolia*), blackberry (*Rubus allegheniensis* or *R. pensilvanicus*), blackgum (*Nyssa sylvatica*), ninebark (*Physocarpus opulifolius*), choke cherry (*Prunus virginiana*), American elderberry (*Sambucus canadensis*), steeple bush (*Spiraea latifolia*), highbush blueberry (*Vaccinium corymbosum*), muscle wood (*Carpinus caroliniana*), nanny berry (*Viburnum lentago*), Northern arrowwood (*Viburnum recognitum*), Cockspur hawthorn (*Crataegus crus-galli*) and scrub oak (*Quercus ilicifolia*). These plantings will need to be fenced to protect from damage by browsing herbivores. Fencing will consist of 8' woven wire fence or as determined by District Forester. Posts, fencing, other materials, seedlings and labor will be provided by Lessee. Lessee will also be responsible for fence maintenance. Revegetation with shrubs and fencing will not be required on steep slopes. Conifer planting is applicable on slopes where safe to do so.

6.5 Basking areas and habitat for the Timber Rattlesnake and the Allegheny Woodrat may need to be created in disturbed areas as deemed appropriate by District Forester.

6.6 For timber rattlesnakes, the available rocks will be piled south-facing in the disturbed area. In order to create basking habitat, the rocks should be placed in piles, with large flat rocks laid horizontally. The crevices created will allow the snakes to thermoregulate, or to retreat if threatened. Conifers **should not** be planted near these created basking areas to avoid shading the rocks.

6.7 Additionally, rocks stockpiled during excavation may be piled to create crevices for the Allegheny Woodrat at the direction of District Forester. Some conifers may be planted near the created woodrat habitat, but deciduous, mast-producing trees such as chestnut oak are more desirable.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

EXHIBIT "E"

OIL AND GAS LEASE ACCESS ROAD SPECIFICATIONS
FOR STATE FOREST LANDS

1. Lease Road Definitions and Specifications

1.01 Lessee recognizes that all roads owned or maintained by Department, which are used in the execution of this Lease, were constructed and improved for the use of Department and for the general public having business in and making use of State Forest land. Lessee, therefore, agrees that its operations will not be conducted in such a manner as to prevent, hinder, or obstruct the customary use of such roads by Department or by the public.

1.02 Roads necessary to develop an oil or gas well site shall be classified as lease access roads. These roads are for primary access to oil or gas well sites.

1.03 Lessee shall not construct or improve any roads or clear any drilling sites, without prior approval from District Forester*, who shall set forth the type and grade of roads and area to be cleared. Access roads shall be held to a maximum grade of ten percent (10%). However, if steeper grades are necessary, written approval must be obtained from District Forester prior to their construction.

2. Location

2.01 Lease access roads, including all installations which Lessee shall complete at his expense prior to the start of drilling operations, shall be located and designated on the ground by District Forester, and on a topographic map having a scale of 1 inch = 2,000 feet, or any road construction map, of larger scale, which Lessee has provided. A copy of said map must be provided to District Forester prior to construction.

2.02 Where possible, the lease access road locations will follow existing roads or old abandoned roads or pipeline rights-of-way. In such instances, these roads shall be improved and maintained to conform with the specifications for the location, construction, and maintenance of lease access roads.

2.03 When the lease access road is to be located in an area where no road exists and access to the road and drill site will open onto a state or township highway, Lessee shall obtain the necessary permits and approval from the Pennsylvania Department of Transportation or township for said opening. On all lease tracts where the road opens onto a paved state or township highway, Lessee shall take

*Wherever the words District Forester are used, it shall be understood that they shall also apply to any staff forester whom the District Forester may appoint as his or her representative.

extra precaution to prevent mud and debris from being carried onto the paved highway especially during periods of heavy road use. In areas where a mud problem may be present, Lessee shall stabilize the paved road junction with native stone or washed gravel.

2.04 The District Forester must be notified five (5) working days prior to start of any road construction, improvement or maintenance so that the District Forester can make arrangements to be available when actual work begins in order to correct any misunderstanding regarding the road location or road work.

3. Clearing

3.01 Clearing for lease access roads shall be wide enough to allow the construction of a road having a minimum width of 18 feet including ditches (a 16-foot running surface). Where turnouts are required, additional width shall be cleared as designated by District Forester (see Sketch A). The right-of-way width must be a 24-foot minimum to allow prior drying action by the wind and sun.

3.02 Trees in the right-of-way must be cut and removed from cleared right-of-way. All stumps, roots, slash, and other debris must be disposed of as designated by the District Forester.

4. Grading

4.01 The lease access road shall be either insloped, outsloped, or crowned as specified by District Forester (see Sketch B). Ditches must be constructed on all roads except where they cross rock formations.

4.02 Cut slopes may be as steep as the soil formation or material will allow, as determined by District Forester during construction. Undercutting of slopes is prohibited. All cut slopes will be mulched and seeded as specified in Lessee's Erosion and Sedimentation Plan to stabilize the cut slope as soon as possible after disturbance unless this requirement is waived by District Forester.

4.03 As needed, Lessee may use without charge road shale and/or borrow materials from State Forest land. Extracting such material shall be restricted to locations designated by District Forester. All disturbed areas shall be restored to the satisfaction of the District Forester and treated with lime, fertilizer, and planted with seed as outlined in Lessee's Erosion and Sedimentation Plan.

5. Drainage

5.01 Underground culverts (metal or plastic) and intercepting dips (see Sketch C) of sizes and types specified by District Forester shall be installed or constructed by Lessee at locations designated on the ground by District Forester.

5.02 When any cross drainage or intercepting dip is within 100 feet of a stream crossing on a general watershed or within 200 feet of a stream crossing on a public or domestic watershed, Lessee shall install a sump at the discharge end to receive water before it is discharged into the forest.

5.03 Lessee shall break the berm on the outside of the road at strategic locations to allow drainage of the road surface. Such breaks may be made with a bulldozer and shall be located by District Forester. As a guiding rule these breaks shall be located a maximum of 50 feet apart.

5.04 If soil erosion takes place at the discharge end of culverts, intercepting dips, water bars, or breaks in the berms, a floor of hand-placed rock shall be provided. At discharge ends, tail ditches will be of sufficient length and depth to ensure that drainage does not back up to road surface.

5.05 Sections of lease access roads located in poorly drained areas must be built up with suitable material above natural grade with suitable material approved by District Forester. Synthetic road fabric must be used in these situations.

6. Bridges, Culverts, and Fords

6.01 Bridges, as specified by District Forester and permitted and approved by the Department of Environmental Protection's Bureau of Dams, Waterways and Wetlands, must be installed where roads cross intermittent or permanent stream channels in accordance with the provisions of the Encroachment Permit. Any bridge design must be approved by the Department prior to construction.

6.02 Culverts, as specified by District Forester and approved by the Department of Environmental Protection's Bureau of Dams, Waterways and Wetlands, shall be placed in the bottom of the stream channel and covered with appropriate fill material. All culverts shall be installed in accordance with the provisions of the Encroachment Permit.

6.03 Fords, as permitted and approved by District Forester and approved by the Division of State Forest Management, the Pennsylvania Fish and Boat Commission's local Waterways Patrolman and the Department of Environmental Protection's Bureau of Dams, Waterways and Wetlands, are permissible only when it is not feasible to install a bridge or culvert. Fords are prohibited on all trout streams and on the watersheds of municipalities, institutions and private users. Fords must have solid bottoms and approaches that contain rock, stone or gravel. Fords must always be located at right angles to the stream channel. DRAGGING MATERIAL ACROSS FORDS IS PROHIBITED. Stream banks must be stabilized with stone to prohibit sedimentation.

7. Maintenance

7.01 Drainage structures shall be kept open and functioning at all times.

7.02 Gravel or shale shall be spread on intercepting dips that become subject to erosion.

7.03 Road surfaces shall be maintained so as to allow water to be drained from the roadway.

7.04 Loose boulders and slide material shall be removed from roadway and side ditches.

8. Retirement and Abandonment

8.01 Surface of roads shall be graded to eliminate any wheel ruts. Fenders and high outside shoulders shall be removed.

8.02 All bridges, drain pipes, and culvert pipes installed by Lessee shall be removed at Lessee's expense when no longer needed unless Lessee is notified otherwise by the District Forester.

8.03 When culverts are removed, they shall be replaced by earth or log water bars (see Sketch E).

8.04 All drainage ways shall be opened and deepened so as to handle storm waters. Seeding to a grade cover for an immediate erosion control shall be completed as required herein.

8.05 Additional water bars shall be installed if required by District Forester.

8.06 The above-listed provisions shall be carried out as each lease access road or portions thereof are abandoned rather than waiting until all development operations have been completed. If well is temporarily abandoned awaiting completion operations (i.e., fracking, acidizing, perforating, drilling deeper), the road should be retired in a manner and at a time as specified by the District Forester.

9. Gates

9.01 All lease access roads must be gated with an approved type of gate (see Sketch F). Authorized gates must be installed during lease operations, and remain after Lease termination. District Forester shall be consulted as to location and time of construction of all gates.

10. Highway Occupancy Permits

10.01 All terms, conditions, and specifications of such permits applicable to this Lease shall be followed.

11. Seeding

11.01 All roads on the Lease are to be limed, fertilized, and seeded to a grass cover as per the requirements of this Lease as outlined in Lessee's Erosion and Sedimentation Plan.

12. Use of Existing State Forest Roads

12.01 Lessee, in its operations, is hereby granted the right to use all State Forest roads, both on or off the leased premises, provided that Lessee agrees to obtain prior written approval from District Forester and to repair any damage to all State Forest roads, on or off the leased premises, when such damage is caused by Lessee's operations; provided, however, if in the opinion of the District Forester in charge, the roads or portions thereof are used by others sufficiently to warrant the apportionment of the maintenance costs, then Lessee may be relieved of the burden of sole maintenance and be required to provide only Lessee's proportionate share as decided by Department through District Forester.

12.02 Where roads built by Lessee cross any fence, Lessee shall construct a gate and keep it closed except when the passageway is in use. Lessee shall keep all said roads free at all times from obstruction by logs, brush, or debris resulting from Lessee's operation. District Forester may require Lessee to temporarily discontinue the use of said roads whenever, in his opinion, such action is necessary to prevent their serious damage.

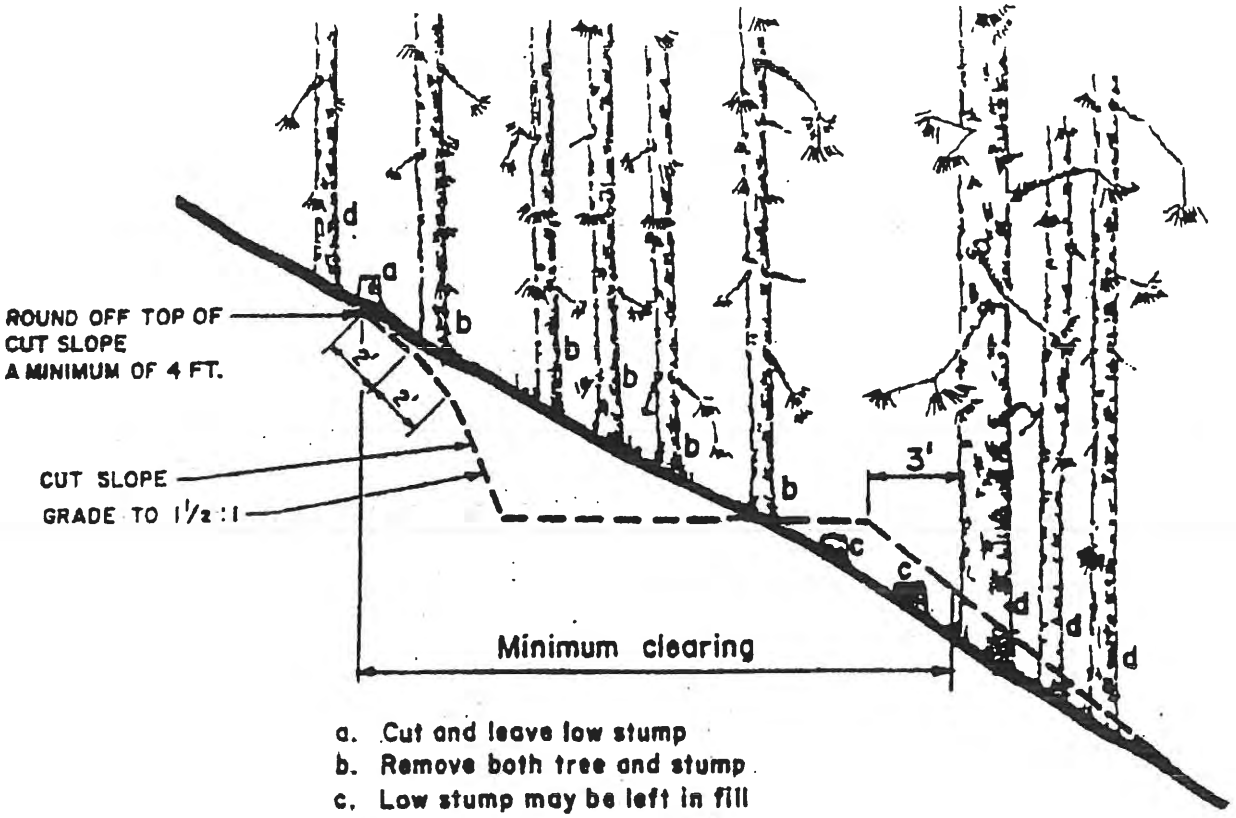
12.03 Upon termination of this Lease, Lessee shall repair said roads and leave them in as good condition as at the beginning of this Lease of which condition District Forester shall be the sole judge. In addition, Lessee shall make any repairs to said roads deemed necessary to District Forester to insure adequate and proper drainage, road surface conditions, horizontal alignment, and cross slope.

12.04 It is understood that the bond required, under the terms of this Lease, shall cover the use and repair of all State Forest roads and bridges on and off the leased premises used by Lessee. Any roads built at the expense of Lessee in its operations shall not be removed or destroyed and shall become a part of the road system of Department.

HAUL ROAD CONSTRUCTION

SKETCH A

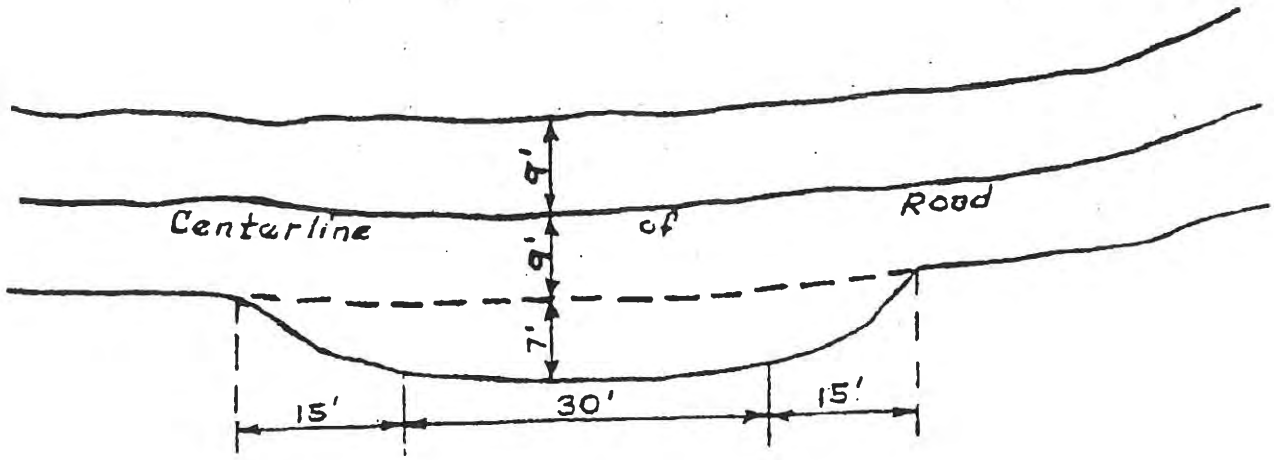
CLEARING FOR CUT AND FILL ROAD



a. Cut and leave low stump
b. Remove both tree and stump
c. Low stump may be left in fill
d. Trees may be left standing

1. Construct road so that hauling will be on solid ground, not on fill.
2. Inslope from fill to cut shall have a fall of not less than 1/4" and not more than 3/8" per foot.
3. Drainage water shall be carried across road to fill slope by intercepting dips or culverts.

TURNOUT FOR HAUL ROAD

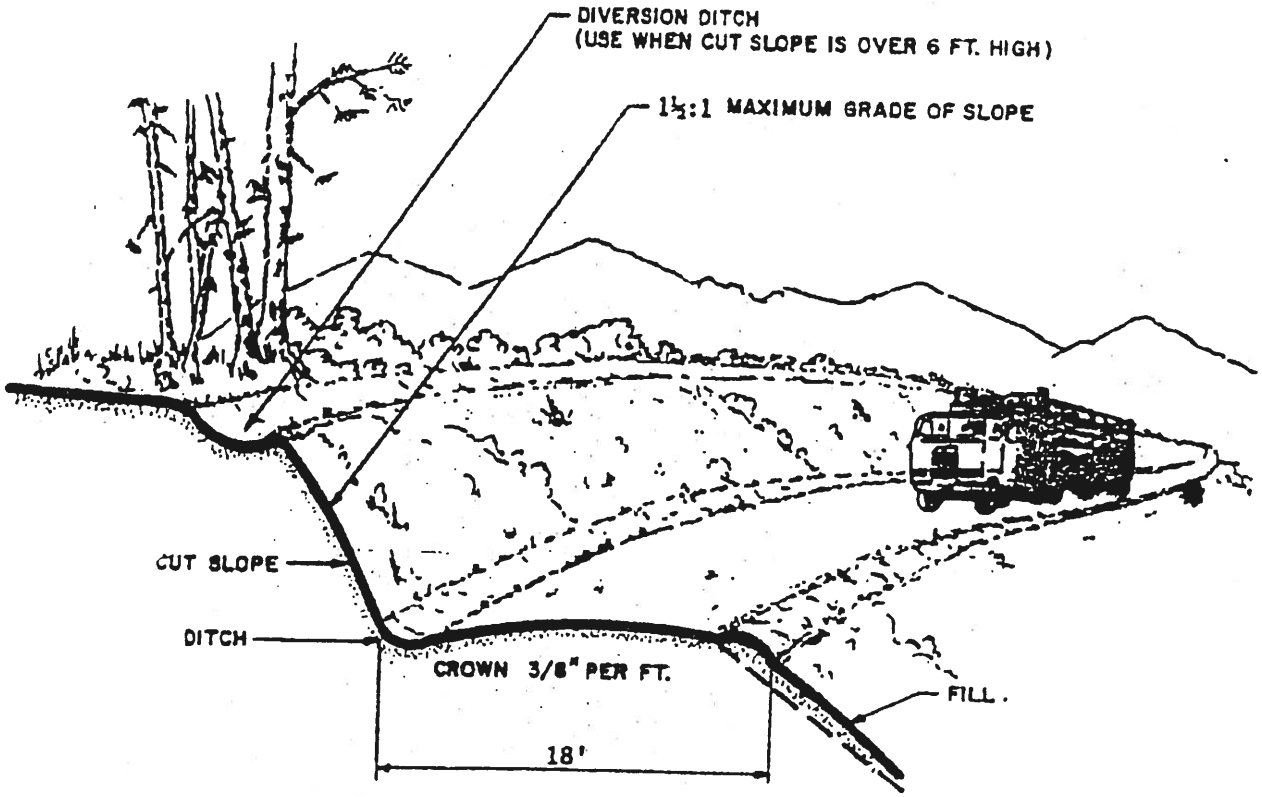


SKETCH A

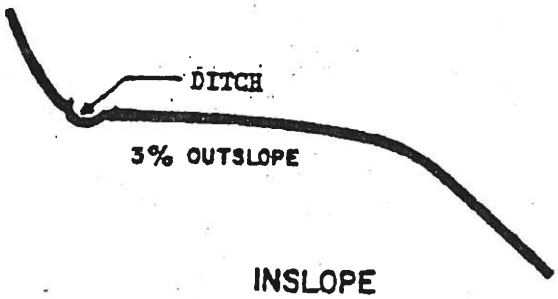
ROADWAY DRAINAGE

SKETCH B

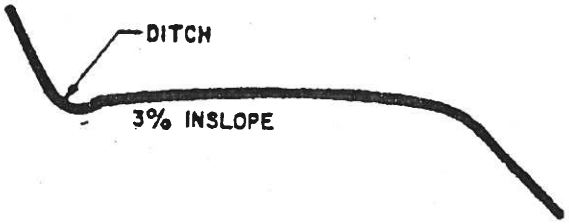
CROWNED ROADWAY



OUTSLOPE



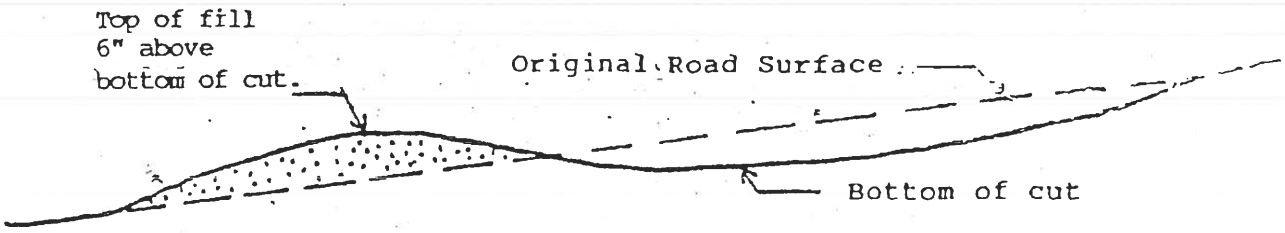
INSLOPE

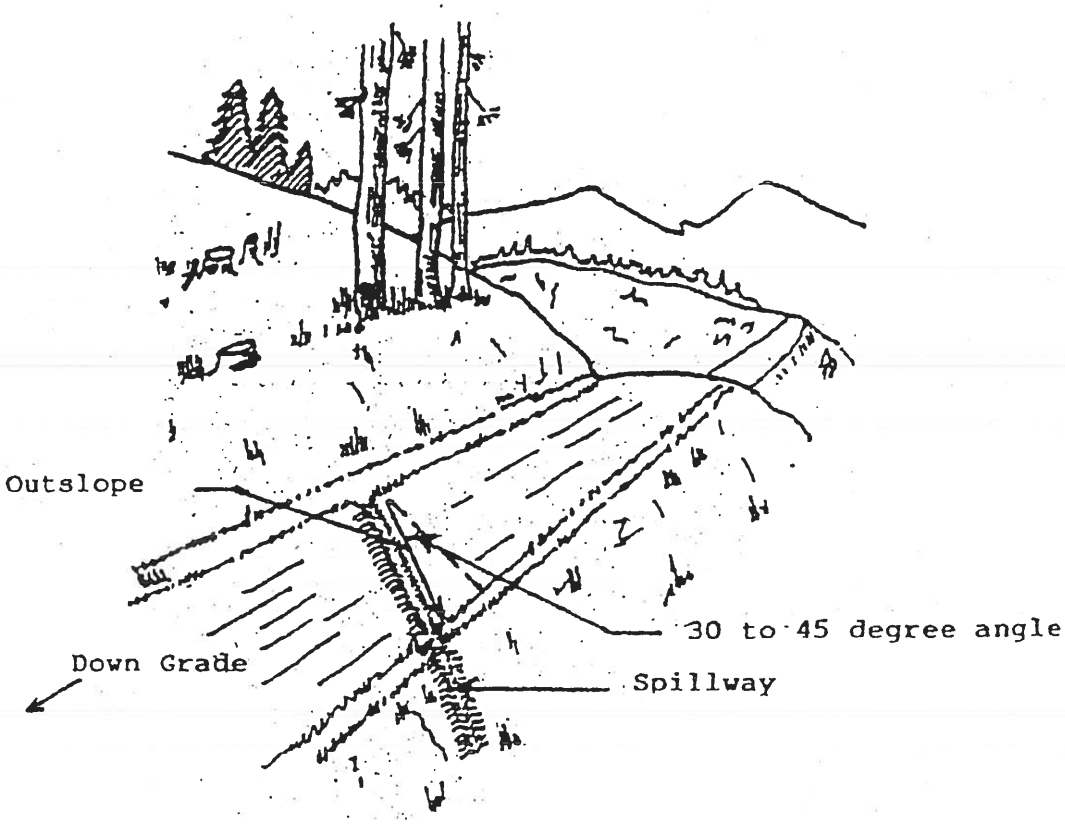


SKETCH B

INTERCEPTING DIP

SKETCH C



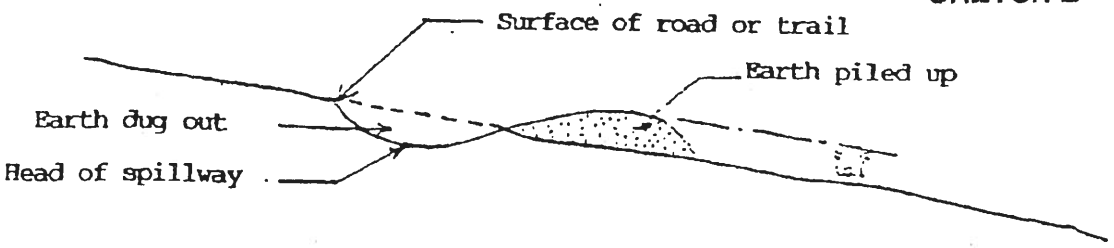


1. Dip to be below outcurves, above incurves, and elsewhere as required by Forester.
2. Horizontal distance from top of fill to bottom of cut is 15' for all Roads. Horizontal distance from bottom of cut to original road surface (upsolop from dip) is as follows: Grade to 5% - 50'; grades over 5% - add 5' for each % over 5.
3. Dip shall be outsloped. Spillway from dip shall be protected from erosion.
4. Dip should be placed at an angle of 30 to 45 degrees across road.
5. Dip shall have a fall of 1/8" to 1/4" per foot.
6. If spillway erodes, provide a floor of 2" plank or hand-placed rock.
7. Intercepting dips shall not be used for grades over 10%. An approved culvert is used for grades exceeding 10%.

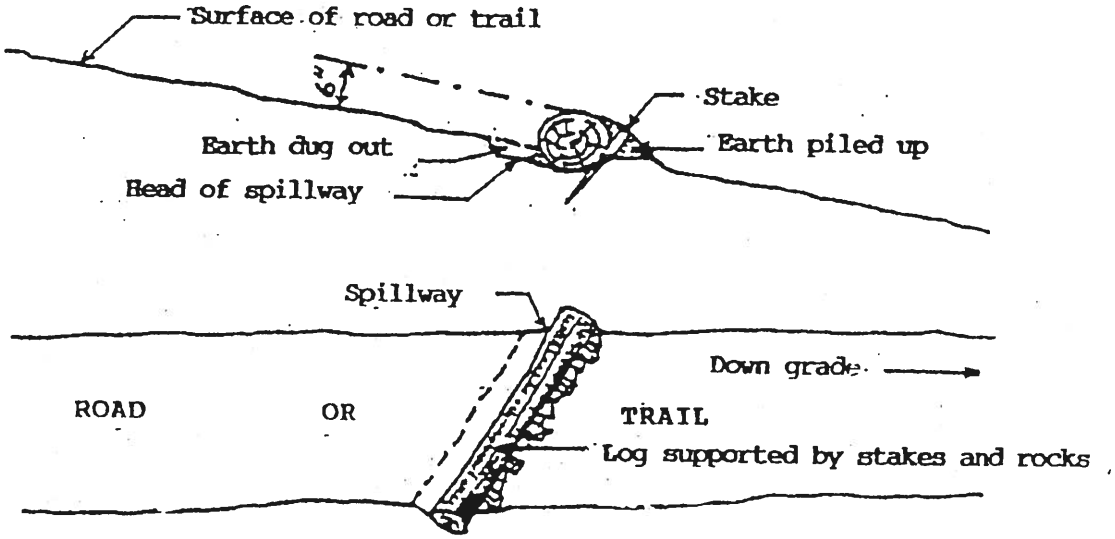
SKETCH C

EARTH WATER BAR

SKETCH E



LOG WATER BAR



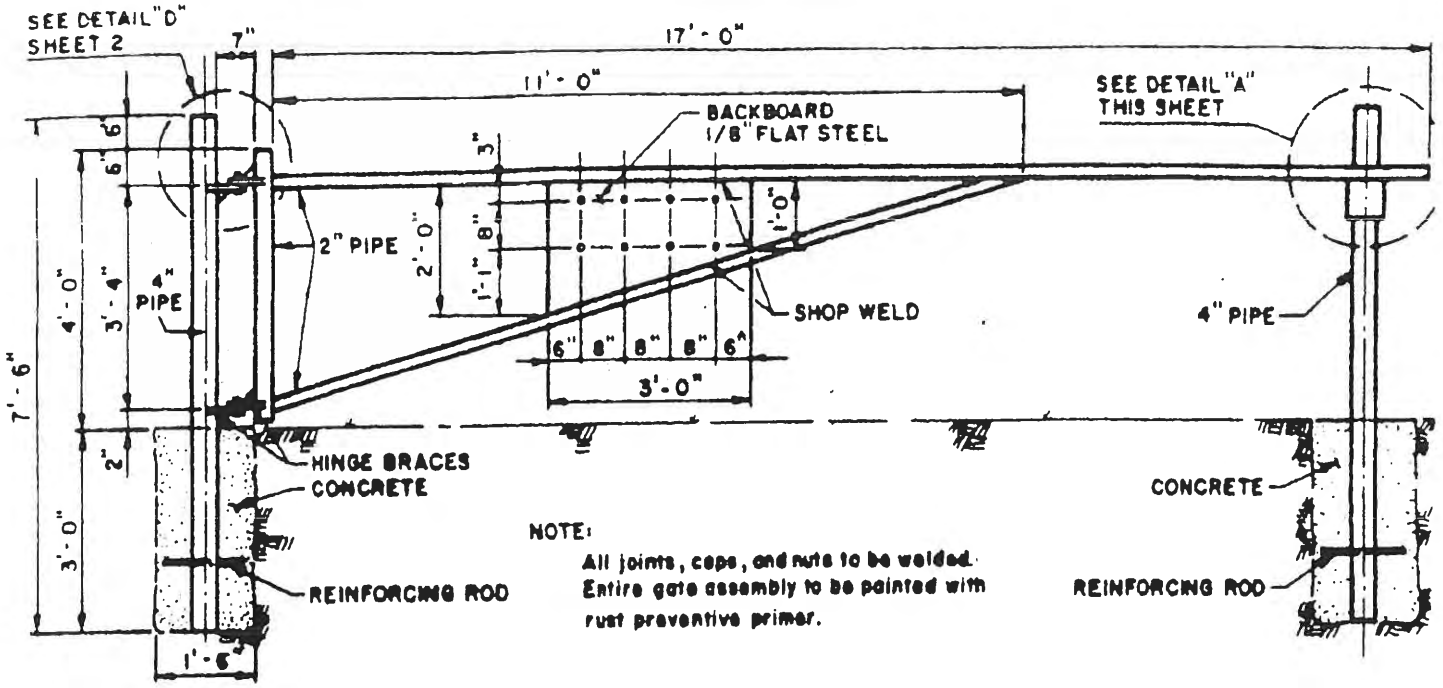
1. Dig trench with mattock at slight angle to road or trail. Fall across road or trail to head of spillway should be no less than 1/8" nor more than 3/8" per foot.

2. Cut log 8" in diameter for water bar. Recommend use of crooked, damaged or broken-top tree. Fender logs also make good water bars.

3. Place log in trench. Make sure trench is deep enough to keep water from running under log.

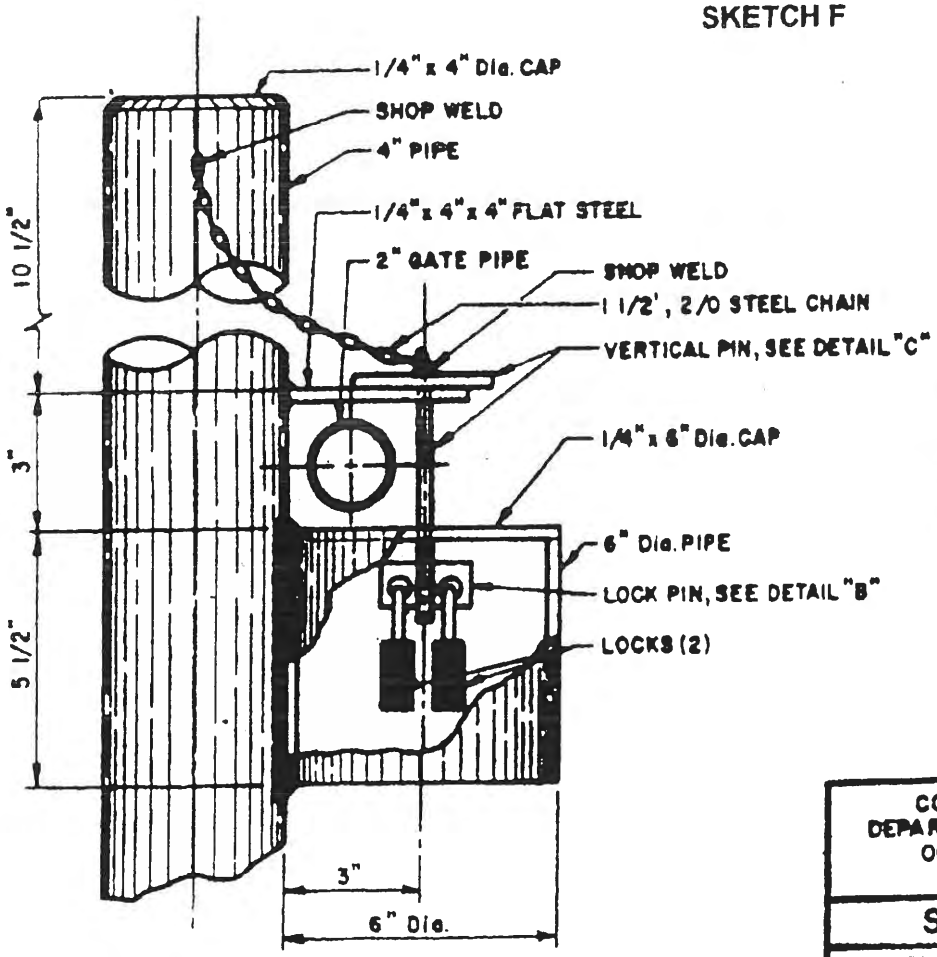
4. Place stakes and rocks on down hill side to hold log in trench.

SKETCH E



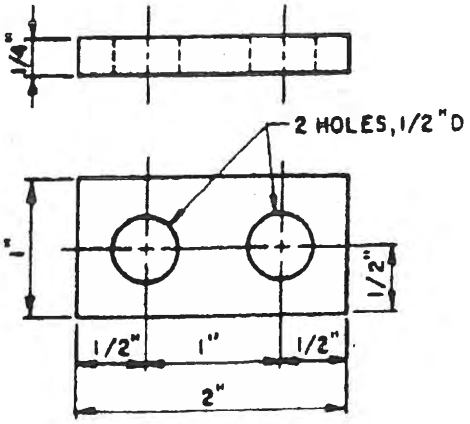
GATE ASSEMBLY

SKETCH F



LOCKING POST

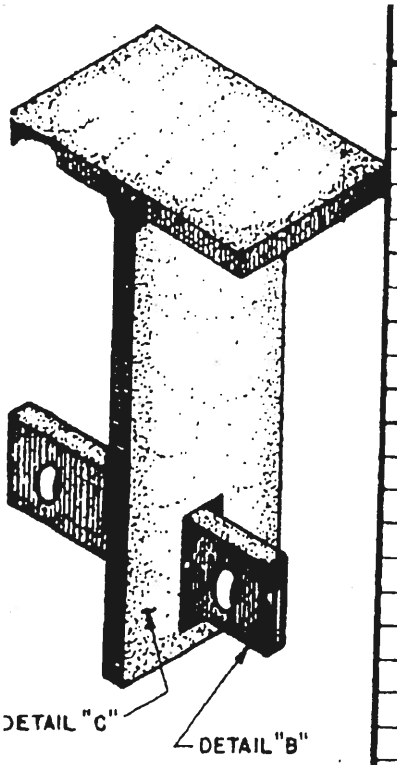
Detail "A". 2 - Req'd.



LOCK PIN

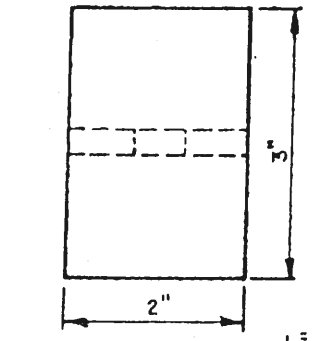
Detail "B", 2 - Req'd

COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES OFFICE OF RESOURCES MANAGEMENT BUREAU OF FORESTRY	
STEEL HAUL ROAD GATE	
DRW. BY: R. D. Myers CHECKED BY: DATE: July 23, 1980	1 of 2

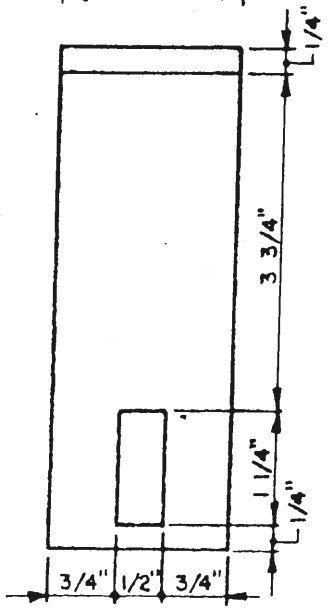


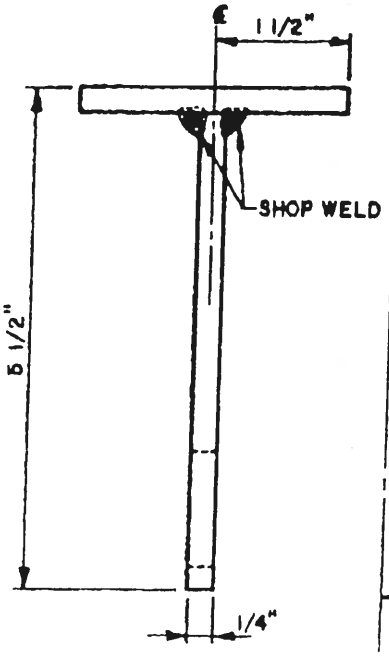
BILL OF MATERIALS

ITEM	QTY.	SIZE	MATERIAL
POST	3	4" Dia. x 7'-6"	STEEL PIPE
TOP GATE BAR	1	2" Dia. x 17'-0"	STEEL PIPE
GATE BRACE	1	2" Dia. x 12'-0"	STEEL PIPE
GATE UPRIGHT	1	2" Dia. x 4'-0"	STEEL PIPE
LOCK COVER	2	6" Dia. x 5 1/2"	STEEL PIPE
POST CAP	3	1/4" x 4" Dia.	FLAT STEEL
LOCK COVER CAP	2	1/4" x 6" Dia.	FLAT STEEL
LOCK SLIDE HOLDER	2	1/4" x 4" x 4"	FLAT STEEL
LOCK SLIDE TOP	2	1/4" x 2" x 3"	FLAT STEEL
LOCK SLIDE TONG	2	1/4" x 2" x 5 1/4"	FLAT STEEL
HINGE HALVES	4	1/4" x 2" x 5"	FLAT STEEL
HINGE PINS	2	3/4" x 1 1/4"	CASE HARDENED NUT & BOLT
HINGE BRACES	4	1/4" x 1 1/2" x 1 1/2"	FLAT STEEL
REINFORCING ROD	3	1/2" x 12"	STEEL BAR
CONCRETE	15	80 LB. BAGS	DRY SACKED READY MIXED
PAINT	1	PINT	RUST PREVENTIVE PRIMER
LOCK PIN	2	1/4" x 1" x 2"	FLAT STEEL
CHAIN	2	1 1/2'	2/0 STEEL
BACKBOARD	1	1'-0" x 2'-0" x 3'-0"	FLAT STEEL



The Vertical Pin may be made from any suitable material either round or flat. Case hardened steel should be used. After the length of the pin has been determined, the lower end should be drilled or burned to accommodate the shackle of the lock. Keep the pin short enough to insure complete protection of the locks within the can.



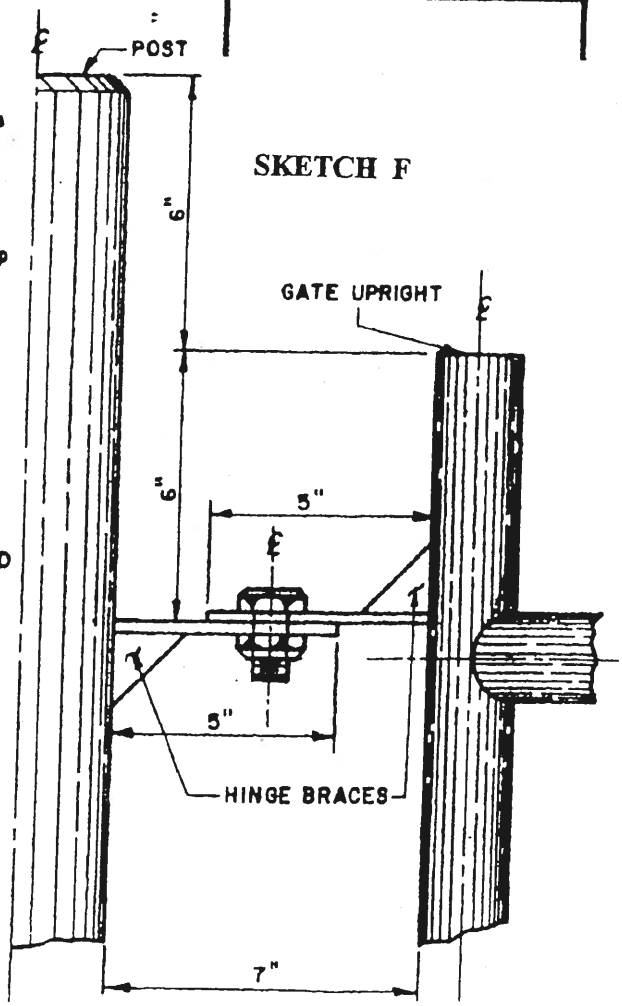


VERTICAL PIN

Detail "C", 2-Req'd

SKETCH F

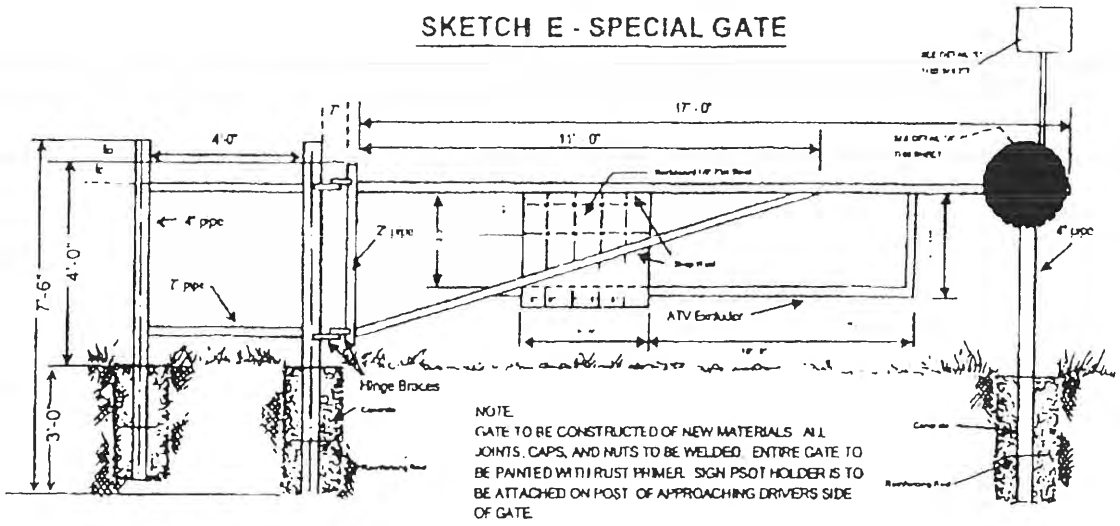
SKETCH F



GATE HINGE

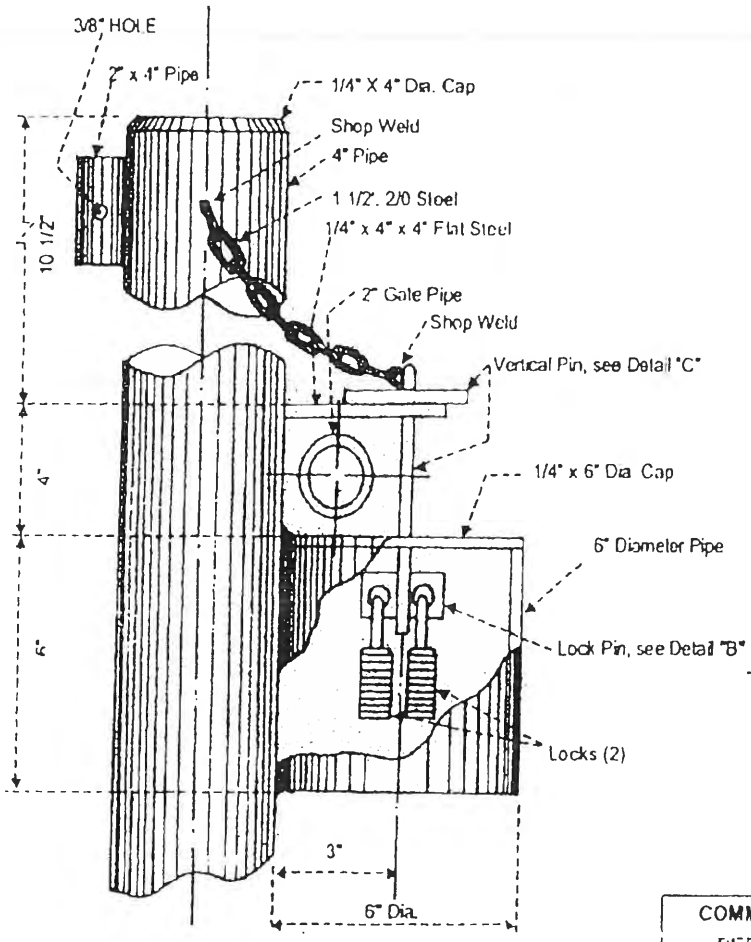
Detail "D", 2-Req'd

SKETCH E - SPECIAL GATE



GATE ASSEMBLY

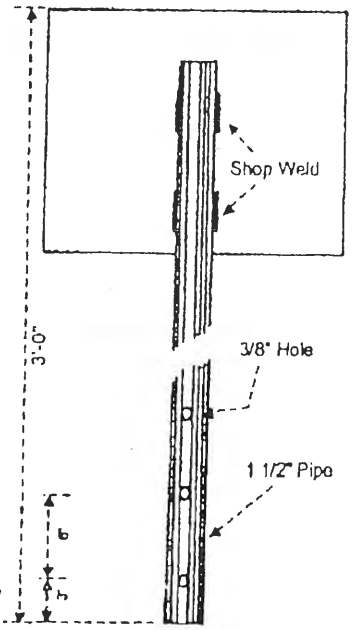
SKETCH F



LOCKING POST

Detail "A", 2 Required

SIGN BACKBOARD
12"X16"X1/8" Flat Steel

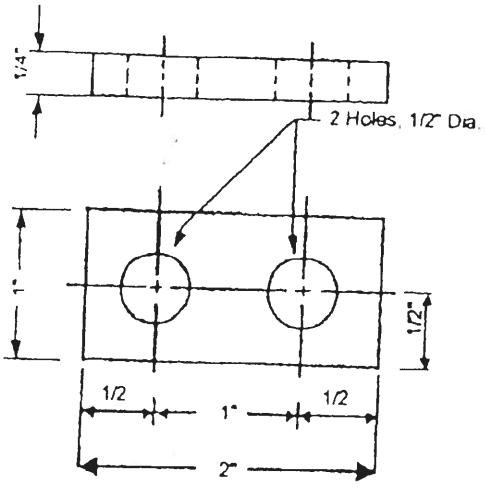


SIGN POST

Detail "E", 1 Required

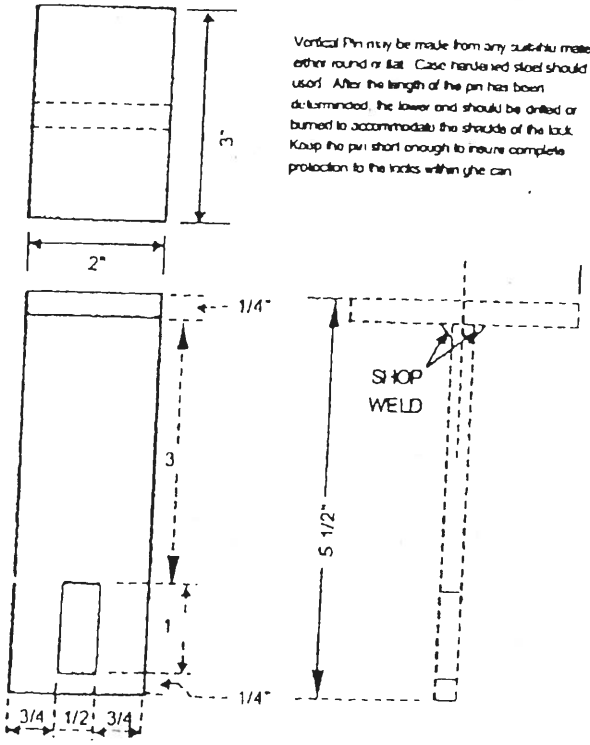
COMMONWEALTH OF PENNSYLVANIA	
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES	
SPECIAL STEEL HAUL ROAD GATE	
July 14, 2003	1 of 2

NOTE
GATE MAY BE CONSTRUCTED OF EITHER (3/16" Minimum) PIPE OR SQUARE STOCK. NO MIXING OF MATERIALS

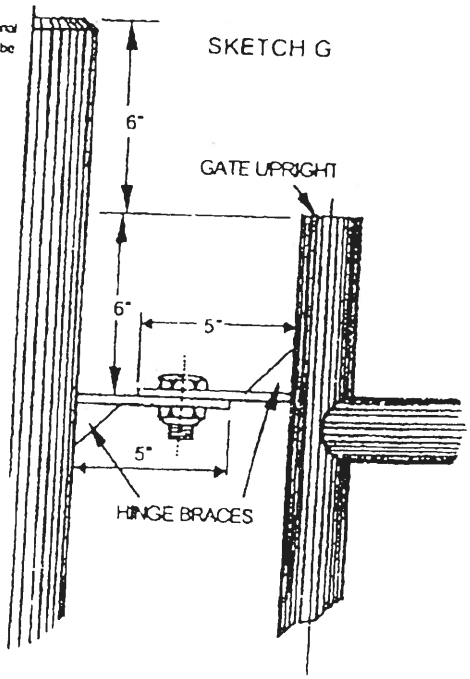


LOCK PIN
Detail"B", 2 Req'd

BILL OF MATERIALS			
ITEM	QTY	SIZE	MATERIALS
Post	4	4" Dia X 7'-6"	Steel Pipe/Square
Top Gate Bar	1	2" Dia X 17'-0"	Steel Pipe/Square
Gate Brace	1	2" Dia X 12'-0"	Steel Pipe/Square
Gate Upright	1	2" Dia X 4'-0"	Steel Pipe/Square
Lock Cover	2	6" Dia X 5 1/2"	Steel Pipe/Square
Post Cap	4	1/4" X 4"	Flat Steel
Lock Cover Cap	2	1/4" X 6"	Flat Steel
Lock Slide Holder	2	1/4" X 4" x 4"	Flat Steel
Lock Slide Top	2	1/4" X 2" X 3"	Flat Steel
Lock Slide Tong	2	1/4" X 2" X 5 1/4"	Flat Steel
Hinge Halves	4	1/4" X 2" X 5"	Flat Steel
Hinge Pins	2	3/4" X 1 1/4"	Case Hard Nut & Bolt
Hinge Braces	4	1/4" X 1 1/2" X 1 1/2"	Flat Steel
Reinforcing Rod	4	1/2" X 12"	Steel Bar
Concrete	20	80 Lb. Bags	Dry Sack Ready Mix
Paint	1	Quart	Primer, Rust Prevent.
Lock Pin	2	1/4" X 1" X 2"	Flat Steel
Chain	2	1 1/2"	2/0 Steel
Backboard	1	1' X 2' X 3' X 1/8"	Flat Steel
Sign Backboard	1	12" X 16" X 1/8"	Flat Steel
Sign Post	1	1 1/2" Dia. X 3'-0"	Steel Pipe/Square
Sign Post Holder	1	2" Dia X 4"	Steel Pipe/Square
Sign Post Pin	1	3/8" X 3"	Case Hard Nut & Bolt
ATV Excluder	1	2" Dia. X 12'-0"	Steel Pipe/Square
Post Brace	2	2" Dia X 4'-0" (min.)	Steel Pipe/Square



VERTICAL PIN
Detail "C", 2-Req'd



GATE HINGE
Detail "D", 2-Req'd

Addendum B
Conversion Site # 17

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

EXHIBIT "F"

OIL AND GAS LEASE FOR STATE FOREST LANDS

DCNR'S STANDARD WELL PLUGGING PROCEDURES
Required By DCNR For All Gas Wells Plugged
On State Forest and Park Lands in Pennsylvania
Covered By Agreements From DCNR

Procedure:

Follow the applicable gas-well plugging regulations of the Department of Environmental Protection (or the regulatory agency that is authorized to oversee plugging at the time) but take all the following steps in every case where construction of the well allows:

1. Verify total depth or attainable bottom of wellbore.
2. Run Gamma Ray (GR) Log, and on wells with production casing, a Casing Collar Locator (CCL) Log.
3. Set permanent bridge plug in cemented production casing 80' above casing shoe.
4. Use a freepoint tool to determine the top of cemented production casing.
5. Cut production casing at or immediately above established freepoint.
6. Condition the hole, i.e., circulate gel down the production casing and up the annulus to clean it of debris.
7. Pull production casing out of hole.
8. Run open hole logs: Gamma Ray, Density, Induction and Temperature Logs, if not already run and available.
9. Identify all gas zones and other fluid-bearing zones from the logs, and available well records.
10. Trip into hole (TIH) with tubing to top of cemented production casing stub. Condition the hole and install 100' cement plug above the "stub."
11. Trip out of hole (TOH) with tubing, installing cement plugs above each gas and other fluid-bearing zones identified by logs and well records. Each cement plug shall extend 70' or more above each zone.
12. Trip out of hole (TOH) to surface casing shoe. Place 100' cement plug extending from 50' below surface casing shoe to a point 50' within the surface casing (not applicable in areas designated by DEP as "coal areas").
13. Wait for cement to harden for 24 hours (WOC Time = 24 hours). Bail surface casing dry to top of cement plug in bottom of surface casing. Verify that no gas exists.
14. Wait for cement to harden further for 1 week. Verify that no gas exists. Then load surface casing to ground level with gravel (2RC rock).
15. Install permanent monument; install swedge on surface casing to vent pipe (monument) with pipe elbow to prevent rainwater from filling pipe. Leave vent pipe open so that any gas leakage into the gravel filled surface casing will vent to the atmosphere.
16. Install marker plate showing the name of the person, firm, company, operator or corporation for whom the well was drilled, and the number of the well, stamped, cast or otherwise permanently made part of the marker.
17. In the presence of Forestry personnel, monitor the plugged well for the presence of gas immediately after plugging and every six months for two years.
18. Provide copies of all electric logs run on the well and the well plugging certificate to the Minerals Section, Bureau of Forestry, DCNR, within 30 days after the date plugging was completed.
19. If, in the process of plugging a well, operator encounters a shallow horizon above the depth of 1,000', which is overpressured with gas or other fluids (i.e., has pressure greater than 0.43 psi/ft. of depth), operator may, if it is the leasehold owner of the gas, obtain written permission of DCNR and DEP to plug back to just below the overpressured horizon and vent or produce the overpressured gas or other fluids. If operator is not the leasehold owner of the gas, operator will plug the well as required by this exhibit.

Final Standard:

The burden will be placed on the operator to properly plug gas wells on State Forest and Park lands, using state-of-the-art methods so that there is no evidence of gas leakage.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

EXHIBIT "G"

CONTRACTOR INTEGRITY PROVISIONS FOR COMMONWEALTH CONTRACTS FOR STATE FOREST LANDS

CONTRACTOR INTEGRITY PROVISIONS

For purposes of this clause only, the words "confidential information," "consent," "contractor," "financial interest," and "gratuity" shall have the following definitions:

1) **Confidential information** means information that is not public knowledge, or available to the public on request, disclosure of which would give an unfair, unethical, or illegal advantage to another desiring to contract with the Commonwealth.

2) **Consent** means written permission signed by a duly authorized officer or employee of the Commonwealth, provided that where the material facts have been disclosed, in writing, by prequalification, bid, proposal, or contractual terms, the Commonwealth shall be deemed to have consented by virtue of execution of this agreement.

3) **Contractor** means the individual or entity that has entered into the Contract with the Commonwealth, including directors, officers, partners, managers, key employees and owners of more than a five percent interest.

4) **Financial interest** means:

   a) Ownership of more than a five percent interest in any business; or

   b) Holding a position as an officer, director, trustee, partner, employee, or the like, or holding any position of management.

5) **Gratuity** means any payment of more than nominal monetary value in the form of cash, travel, entertainment, gifts, meals, lodging, loans, subscriptions, advances, deposits of money, services, employment, or contracts of any kind.

The Contractor shall maintain the highest standards of integrity in the performance of the Contract and shall take no action in violation of state or federal laws, regulations, or other requirements that govern contracting with the Commonwealth.

The Contractor shall not disclose to others any confidential information gained by virtue of the Contract.

The Contractor shall not, in connection with this or any other agreement with the Commonwealth, directly, or indirectly, offer, confer, or agree to confer any pecuniary benefit on anyone as consideration for the decision, opinion, recommendation, vote, other exercise of discretion, or violation of a known legal duty by any officer or employee of the Commonwealth.

The Contractor shall not, in connection with this or any other agreement with the Commonwealth, directly or indirectly, offer, give, or agree or promise to give to anyone any gratuity for the benefit of or at the direction or request of any officer or employee of the Commonwealth.

Except with the consent of the Commonwealth, neither the Contractor nor anyone in privity with him or her shall accept or agree to accept from, or give or agree to give to, any person, any gatuity from any person in connection with the performance of work under the Contract except as provided therein.

The Contractor, upon being informed that any violation of these provisions has occurred or may occur, shall immediately notify the Commonwealth in writing.

The Contractor, by execution of the Contract and by the submission of any bills or invoices for payment pursuant thereto, certifies, and represents that he or she has not violated any of these provisions.

The Contractor, upon the inquiry or request of the Inspector General of the Commonwealth or any of that official's agents or representatives, shall provide, or if appropriate, make promptly available for inspection or copying, any information of any type or form deemed relevant by the Inspector General to the Contractor's integrity or responsibility, as those terms are defined by the Commonwealth's statutes, regulations, or management directives. Such information may include, but shall not be limited to, the Contractor's business or financial records, documents or files of any type or form which refers to or concern the Contract. Such information shall be retained by the Contractor for a period of three years beyond the termination of the Contract unless otherwise provided by law.

For violation of any of the above provisions, the Commonwealth may terminate this and any other agreement with the Contractor, claim liquidated damages in an amount equal to the value of anything received in breach of these provisions, claim damages for all expenses incurred in obtaining another Contractor to complete performance hereunder, and debar and suspend the Contractor from doing business with the Commonwealth. These rights and remedies are cumulative, and the use or nonuse of anyone shall not preclude the use of all or any other. These rights and remedies are in addition to those the Commonwealth may have under law, statute, regulation, or otherwise.

CONTRACTOR RESPONSIBILITY PROVISIONS

For the purpose of these provisions, the term contractor is defined as any person, including, but not limited to, a bidder, offeror; loan recipient, grantee, or subgrantee, who has furnished or seeks to furnish goods, supplies, services, or leased space, or who has performed or seeks to perform construction activity under contract, subcontract, grant, or subgrant with the Commonwealth, or with a person under contract, subcontract, grant, or subgrant with the Commonwealth or its state-affiliated entities, and state-related institutions. The term contractor may include a permittee, licensee, lessee or any agency, political subdivision, instrumentality, public authority, or other entity of the Commonwealth.

1. The Contractor certifies, for itself and all its subcontractors, that as of the date of its execution of this Bid/Contract, that neither the Contractor, nor any subcontractors, nor any suppliers are under suspension or debarment by the Commonwealth or any governmental entity, instrumentality, or authority and, if the Contractor cannot so certify, then it agrees to submit, along with its Bid, a written explanation of why such certification cannot be made.

2. The Contractor also certifies, that as of the date of its execution of this Bid/Contract, it has no tax liabilities or other Commonwealth obligations.

3. The Contractor's obligations pursuant to these provisions are ongoing from and after the effective date of the contract through the termination date thereof. Accordingly, the Contractor shall have an obligation to inform the Commonwealth if, at any time during the term of the Contract, it becomes delinquent in the payment of taxes, or other Commonwealth obligations, or if it or any of its subcontractors are suspended or debarred by the Commonwealth, the federal government, or any other state or governmental entity. Such notification shall be made within 15 days of the date of suspension or debarment.

4. The failure of the Contractor to notify the Commonwealth of its suspension or debarment by the Commonwealth, any other state, or the Federal government shall constitute an event of default of the Contract with the Commonwealth.

5. The Contractor agrees to reimburse the Commonwealth for the reasonable costs of investigation incurred by the Office of State Inspector General for investigations of the Contractor's compliance with the terms of this or any other agreement between the Contractor and the Commonwealth, which results in the suspension or debarment of the Contractor. Such costs shall include, but shall not be limited to, salaries of investigators, including overtime, travel and lodging expenses, and expert witness and documentary fees. The Contractor shall not be responsible for investigative costs for investigations that do not result in the Contractor's suspension or debarment.

6. The Contractor may obtain a current list of suspended and debarred Commonwealth contractors by either searching the Internet at http://www.dgs.state.pa.us/debarment.htm or contacting the:

Department of General Services
Office of Chief Counsel
603 North Office Building
Harrisburg, PA 17125

Telephone No: (717) 783-6472
FAX No: (717) 787-9138

AMERICANS WITH DISABILITIES ACT

a. Pursuant to federal regulations promulgated under the authority of The Americans With Disabilities Act, 28 C.F.R. § 35.101 et seq., the Contractor understands and agrees that it shall not cause any individual with a disability to be excluded from participation in this Contract or from activities provided for under this Contract on the basis of the disability. As a condition of accepting this contract, the Contractor agrees to comply with the "General Prohibitions Against Discrimination," 28 C.F .R. § 35.130, and all other regulations promulgated under Title II of The Americans With Disabilities Act, which are applicable to all benefits, services, programs, and activities provided by the Commonwealth of Pennsylvania through contracts with outside contractors.

b. The Contractor shall be responsible for and agrees to indemnify and hold harmless the Commonwealth of Pennsylvania from all losses, damages, expenses, claims, demands, suits, and actions brought by any party against the Commonwealth of Pennsylvania as a result of the Contractor's failure to comply with the provisions of subparagraph a above.

OFFSET PROVISION

The Contractor agrees that the Commonwealth may set off the amount of any state tax liability or other obligation of the Contractor or its subsidiaries to the Commonwealth against any payments due the Contractor under any contract with the Commonwealth.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

EXHIBIT "H"

NONDISCRIMINATION/SEXUAL HARRASSMENT PROVISIONS FOR COMMONWEALTH CONTRACTS FOR STATE FOREST LANDS

During the term of the Contract, the Contractor agrees as follows:

a. In the hiring of any employees for the manufacture of supplies, performance of work, or any other activity required under the Contract or any subcontract, the Contractor, subcontractor or any person acting on behalf of the Contractor or subcontractor shall not by reason of gender, race, creed, or color discriminate against any citizen of this Commonwealth who is qualified and available to perform the work to which the employment relates.

b. Neither the Contractor nor any subcontractor nor any person on their behalf shall in any manner discriminate against or intimidate any employee involved in the manufacture of supplies, the performance of work or any other activity required under the Contract on account of gender, race, creed, or color.

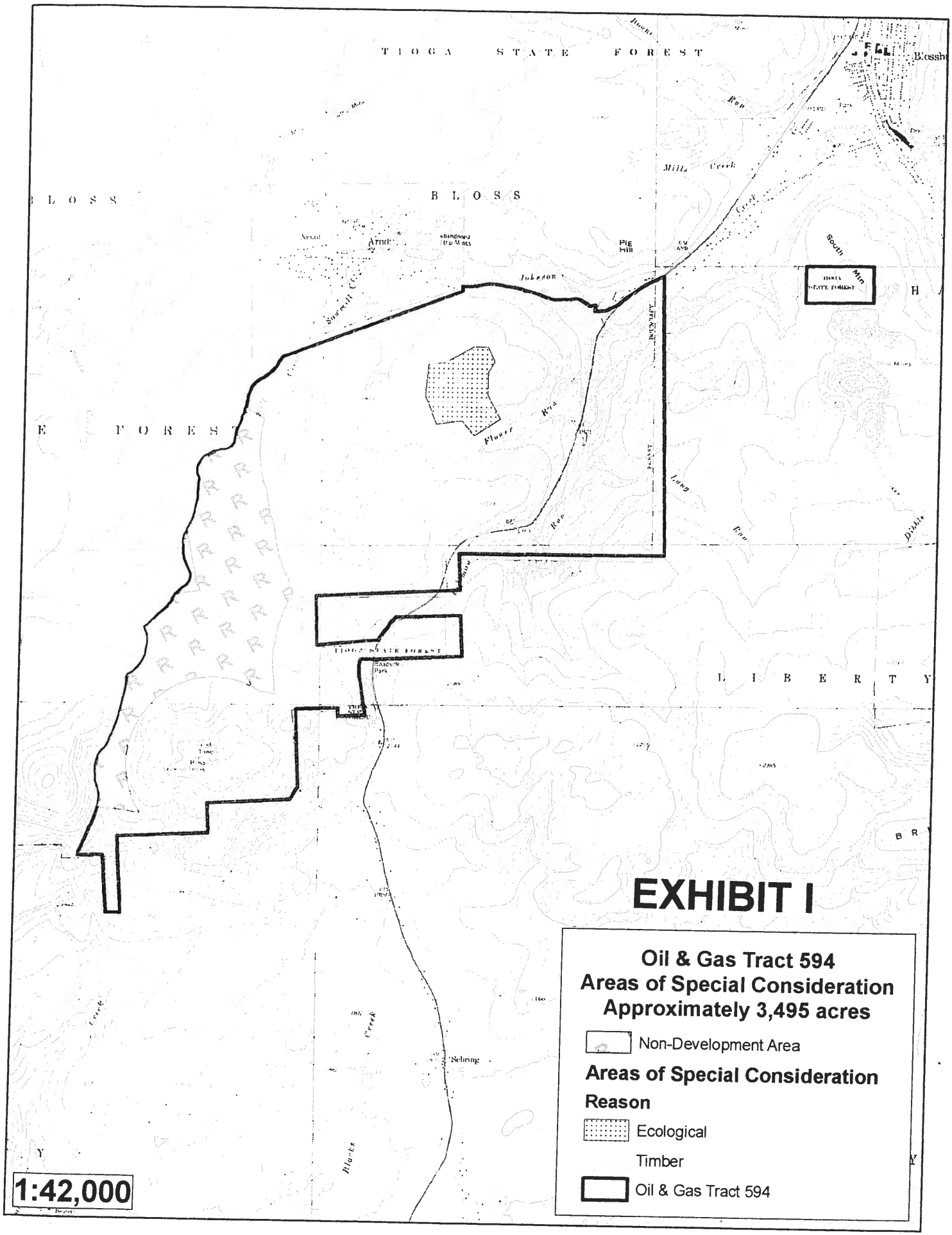
c. The Contractor and any subcontractors shall establish and maintain a written sexual harassment policy and shall inform their employees of the policy. The policy must contain a notice that sexual harassment will not be tolerated and employees who practice it will be disciplined.

d. The Contractor shall not discriminate by reason of gender, race, creed, or color against any subcontractor or supplier who is qualified to perform the work to which the contract relates.

e. The Contractor and each subcontractor shall furnish all necessary employment documents and records to and permit access to its books, records, and accounts by the contracting officer and the Department of General Services' Bureau of Contract Administration and Business Development for purposes of investigation to ascertain compliance with the provisions of this Nondiscrimination/Sexual Harassment Clause. If the Contractor or any subcontractor does not possess documents or records reflecting the necessary information requested, it shall furnish such information on reporting forms supplied by the contracting officer or the Bureau of Contract Administration and Business Development.

f. The Contractor shall include the provisions of this Nondiscrimination/Sexual Harassment Clause in every subcontract so that such provisions will be binding upon each subcontractor.

g. The Commonwealth may cancel or terminate the Contract, and all money due or to become due under the Contract may be forfeited for a violation of the terms and conditions of this Nondiscrimination/Sexual Harassment Clause. In addition, the agency may proceed with debarment or suspension and may place the Contractor in the Contractor Responsibility File.



Addendum B
Conversion Site # 17

including farm-related businesses, are provided for, as are limited- or low-density residential uses.

D. I Industrial District

The purpose of this district is to encourage the continuity and expansion of existing industrial operations and enable possible new industrial investment. Reasonable standards are included to minimize air pollution, noise, odors, glare, heat, and potential fire and safety hazards. Other requirements ensure that adequate buffer yards and/or screening are provided between the uses in this zone and other adjoining zones. Due to the rural nature of land areas zoned in this Ordinance, heavy industrial activities requiring large-scale infrastructure (highways, roads, water, sewer) are discouraged in this district.

E. WC Woodland Conservation District

This district is intended to encourage the conservation of land where the economics of building and supplying public services and facilities are damaging to ecologically sensitive lands, and to recognize the environmental value of the County's wooded areas. This zone includes large tracts of forested land, steep slopes, certain wetlands, special protection waters designated by the PA DEP, and biological diversity areas designated by the Clinton County Natural Heritage Inventory. The regulations of this district are intended to limit development of steep slopes; preserve natural drainageways; protect water supply and wildlife habitat areas; and encourage uses which will enhance the County's environmental protection objectives.

F. RF Rural Forest District

This district is intended to permit a variety of low-density and principally residential and recreational uses that are in keeping with the hilly, wooded, non-developed areas of the county. Activities that relate to forest, low-level agriculture and outdoor uses are permitted in this district.

G. CS Countryside District

The Countryside (CS) District is designed to permit residential development at densities consistent with the maintenance of a rural, countryside character. It is intended to encourage the preservation of the natural habitats and scenic values of the WC District, with a less restrictive lot size. It also serves as a transitional district between conservation areas/farmland and more densely settled residential areas. The permitted uses and structures and lot, yard and open space requirements in this district are consistent with the WC District and will not significantly disrupt conservation, agricultural or forestry uses.

303 ZONING MAPS

The locations and boundaries of the Zoning Districts are hereby established as shown on the Official Zoning Map for each covered municipality, which is made a part of this Ordinance (Part 15) together with all future notations, references and amendments.

No change of any nature shall be made to the Official Zoning Map, except in conformance with the procedures set forth in Section 1201 of this Ordinance. The final authority as to the status of zoning districts shall be the Official Zoning Map. Any changes made to the zoning districts shall be made on the Official Zoning Map promptly after the amendment has been approved by the County Commissioners. All such changes shall be recorded on the Map's Revision Block and shall include the date of the amendment, a brief description of the change, and the initials of the individual making the change.

SECTION 407
RF – RURAL FOREST DISTRICT

Uses and Structures

Permitted Principal Uses & Structures (Zoning Officer)	Permitted Accessory Uses & Structures (Zoning Officer)	Special Exception Uses & Structures (Zoning Hearing Board)
Agricultural uses (See Section 521)	Uses and structures customarily incidental to an approved principal use.	Animal hospitals, kennels and veterinary Facilities.
Forestry or forest management.	Essential services.	Bed and breakfasts/guest homes.
Family and group daycare homes.	Private swimming pools. (See 526)	Group homes.
Personal service businesses.	Temporary roadside stands. (See 522)	Campgrounds, commercial and private, including RV parks.
Mining under 10,000 tons per year. (See 519)	Home-based businesses or occupations. (See 527)	Churches; cemeteries.
Seasonal dwellings.	Farm-related businesses. (See 528)	Clubs; professional offices.
Single-family detached dwellings. (See 503)	Personal wind energy facilities. (See 531)	Commercial and church-related daycare centers and nursery schools.
Mobile homes on individual lots. (See 506)	Off-street parking and/or loading areas. (See 902 and 903)	Mobile home parks.
Bed and breakfast establishments/guest homes.		Mining over 10,000 tons per year. (See 519)
Two-family dwellings (duplexes; see 503).		Sawmills and lumber yards.
Oil and gas operations.		Utility supply facilities.
Communications antennas mounted on existing public utility transmission towers, buildings, or other structures, and communications equipment buildings		Recycling Collection Points.
Communication towers, antennas, and buildings.		Retirement Community.
		Rural Retail Shopping Center.

<Continued on next page>

425 of 477
Addendum C
Conversion Site # 3

SECTION 407
RF – RURAL FOREST DISTRICT

Lot, Yard, and Open Space Requirements

Minimum Lot Requirements (See Section 602)	Minimum Yard Requirements (Setback) (See Section 603)	Minimum Height Limitations (See Section 604)
Minimum Lot Area for All Uses within the District: 1 acre (43,560 sq ft) Minimum Lot Width at Setback: 150 feet. Minimum Lot Depth at Setback: 150 feet. Maximum Building Coverage: 35% Regardless of the minimums provided above, all lots shall meet the PA Sewage Facilities Act and all other state and local sewage and water regulations.	Front Yard - 35 feet from edge of street right-of-way. Corner lots shall be construed to have two front yards. Side Yards: Principal Structures - 15 feet each side. Accessory Structures – 8 feet each side. Rear Yard: Principal Structures – 25 feet Accessory Structures – 8 feet Buildings housing livestock (including dog kennels): 50 feet from a public right-of-way 200 feet from a residential structure or use other than the owner's. Oil and Gas Operations – See Section 608.	Principal Structures: 35 feet or three stories, whichever is less. Accessory Structures: 25 feet Agricultural Structures: No maximum

Addendum C
Conversion Site # 3

A. RESOURCE PROTECTION (RP) DISTRICT

This district is intended to protect the most important and sensitive natural areas as designated in the County Comprehensive Plan, which contribute greatly to the quality of life in Lycoming County. Protection of timber and other forest resources, wildlife habitat, special plant communities, scenic resources, and other natural areas is the primary objective. Continued harvesting of resources such as timber and game is an important activity of this district and can be beneficial to the resource if conducted properly.

The Resource Protection District discourages intensive growth by requiring large site areas and setbacks that also preserve the rural character of the area where it is used. The minimal development which is allowed must be located so as to maximize the amount of undisturbed natural areas. Examples of areas which may fall within the Resource Protection District include State Game Lands and private hunting/ fishing preserves.

B. AGRICULTURAL (AG) DISTRICT

This district is intended to maintain, preserve and protect areas of Lycoming County that are predominantly in agricultural use, and/or have historically demonstrated high agricultural productivity. Land in this classification should not be used to accommodate the County's growth and are generally rated as Class I, II, and III soils by the U.S. Department of Agriculture, Soil Conservation Service. As a matter of policy, it is hereby determined that the highest and best use of this land is agriculture. This district is intended to prevent or reduce land use conflicts by restricting the type and amount of non-farm development in farming areas.

The Agricultural District is also intended to encourage farmers to invest in farm improvements and to discourage land speculation. Each area of the County where this district is applied is not intended to accommodate growth in the future and therefore petitions for rezonings shall be discouraged. The Agricultural District designation also ensures the continuation of the rural character of these areas of the County.

C. COUNTRYSIDE (CS) DISTRICT

The Countryside (CS) District is designed to permit residential development at densities that are consistent with the maintenance of a rural countryside character. It is intended to encourage the preservation of natural habitats and the scenic values of Lycoming County. It may also serve as a transitional district between natural areas or farmland and more suburban areas, and provide for limited commercial and industrial development opportunities in areas with suitable infrastructure and without severe environmental constraints. Performance standards permit a residential density and non-residential intensity that will not significantly disrupt agricultural or forestry uses.

ARTICLE 3

USE REGULATIONS

DIVISION 3000 PURPOSE

The purpose of this Division is to establish those land uses which are either permitted or not permitted to locate in each zoning district. A further distinction is made for uses which may be located in a given district only after obtaining a Special Exception from the County Zoning Hearing Board. All uses and structures must comply with the applicable provisions of this Ordinance. All uses and their supplementary regulations will be defined in detail in Division 3200.

DIVISION 3100 PERMITTED USES

SECTION 3110 KEY TO TABLE OF PERMITTED USES

P = Permitted by right in this district with a Zoning/Development Permit. This means that the use is permitted and only a review to confirm that the proposed use meets all standards is needed to obtain a Zoning/Development Permit. Refer to Division 3200 for land use definitions and applicable supplementary regulations.

N = Not permitted in this district.

S = Permitted in this district only upon approval of a Special Exception (see Division 10300).

The uses permitted in each district are specifically designated in Section 3120. Other than by zoning change, no use which is expressly prohibited shall be built in a district. The Zoning Administrator, however, may make a determination to permit uses which are not specifically listed but are similar to uses that are expressly permitted in Section 3120.

Commentary: One of the most important functions of zoning is the division of land uses into zoning districts, which at least in theory, contain compatible uses. Conventional zoning ordinances generally attempt to accomplish this objective by creating zoning districts with a very limited range of land uses within each district. This Ordinance uses controls such as bufferyards and intensity standards to foster a compatible mix of residential, business, and services in those areas of the County which have the infrastructure to support growth, as in the Rural Center and Suburban Zoning Districts.

This Ordinance also allows increased flexibility in the choice of housing types. For example, multi-family housing is permitted in the Countryside and Rural Center Districts but is made more compatible with single-family houses by restricting the number of multi-family dwelling units/acre to a level compatible with the rural character of the district, requiring open space for multi-family developments, and requiring bufferyards (see Article 6) between multi-family developments and adjacent single-family homes.

SECTION 3120 PERMITTED USES

Table 3120 - Permitted Uses

Table 3120
Permitted Uses
Zoning District*

General Use	Rural				Suburban			Urban		Preservation
	AG	RP	CS	RC	E	SESM		CR	I	NP
Agricultural (Section 3210, Pg 14)										
A. Agricultural	P	P	P	S	P	S	S	P	P	S
B. Clearing	P	P	P	S	P	P	P	P	P	P
C. Kennels	P	P	P	S	S	S	N	S	P	N
D. Stables (Commercial)	P	P	P	N	P	P	N	N	P	N
E. Agricultural Accessory Business	S	S	S	S	S	S	S	N	N	S
Residential (Sect. 3220, Pg 16)										
A. Single-Family Dwelling	P	P	P	P	P	P	P	N	N	P
B. Two-Family Dwelling	P	P	P	P	N	P	P	N	N	P
C. Mobile Home:										
Double-Wide	P	P	P	P	P	P	P	N	N	P
Single-Wide	P	S	P	S	N	S	S	N	N	P**
D. Conversion Apartment	P	P	P	P	P	P	P	N	N	S
E. Cluster Development	P	P	P	P	P	P	P	N	N	P
F. Multi-Family	S	N	P	P	N	P	P	S	N	N
G. Mobile Home Park	S	N	P	P	N	P	P	N	N	N
H. Commercial Apartment	N	N	N	P	N	N	P	S	N	N
I. Retirement	N	N	N	N	N	P	N	N	N	N
J. Family Care Unit	S	S	S	S	S	S	S	N	N	S
Institutional (Sect. 3230, Pg 23)										
A. Outdoor Recreation	P	P	P	P	P	P	P	P	N	S
B. Institutions	S	N	S	P	S	S	P	P	N	S
C. Public Service	S	S	S	P	P	P	P	P	P	S
C.1 Wind Energy Facility	P	P	P	N	N	N	N	N	N	N
D. Group Homes	P	P	P	P	P	P	P	N	N	P
E. Institutional Residential	S	N	S	S	S	S	P	S	N	N
F. Day Care Center	P	N	P	P	S	S	P	P	P	S
G. Correctional Institute	N	S	S	N	N	N	N	S	N	N

P = Permitted by right in this district with a Zoning Permit
N = Not permitted in this district
S = Permitted in this District only with a Special Exception

*** AG** Agricultural
RP Resource Protection
CS Countryside
RC Rural Center

E Estate
SE Suburban Estate
SM Suburban Mixed Use

CR Regional Commercial
I Industrial
NP Neighborhood Preservation

**** Permitted in NP districts with an "MH" designation, or in mobile home parks**

TABLE 3120
Permitted Uses (continued)

General Use	Rural				Suburban			Urban		Preservation
	AG	RP	CS	RC	E	SE	SM	CR	I	NP
Commercial										
(Section 3240, pg. 33)										
A. Office	N	N	N	P	N	S	P	P	P	N
B. Services	N	N	N	P	N	N	P	P	P	N
C. Standard Restaurant	N	N	S	P	N	N	P	P	P	N
D. Fast Food Restaurant	N	N	N	S	N	N	P	P	P	N
E. Tavern	N	N	N	P	N	N	P	P	P	N
F. Retail	N	N	N	P	N	N	P	P	S	N
G. Heavy Retail/Service	N	N	N	S	N	N	S	P	P	N
H. Shopping Center	N	N	N	S	N	N	S	P	S	N
I. Commercial Lodging	N	N	N	N	N	N	S	P	P	N
J. Country Inn	P	S	P	P	N	N	P	P	P	S
K. Home Occupations	P	P	P	P	P	P	P	P	P	P
L. Home Businesses	P	S	P	S	N	N	P	P	P	N
M. Campgrounds	P	P	P	N	N	N	N	N	N	N
N. Commercial Recreation	N	N	N	S	N	N	P	P	P	N
O. Commercial Amusement	N	N	N	N	N	N	S	P	N	N
P. Adult Entertainment	N	N	N	N	N	N	N	N	S	N
Q. Communication Tower	S	S	S	N	N	N	N	N	N	N
R. Landing Areas	P	N	P	N	P	N	N	P	P	N
S. Airports	N	N	S	N	N	N	N	N	N	N
T. Ag Support	P	S	P	P	N	N	P	P	P	N
U. Dispensaries	N	N	N	N	N	N	S	N	N	N
Industrial										
(Section 3250, pg. 47)										
A. Ag Processing	S	N	S	N	N	N	N	N	P	N
B. Sawmills	S	N	S	N	N	N	N	N	P	N
C. Light Industry	N	N	S	S	N	N	S	S	P	N
C.1 Oil & Gas Staging Facility	P	P	P	N	S	S	P	P	P	N
C.2 Oil & Gas Compressor, Processing, Metering Facility	P	P	S	N	S	S	S	P	P	N
D. Heavy Industry	N	N	N	N	N	N	N	N	S	N
D.1 Oil & Gas Water Reuse Storage Facility	P	P	P	N	S	S	P	P	P	N
E. Extraction	N	N	S	N	N	N	N	N	S	N
E.1 Oil & Gas Development	P	P	P	N	S	S	S	P	P	N
F. Disposal	N	N	N	N	N	N	N	N	S	N
G. Junk Yards	N	N	N	N	N	N	N	N	S	N
H. Growers/Processors	N	N	N	N	N	N	N	N	S	N
I. Medical Marijuana Transport Vehicle Service	N	N	N	N	N	N	N	N	S	N
Temporary Uses	See Division 3300 (pg. 62)									
Accessory Uses	See Division 3400 (pg. 68)									

P = Permitted by right in this district with a Zoning Permit

N = Not permitted in this district

S = Permitted in this District only with a Special Exception Areas designed as "Special Exception" are a permitted use contingent upon satisfaction of criteria set forth in this Ordinance as per Division 10300 as Administratively determined by the County Zoning Hearing Board.

* **AG** Agricultural	**E** Estate	**CR** Regional Commercial
RP Resource Protection	**SE** Suburban Estate	**I** Industrial
CS Countryside	**SM** Suburban Mixed Use	**NP** Neighborhood Preservation
RC Rural Center		

ARTICLE 4

Resource Protection District

4.1 Purpose of the Resource Protection District

The purpose of the Resource Protection District is to maintain lands that are suitable for high quality renewable forest resource uses; preserve unique areas of habitat and scenic value; and conserve lands where the topography and land features do not readily support development due to environmental constraints and lack of community infrastructure. Therefore, uses that are provided for include seasonal, recreational, agricultural, forestry, and similar rural resource area uses that will not significantly change the character of the natural environment.

4.2 Use Regulations for the Resource Protection District

4.2.1 Permitted Uses

4.2.1.1 Accessory Use or Structure (see supplemental regulations in Article 15);

4.2.1.2 Agriculture;

4.2.1.3 Bed & Breakfast Inn (see Section 4.5);

4.2.1.4 Civic Clubs & Lodges (see Section 4.5);

4.2.1.5 Communications Antennae and Equipment Buildings (see supplemental regulations in Article 17);

4.2.1.6 Cultivation of Crops (no permit required);

4.2.1.7 Dwelling, Seasonal including Hunting or Fishing Club (see Section 4.5);

4.2.1.8 Dwelling, Single Family Detached (see Section 4.5);

4.2.1.9 Dwelling, Two Family (see Section 4.5);

4.2.1.10 Essential Service (no permit required);

4.2.1.11 Family Day Care Home (see supplemental regulations in Article 17);

4.2.1.12 Forestry (no permit required);

4.2.1.13 Home Occupation (see supplemental regulations in Article 17); and

4.2.1.14 Neighborhood Retail (see Section 4.5);

4.2.1.15 No Impact Home Based Business (see supplemental regulations in Article 17);

4.2.1.16 Recreation Facility, Public;

4.2.1.17 Restaurant (see Section 4.5);

4.2.1.18 Riding Stable, Commercial (see supplemental regulations in Article 17); and

4.2.1.19 Riding Stable, Private (see supplemental regulations in Article 17).

4.2.2 Special Exception Uses (criteria found in Article 17)

4.2.2.1 Campground;

4.2.2.2 Communication Tower with Height less than 100 ft;

4.2.2.3 Communications Tower (Height greater than 100 ft.);

4.2.2.4 Home Based Business;

4.2.2.5 Public or Quasi-Public Uses;

4.2.2.6 Recreation Facility, Commercial; and

4.2.2.7 Retail, Office, Service Uses or Rental Storage (see Section 4.5).

4.2.3 Conditional Uses (criteria found in Article 17)

4.2.3.1 Hotel/Motel (see Section 4.5);

4.2.3.2 Solid Waste Transfer Facility (see Section 4.5);

4.2.3.3 Surface Mining; and

4.2.3.4 Wind Energy Facility.

4.3 Height and Coverage Requirements in the Resource Protection District

4.3.1 Maximum Building Height: 35 ft.

4.3.2 Maximum Building Coverage: 25%

4.3.3 Maximum Impervious Surface (including buildings): 30%

4.4 Minimum Areas and Dimensions in the Resource Protection District

4.4.1 Minimum Lot Area: 1 acre

4.4.2 Minimum Lot Width: 150 ft.

4.4.3 Minimum Building Lines:

front:	25 ft., but not less than 50 ft. from the road centerline
front on major traffic street:	40 ft.
side:	10 ft.
rear:	10 ft.

4.5 Limitations With Respect to Development Uses in the Resource Protection District.

See Section 4.2 for uses which are subject to this section (i.e. labeled *see Section 4.5*). Identified development uses in the Resource Protection District shall be subject to the following limitations and standards:

4.5.1 Maximum Acres Allocated To Development Uses

The number of acres of development uses permitted in the Resource Protection District after *[ordinance adoption date]* shall be based on the parent parcel size in accord with the following schedule and standards.

Size (Acres) Of Parent Parcel As of *[ord. adoption date]*	Total Number of New Acres of Development Uses Permitted
1-25 acres	1
> (greater than) 25 up to 60	2
> 60 up to 100	3
> 100 up to 150	4
over 150	5 acres plus 1 acre for each additional 50 acres over 150 acres

4.5.1.1 New development uses shall be on the least productive land feasible, so as to minimize interference with agriculture and forestry production.

4.5.1.2 As noted in Section 4.5.1 the lot size (acres) existing in the parent parcel shall be the number of acres described in the parent parcel deed description as of *[ordinance adoption date]*. For purposes of this provision, roads, alleys, streets, highways, natural or manmade boundaries and tax map parcels shall be disregarded for the purpose of determining the number of acres in the parent parcel deed.

4.5.1.3 The owners of land subject to these provisions are urged to consider techniques to minimize the effects of new development uses on agricultural and forestry operations including use of least productive soils, maximizing distance from livestock operations, avoiding quality timber stands, contiguous lot placement using a common access, or other methods. In addition, innovative arrangements involving clustering of units (see Section 17.6) and DEP approved sewage disposal alternatives may be considered when suitable legal arrangements are implemented by the applicant.

4.5.2 Subdivision of Land in the Resource Protection District

4.5.2.1 Except where necessary to permit the location of a development uses in accord with Section 4.5.1, no subdivision of land shall be permitted; provided however this shall not prevent a parcel from being divided into or among two or more farms or timber tracts when the objective is to increase the size of one with land from the other or to improve the efficiency of an agricultural or forestry operation. A subdivision plan shall be required to accomplish such a transfer.

4.5.2.2 Any new division line being created between two farms or timber tracts shall be agriculturally reasonable and shall not be so as to render the agricultural or forestry use of the land less efficient; i.e. under normal circumstances fields and contour strips shall not be divided. The tracts transferred to a farm or parcel pursuant to this section shall not subsequently be separated from such farm or parcel.

4.5.2.3 A property owner submitting a subdivision plan for any purpose involving an agricultural or forest production operation will be required to specify on his plan which lot or lots carry with them the right to erect or place any unused quota of acres for development uses his tract may have.

4.5.2.4 The property owner shall also be required to assign for each lot created for a new agricultural or forest production operation at least one acre for a dwelling and to demonstrate that the lot can be approved as a location for the placement of the dwelling unit unless the lot is being permanently merged with another parcel which has either an existing dwelling or the right to erect or place at least one dwelling.

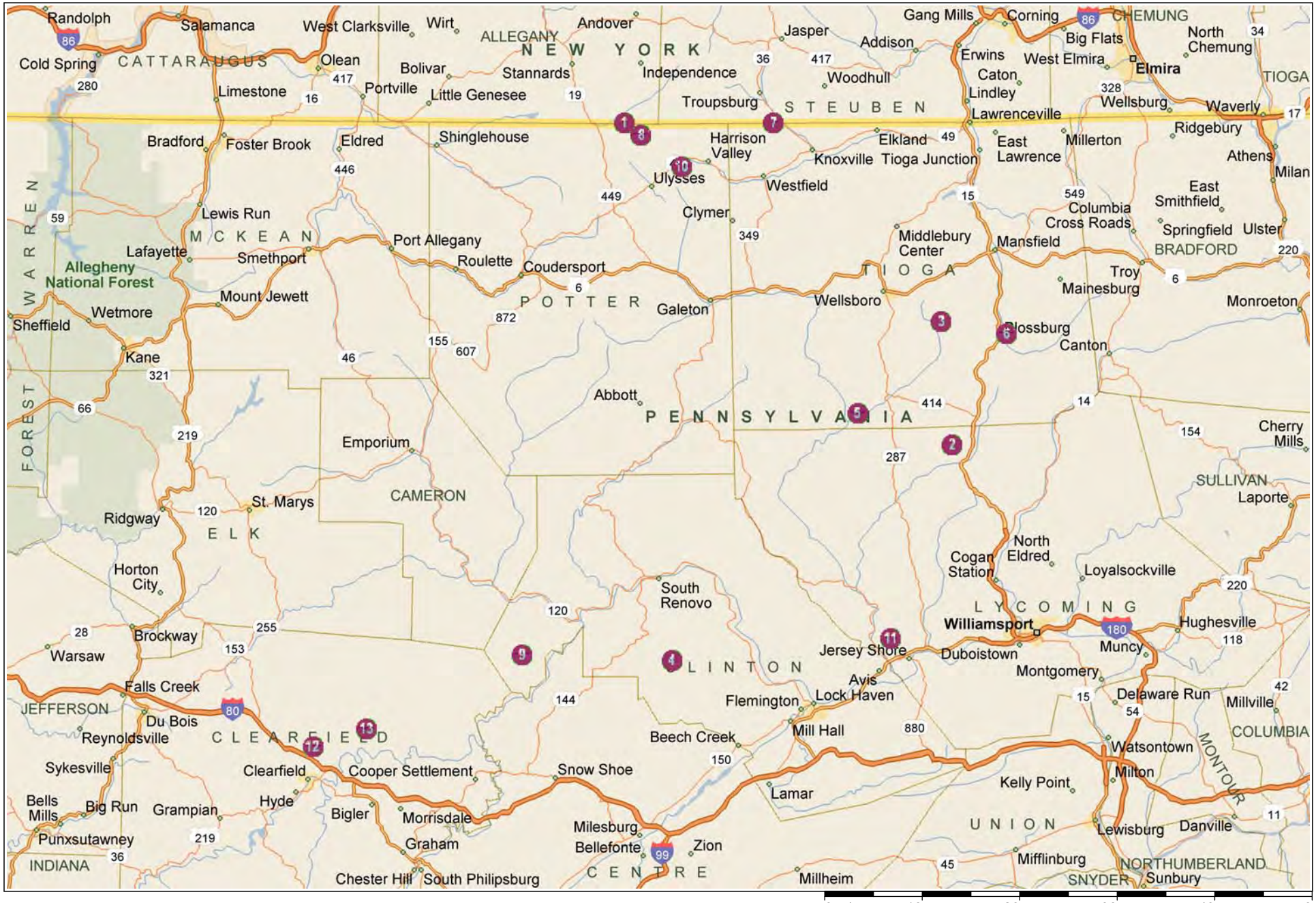
4.5.3 Nuisance Disclaimer in the Resource Protection District

The following notation shall be affixed to all subdivision plans and to deeds for newly created parcels in the Resource Protection District.

> *Lands within the Resource Protection District are used for commercial agricultural and forest production. Owners, residents, and other users of this property may be subjected to inconvenience, discomfort and the possibility of injury to property and health arising from normal and accepted agricultural and forestry practices and operations, including, but not limited to noise, odors, dust, the operation of machinery of any kind, including aircraft, the storage and disposal of manure, the application of fertilizers, herbicides, and pesticides. Owners, residents, and users of this property should be prepared to accept these conditions and are hereby put on official notice that Section 4 of the Pennsylvania Act 33 of 1982 "The Right to Farm Law" may bar them from obtaining a legal judgment against such normal agricultural operations.*

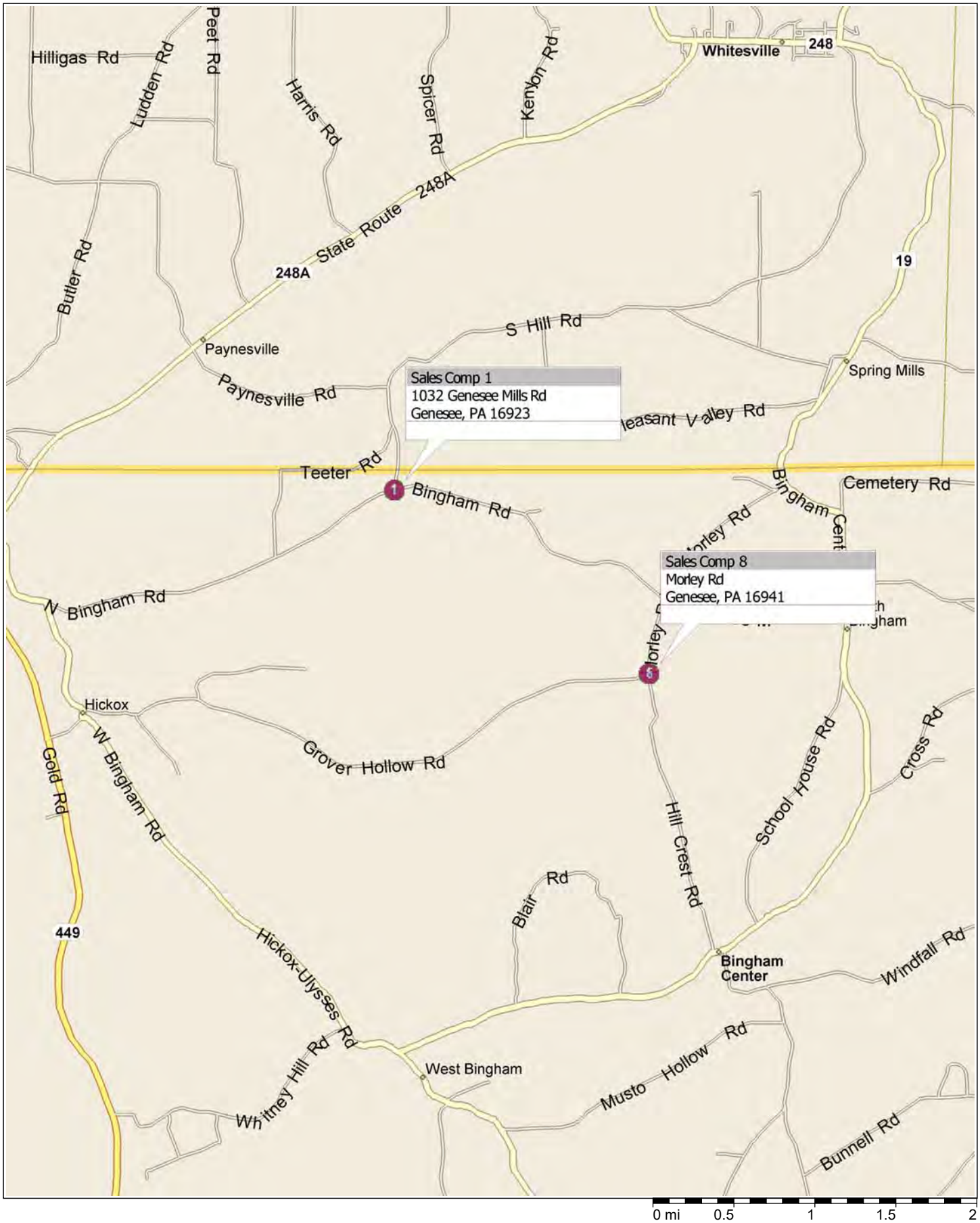
Failure to comply with this section by not placing this nuisance disclaimer in any subdivision plan or deed for parcel in the Resource Protection District, shall in no way be construed as a waiver, restriction or limitation of any rights to utilize land in the resource protection district under any applicable federal, state, or local laws, including permitted agricultural and forestry uses under this zoning ordinance.

2018-097 - Sales Comp Location



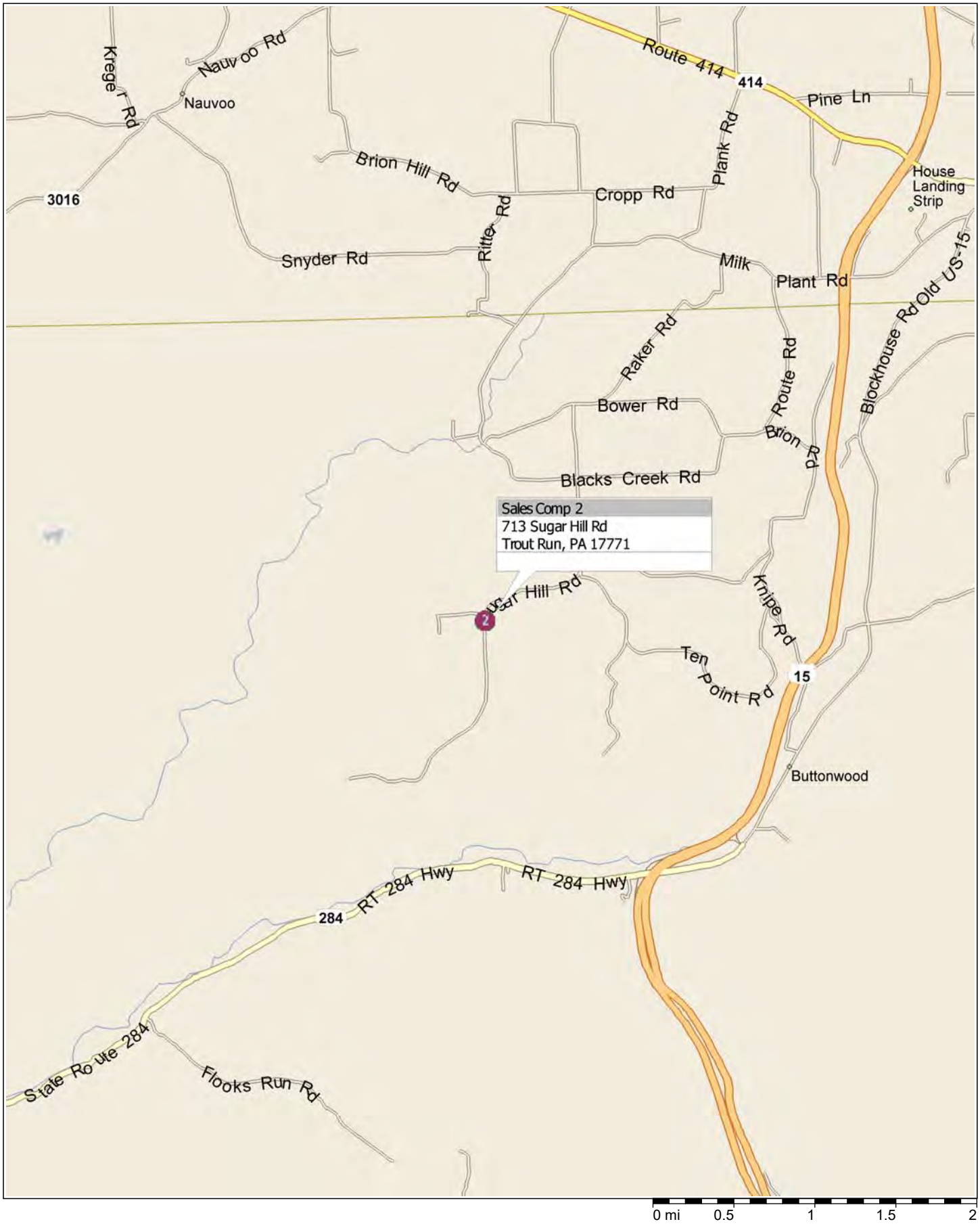
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



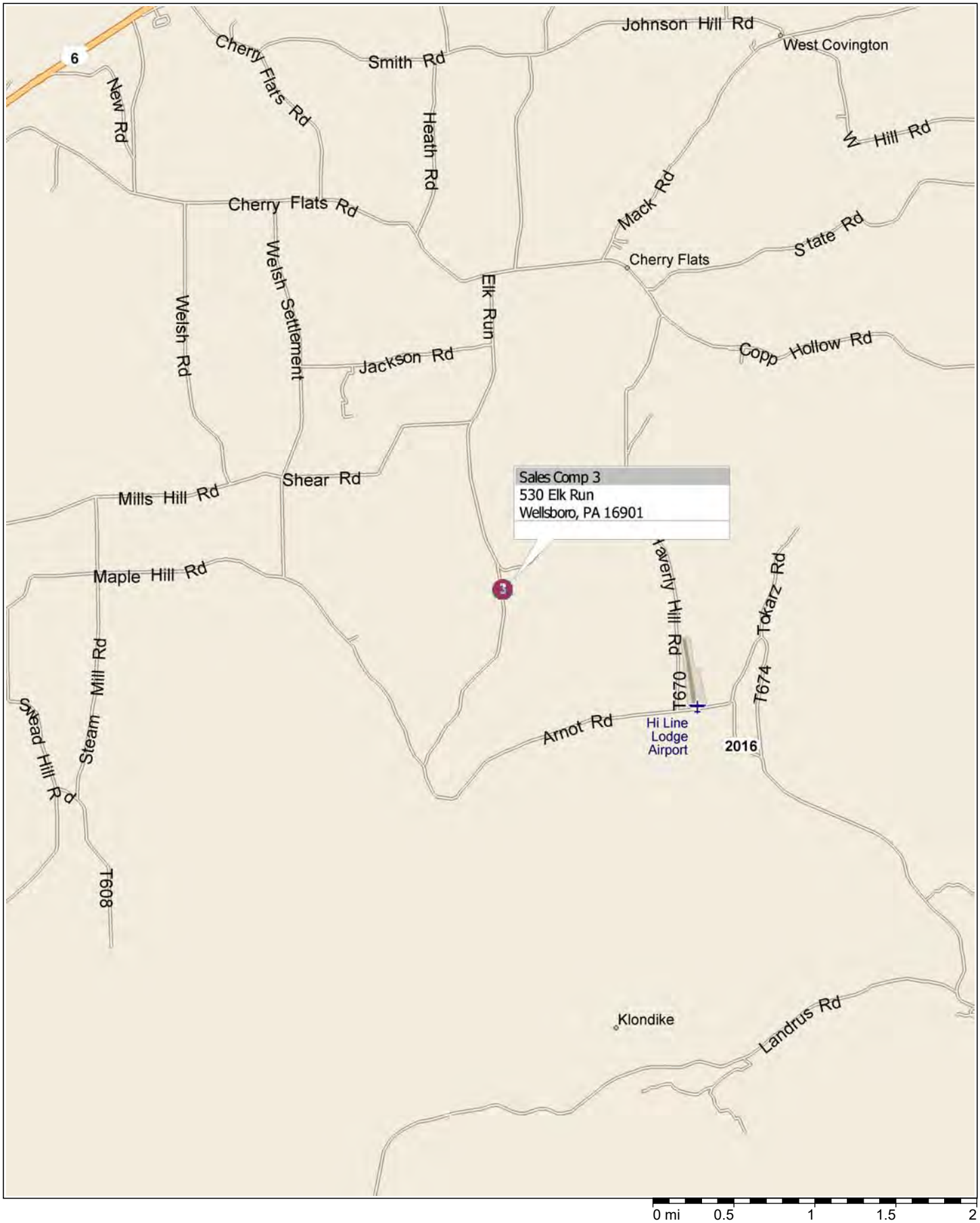
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



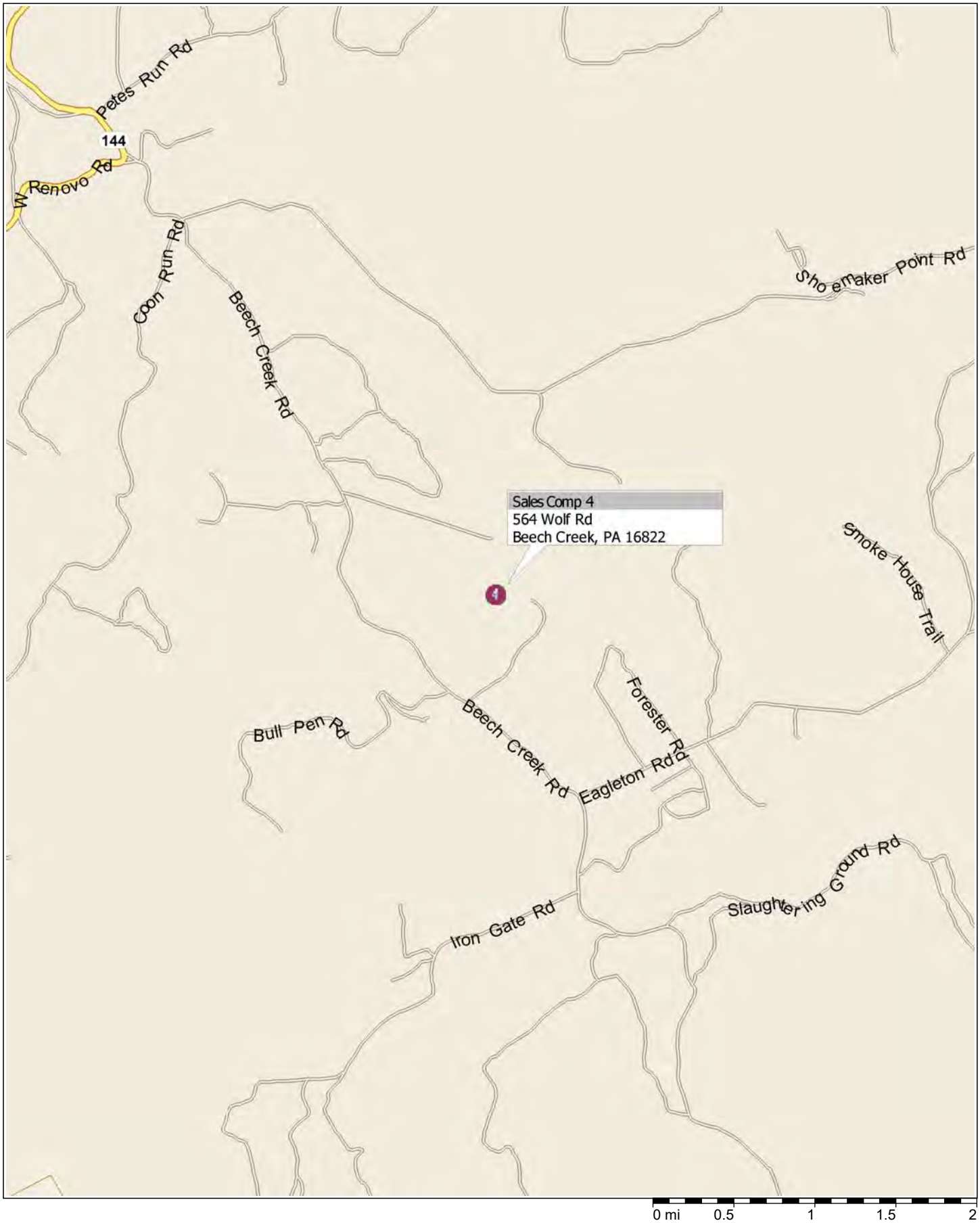
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



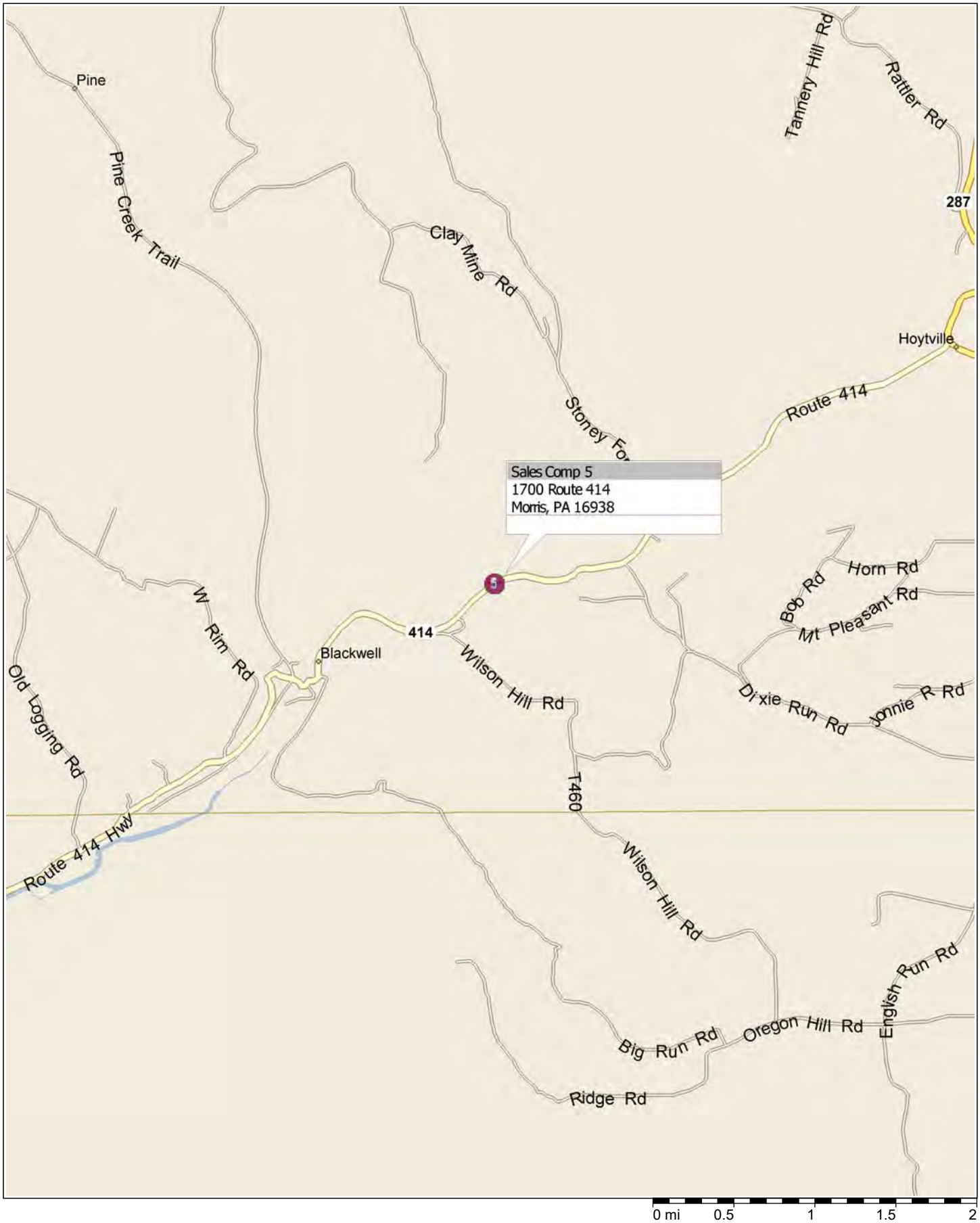
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



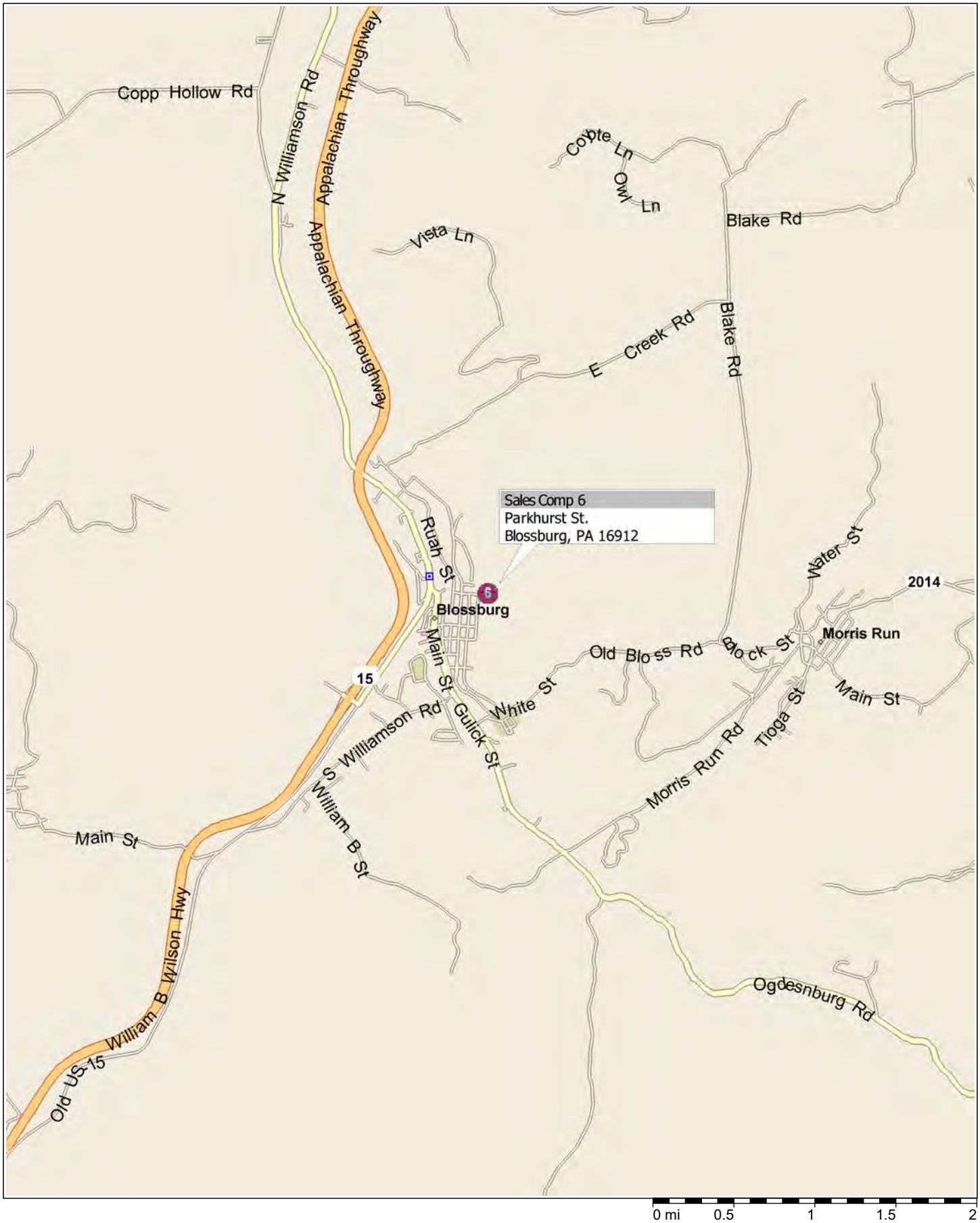
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



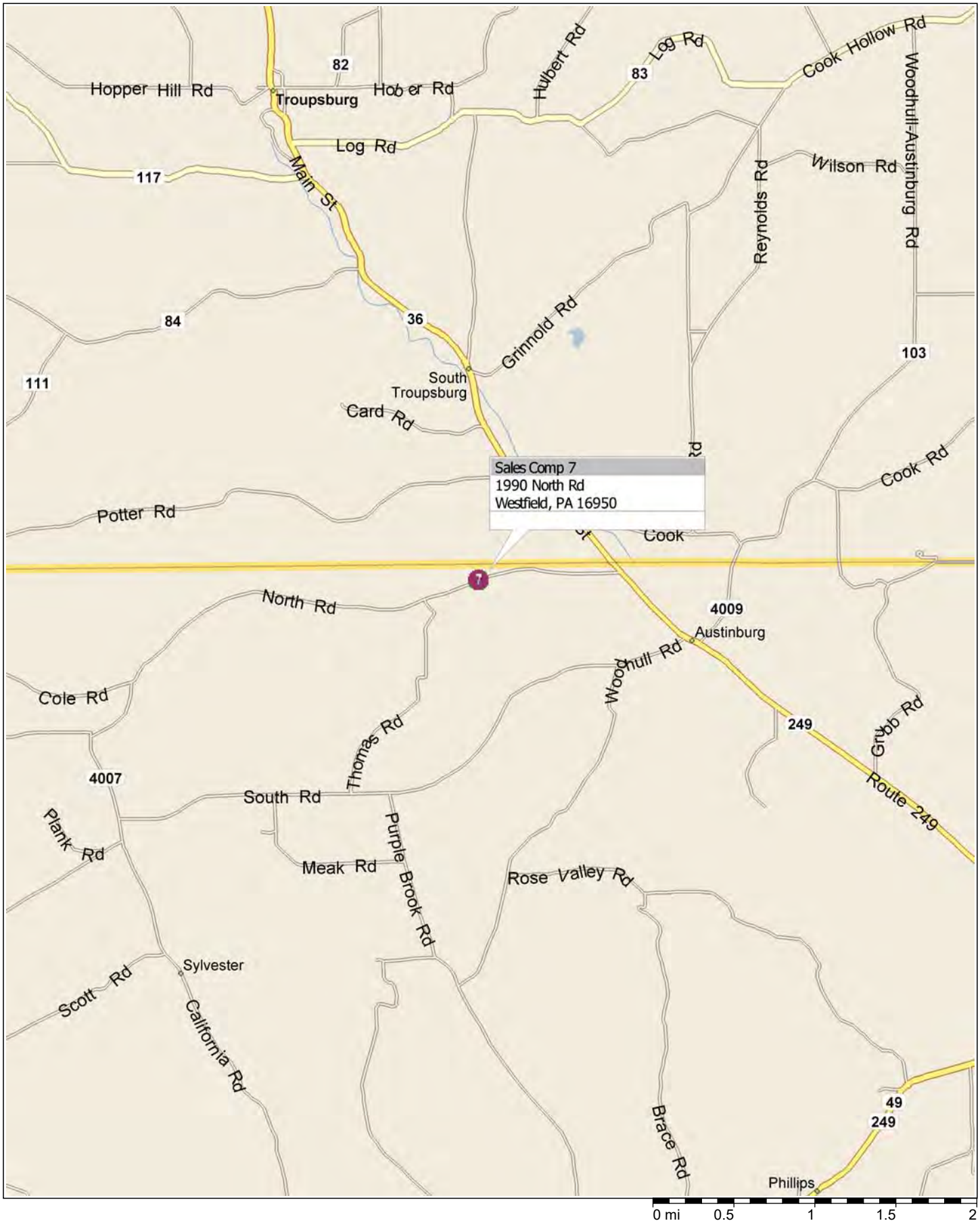
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



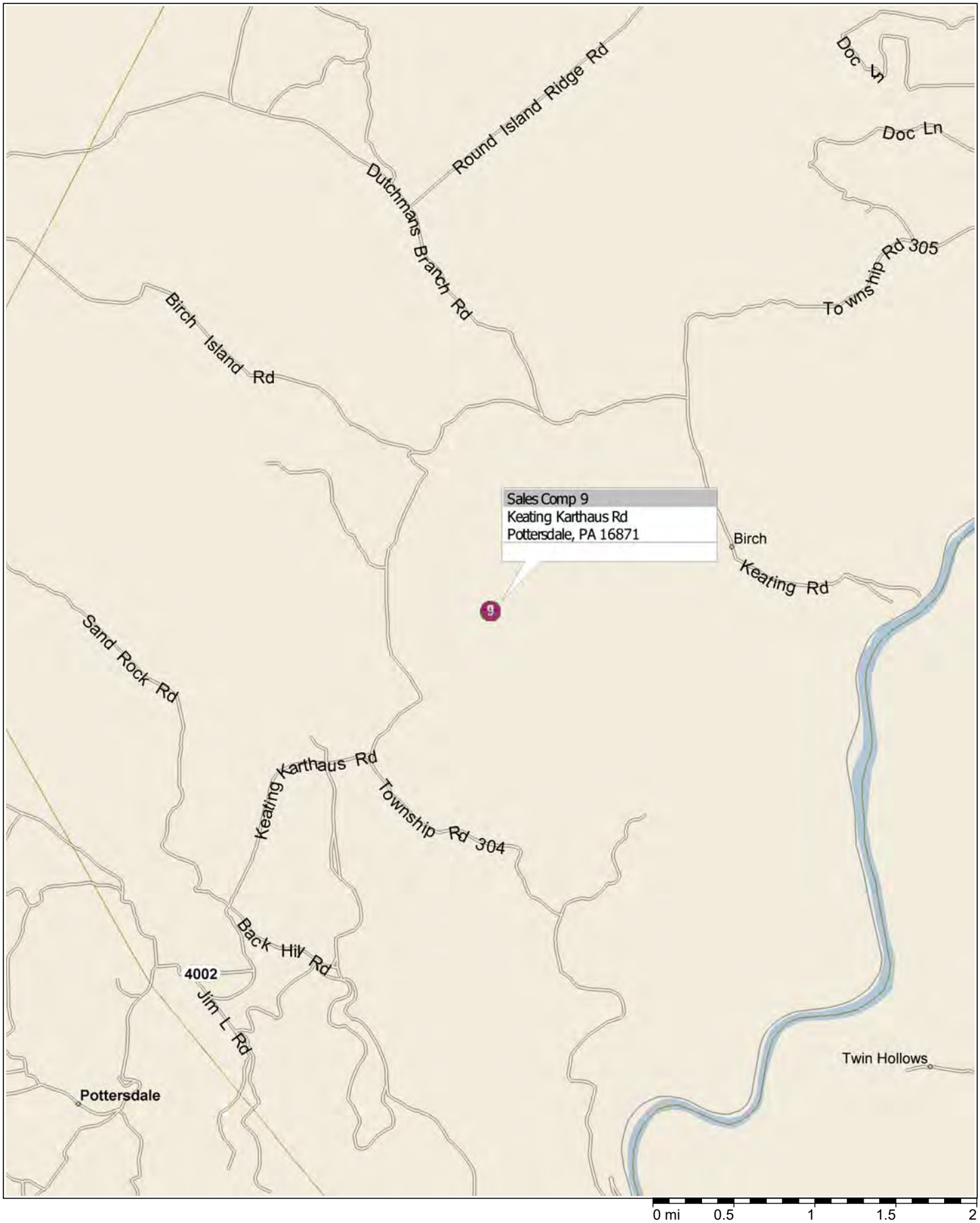
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



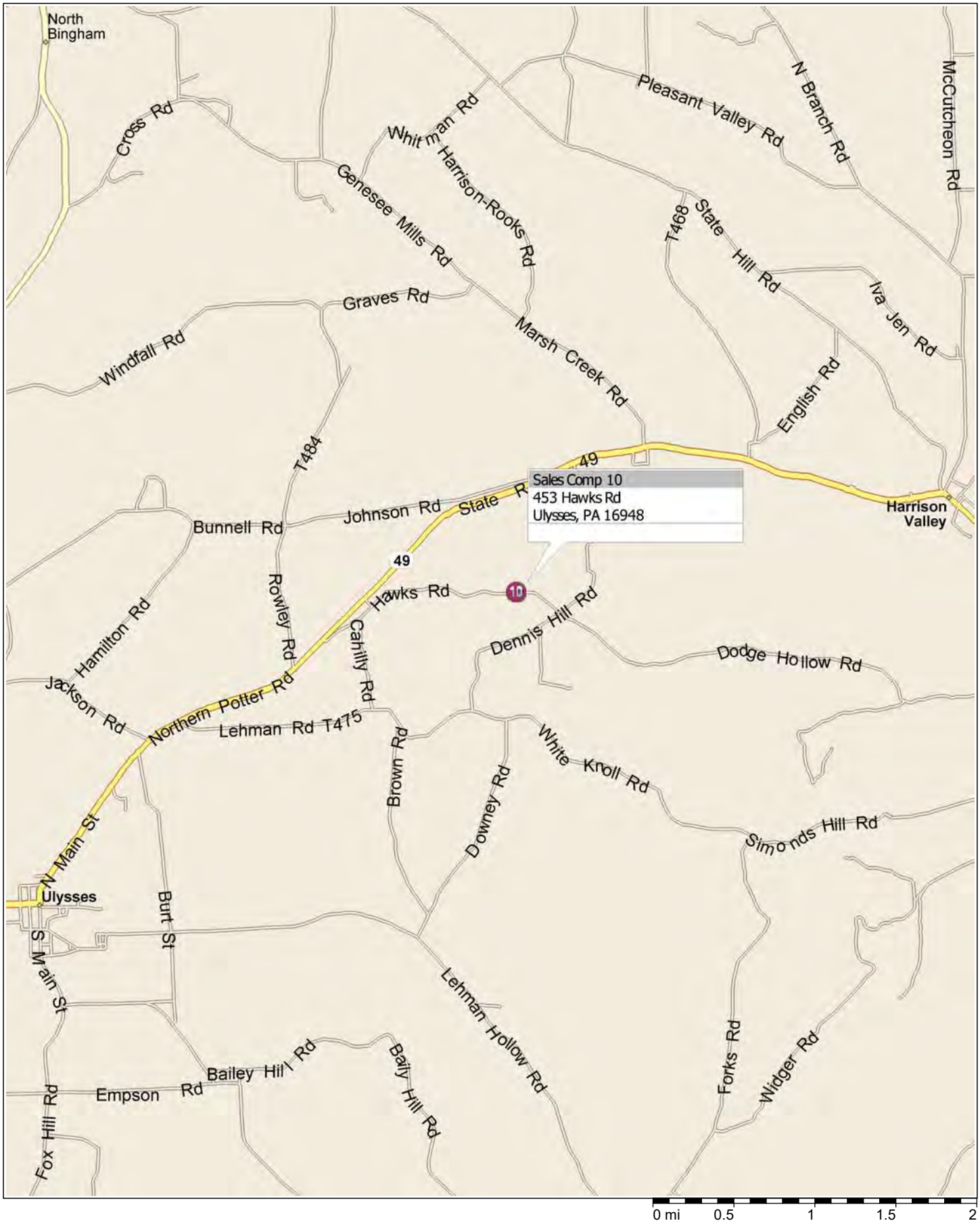
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



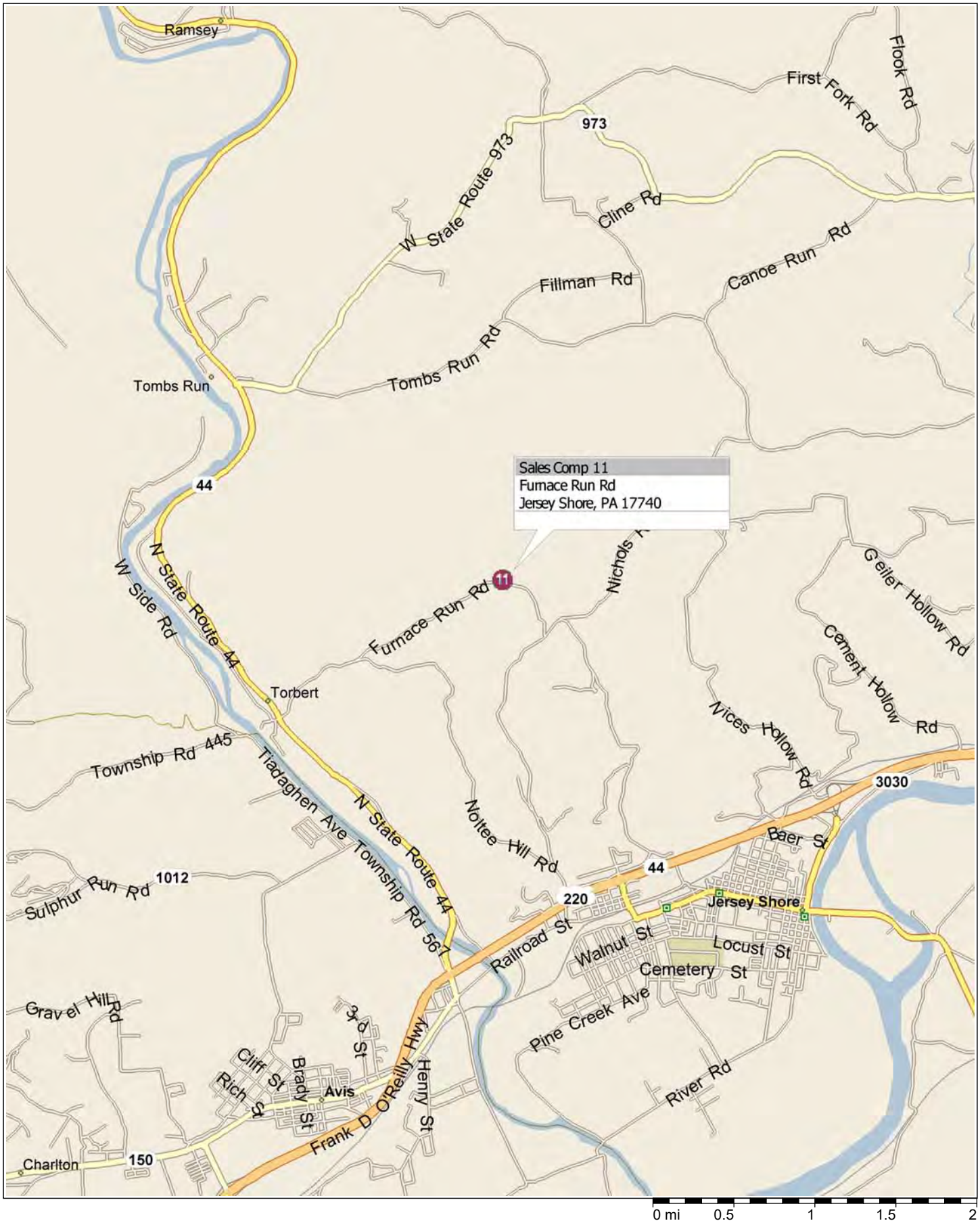
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



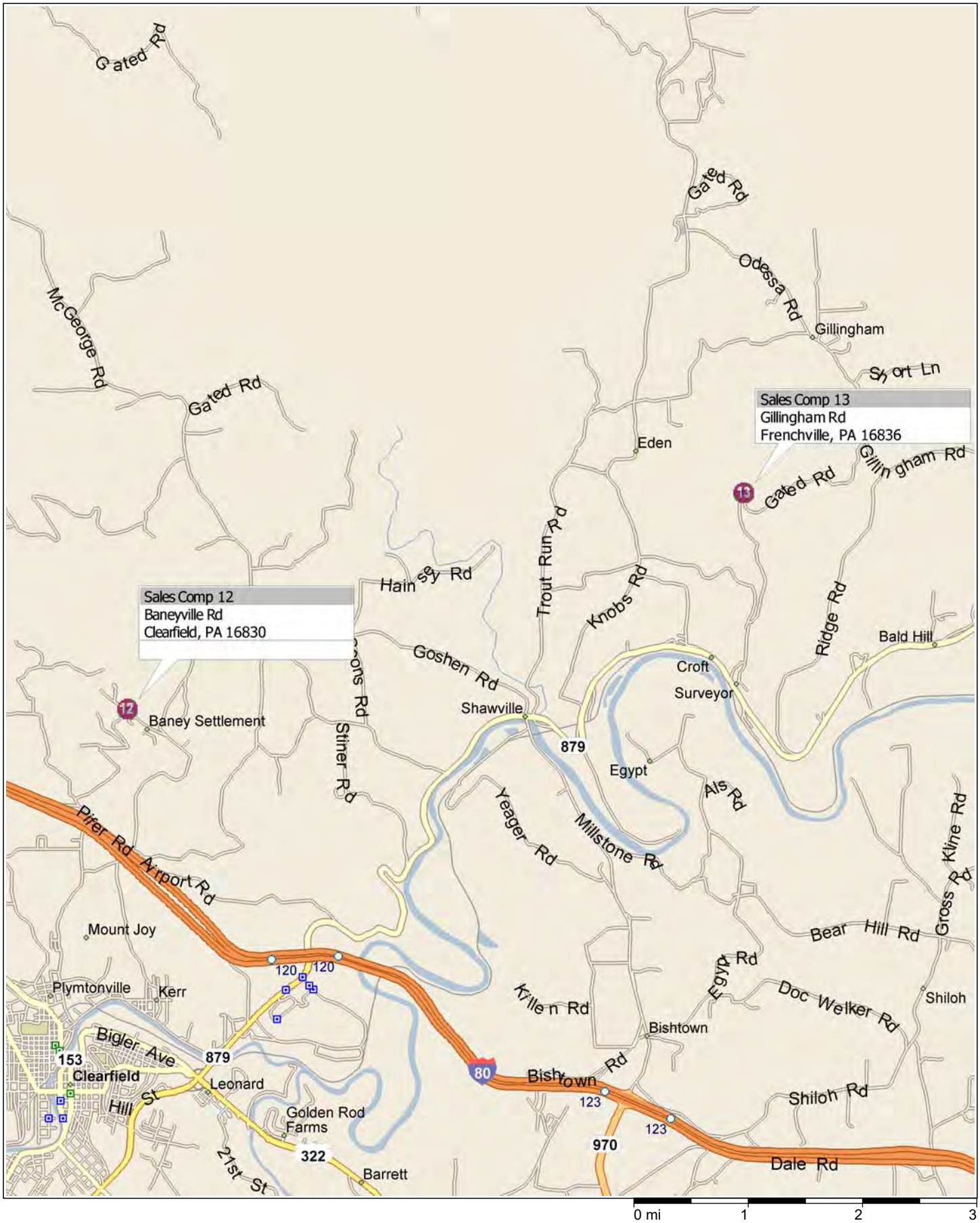
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-097 - Sales Comp Location



Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

Sales Analysis

Property Identification

Sale #	10518088	Date Sold	February-18	Deed Reference	201800741
Tax Parcel ID	040-006-015A	Sale Price	$350,000	Zoning	None
Municipal Code	40	Total Acres	172.12	Type of Operation	Woodland
Seller (Grantor)	Claire G. Keller	Price Per Acre	$2,033	Specialty Code	12.0
Buyer (Grantee)	Daryl B. Hurst	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	1032 Genesee Mills Rd			County Zone	I
County	Potter	Financing		Zip Code	16923
Township	Bingham	Type of Lender	Bank	Previous Sale Date	10/5/84
School District	Northern Potter	Amount Financed	$148,000		
Nearest Town	Genesee	Rate		Verified:	PR/Insp/Buyer
Distance From	3 miles east	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$350,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	< 5%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$4,072	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	2,036	/Acre =	0	50%
Woodland	171.89	Acres X	2,036	/Acre =	350,000	50%
Farmstead	0.00	Acres X	4,072	/Acre =	0	100%
Roads & Waste	0.23	Acres X	0	/Acre =	0	0%
Total Land Value	172.12	Acres X	$2,033	/Acre =	$350,000	

Soil Types	%
LhB	2%
LhD	7%
OesD	20%
TuB	3%
UdA	11%
VlC	3%
VlF	21%
VlsF	27%
WoC	2%

Soil Classifications	
Class I	0%
Class II	5%
Class III	5%
Class IV	7%
Class V	11%
Class VI	21%
Class VII	50%

Pasture Soil Types: None

Woodland Soil Types: LhB, LhD, LhsD, OeC OesD, RoE, TuB, UdA, VlV, VlF, VlsF, WeD, WoC

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: None

Oil & Gas Wells: None

Road Type: Asphalt

Rights Transferred

Fee simple - No O&G Lease recorded. Transmission pipeline running west to east along northern portion of tract.

Comments

Mostly wooded tract that is irregular in shape. Acreage assumed based on a recent survey.

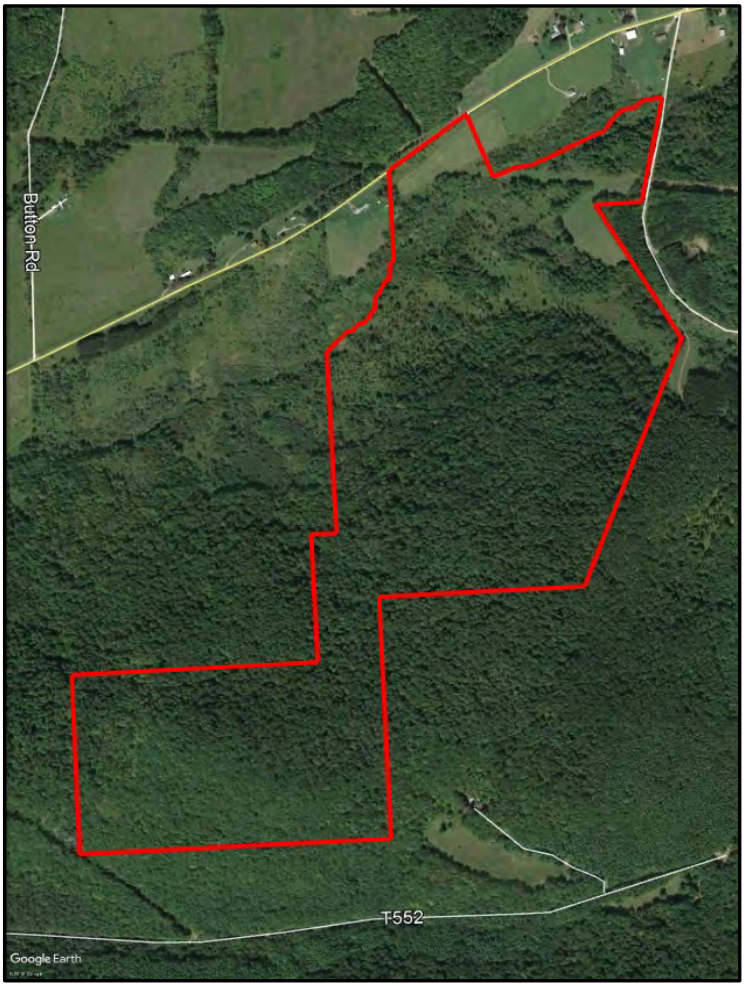
Aerial photography does not indicate any recent timbering.

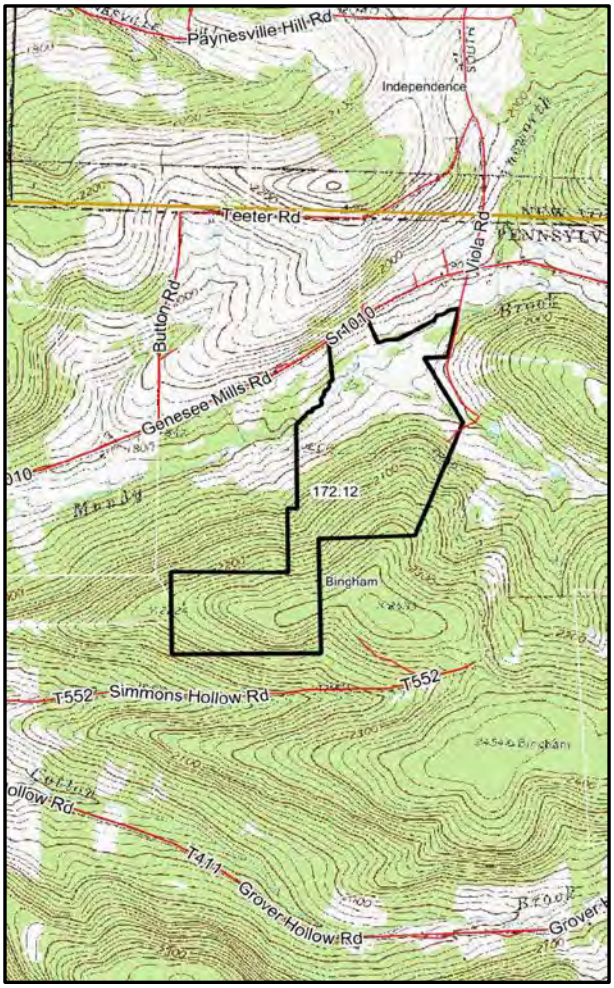
Property transferred as fee simple with no O&G leases at time of purchase. Property is crossed by 50' wide gas transmission line. The closest Marcellus Shale well is 10 miles south. There are several conventional wells located 3 miles east of the subject.

The subject is 11 miles north of a State Forest.

Confirmed with Stephen Bolt ARA, who completed an appraisal on the subject. Landowner was an out of the area buyer and purchasing it as an investment and recreational use.

Sales Photos/Maps





Sales Analysis

Property Identification

Sale #	8117778	Date Sold	November-17	Deed Reference	201700015529
Tax Parcel ID	18-147-117	Sale Price	$650,000	Zoning	Ag
Municipal Code	18	Total Acres	121.88	Type of Operation	Recreational
Seller (Grantor)	Jayne Gerbrick	Price Per Acre	$5,333	Specialty Code	20.0
Buyer (Grantee)	Howard Schmouder	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	713 Sugar Hill Rd			County Zone	I
County	Lycoming	Financing		Zip Code	17771
Township	Jackson	Type of Lender	None	Previous Sale Date	4/17/17
School District	Southern Tioga	Amount Financed	$0		
Nearest Town	Liberty	Rate		Verified:	PR/Insp/Buyer
Distance From	4 miles southwest	Term	yrs.	Terms	Arms Length
Road Frontage	None	Cash Equivalency	$650,000	Cap Rate	0.00%
Utilities:	On-Site	Flood Plain	< 5%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$9,436	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	4,718	/Acre =	0	50%
Woodland	121.88	Acres X	4,718	/Acre =	575,000	50%
Farmstead	0.00	Acres X	9,436	/Acre =	0	100%
Roads & Waste	0.00	Acres X	0	/Acre =	0	0%
Total Land Value	121.88	Acres X	$4,718	/Acre =	$575,000	

Soil Types	%
LbB	17%
LbD	11%
OxB	1%
OxD	1%
OxE	70%
--	0%
--	0%
--	0%
--	0%

Soil Classifications	
Class I	0%
Class II	0%
Class III	0%
Class IV	0%
Class V	0%
Class VI	30%
Class VII	70%

Pasture Soil Types: Pasture Soils
Woodland Soil Types: LbB, LbD, OxB, OxD, OxE

Timber Quality: Average -
Topography: Rolling

Improvements

Buildings: Cabin and two garages - 1152 sq ft - $75,000 contributory value
Oil & Gas Wells: None
Road Type: Gravel - 50' Wide ROW

Rights Transferred

Fee simple - O&G lease dated 4/17/2014 assigned to buyer.

Comments

Wooded tract with a 1152 sq ft cabin which could not be viewed because of gate. Property accessed by an 118' long 50' wide ROW from Sugar Hill Road.

Aerial photography indicates timbering on a portion of the property in the last 10 years.

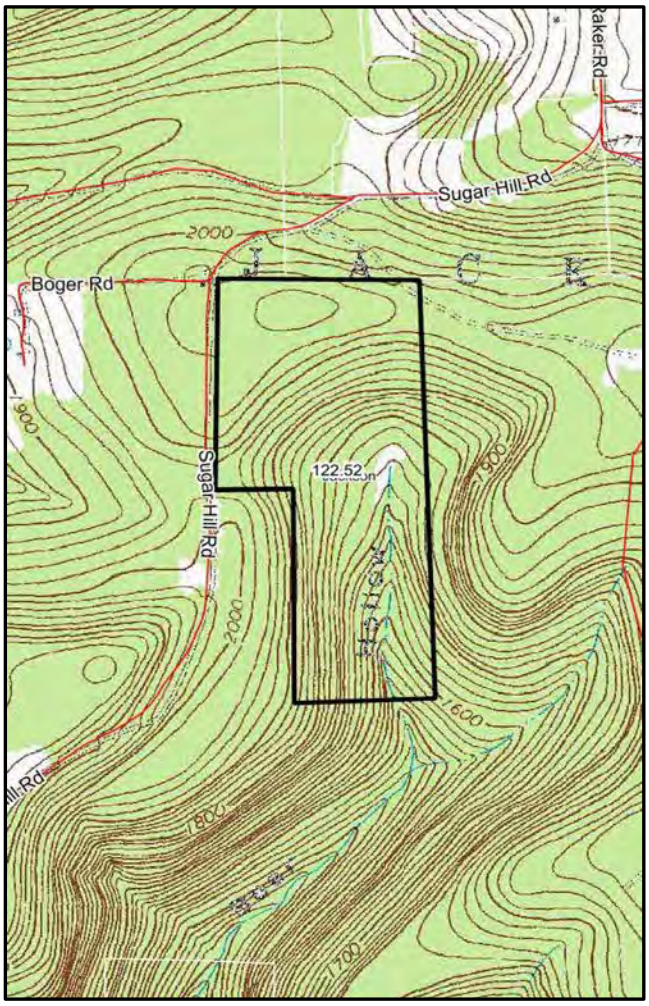
The property was transferred fee simple with a O&G lease dated 4/2014 being assigned to the buyer. There are bands of Marcellus Shale wells 2 miles to the north and 2 miles to the south of the property.

The property is >3 miles east of State Game Lands & <6 miles northwest of a State Forest.

Previous sale dated 3/31/2017 was from an estate to an heir.

Verified with buyer. Buyer's motivation was investment value in timber & OGM rights as well as to establish a hunting camp. Buyers own a saw mill business.

Sales Photos/Maps



Assessment Photo

Sales Analysis

Property Identification

Sale #	11717702	Date Sold	October-17	Deed Reference	201709339 & 201709340
Tax Parcel ID	See Comments	Sale Price	$766,880	Zoning	AR
Municipal Code	4	Total Acres	191.72	Type of Operation	Woodland
Seller (Grantor)	Rita Bocher	Price Per Acre	$4,000	Specialty Code	12.0
Buyer (Grantee)	Signor Res/L Viard	% Tillable	7%	Highest & Best Use	Recreational/Timber
Street Address	530 S. Elk Run Rd			County Zone	I
County	Tioga	Financing		Zip Code	16901
Township	Charleston	Type of Lender	None	Previous Sale Date	10/31/58
School District	Wellsboro Area	Amount Financed	$0		
Nearest Town	Wellsboro	Rate		Verified:	PR/Insp/Appr
Distance From	7 miles southeast	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$766,880	Cap Rate	0.00%
Utilities:	On-Site	Flood Plain	5-10%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	12.85	Acres X	$7,653	/Acre =	$98,338	100%
Permanent Pastur	0.00	Acres X	3,826	/Acre =	0	50%
Woodland	172.88	Acres X	3,826	/Acre =	661,502	50%
Farmstead	0.92	Acres X	7,653	/Acre =	7,041	100%
Roads & Waste	5.07	Acres X	0	/Acre =	0	0%
Total Land Value	191.72	Acres X	$4,000	/Acre =	$766,880	

Soil Types	%
BaB	1%
ChB	10%
LsD	1%
MoB	22%
MoC	20%
OgB	2%
OgC	8%
OgD	9%
OTF	25%

Soil Classifications	
Class I	0%
Class II	14%
Class III	42%
Class IV	8%
Class V	0%
Class VI	10%
Class VII	25%

Pasture Soil Types: None

Woodland Soil Types: BaB, ChB, LoB, LoC, LsD, MoB, MoC, OgB, OgC, OgD, OTF, Ow

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: Cabins - No Contributory Value

Oil & Gas Wells: None - Leased 136.72 acres in a unit

Road Type: Gravel

Rights Transferred

Fee simple - 100% of surface t& 50% of subsurface transferred to Signor Resources LLC, 50% of subsurface transfered to L Viard.

Comments

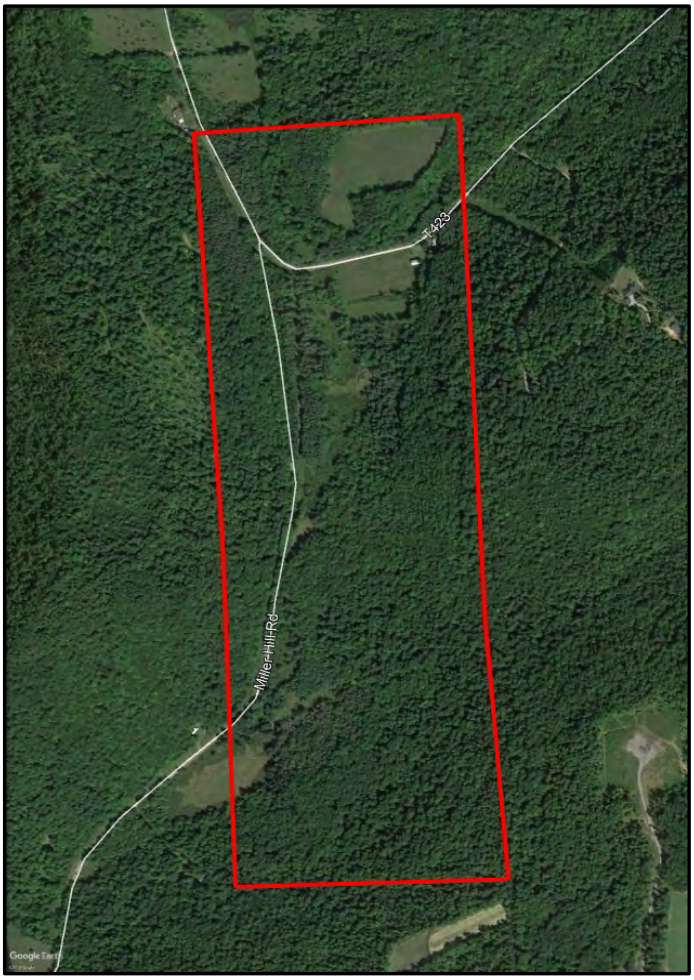
Large mostly wooded tract located on three tax parcels - 04-08.00-024A; 04-08.00-024; 04-08.00-024B; 04-08.00-024C. No evidence of recent timbering is noted on aerial photography. The tract is ½ mile north of a State Forest.

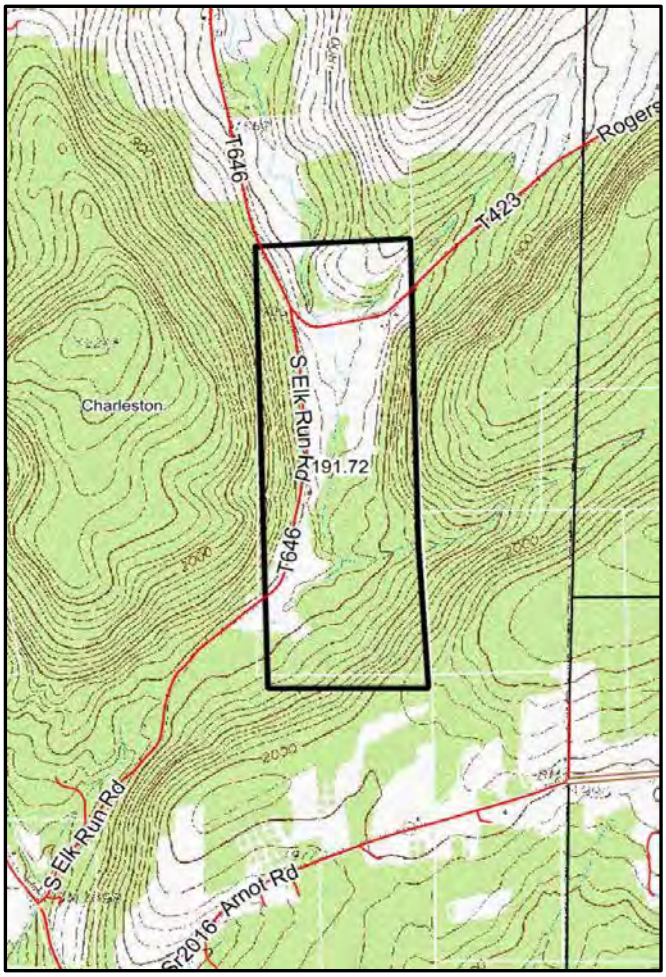
Property transferred via two deeds. They are combined for the purposes of this appraisal as they represent 100% transfer by seller. Both transfers occurred simultaneously. 100% of surface rights and 50% transferred to Signor Resources LLC for $575,160. The remaining transfer of 50% of the subsurface transferred for $191,720 to Lee A Viard FLP. Signor Resources sold the surface for $194,820 on November 1, 2017. This buyer was given first right of refusal for 50% of subsurface rights. Property was on the market for 208 days and was initially listed at $1,323,000.

O&G lease has been initiated. 136.72 acres is declared SWEPI (Shell Oil) unit. An unconventional well has been drilled ½ mile east of the subject, but is designated by the DEP as regulatory inactive status. The area has several wells that are designated regulatory inactive. The active wells are 3+ miles to the east and northeast.

Sale was verified with selling agent by Stephen Bolt, ARA. Motivation was for investment.

Sales Photos/Maps





Sales Analysis

Property Identification

Sale #	3516720	Date Sold	October-16	Deed Reference	2016-4099
Tax Parcel ID	5-24994	Sale Price	$176,850	Zoning	FC
Municipal Code	5	Total Acres	70.74	Type of Operation	Woodland
Seller (Grantor)	Annette Bechdel	Price Per Acre	$2,500	Specialty Code	12.0
Buyer (Grantee)	Terril Fjeldsted	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	564 Wolf Rd			County Zone	I
County	Clinton	Financing		Zip Code	16822
Township	Beech Creek	Type of Lender	Seller	Previous Sale Date	1/30/98
School District	Keystone Central	Amount Financed	$160,000		
Nearest Town	Mill Hall	Rate		Verified:	PR/Insp/Buyer
Distance From	14 miles northwest	Term	yrs.	Terms	Arms Length
Road Frontage	Limited	Cash Equivalency	$176,850	Cap Rate	0.00%
Utilities:	None	Flood Plain	None	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$5,031	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	3,773	/Acre =	0	75%
Woodland	70.30	Acres X	2,516	/Acre =	176,850	50%
Farmstead	0.00	Acres X	5,031	/Acre =	0	100%
Roads & Waste	0.44	Acres X	0	/Acre =	0	0%
Total Land Value	70.74	Acres X	$2,500	/Acre =	$176,850	

Soil Types	%
CgB	33%
CpB	12%
HjC	2%
HmD	44%
WeB	9%
--	0%
--	0%
--	0%
--	0%

Soil Classifications	
Class I	0%
Class II	0%
Class III	0%
Class IV	0%
Class V	0%
Class VI	9%
Class VII	91%

Pasture Soil Types: None

Woodland Soil Types: CgB, CpB, HjC, HmD, WeB

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: Cabin - Limited contributory value

Oil & Gas Wells: Two conventional wells

Road Type: Gravel

Rights Transferred

Fee simple - No recent gas leases were found.

Comments

Wooded tract with frontage on Wolf Road. Located in the Forest Conservation zoning district. There is no indication from aerial photography of any recent timbering,

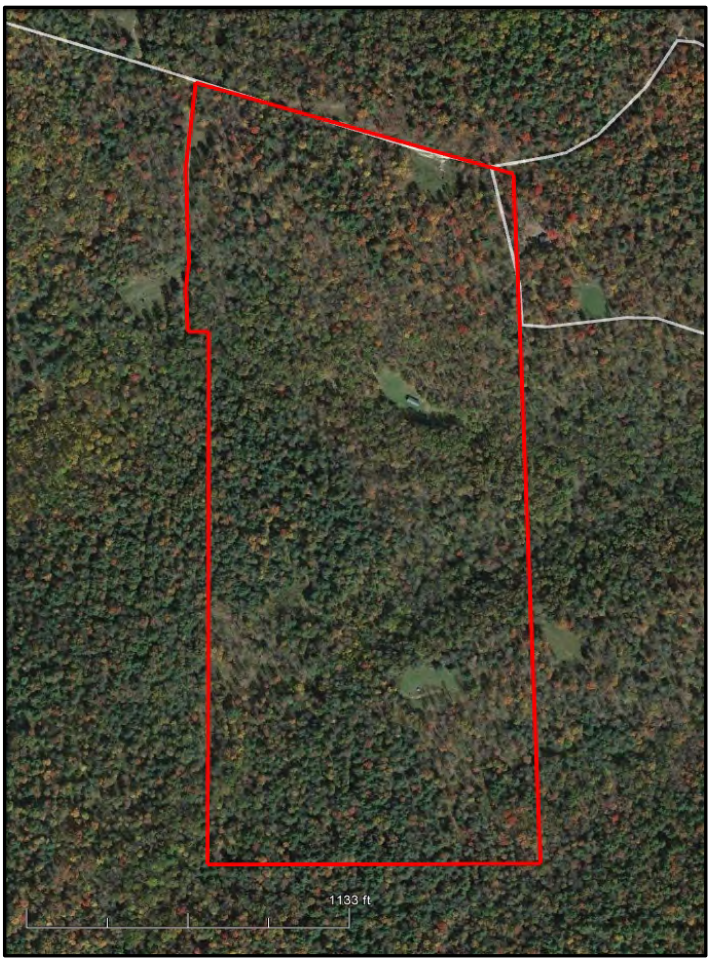
Property has a cabin with limited contributory value.

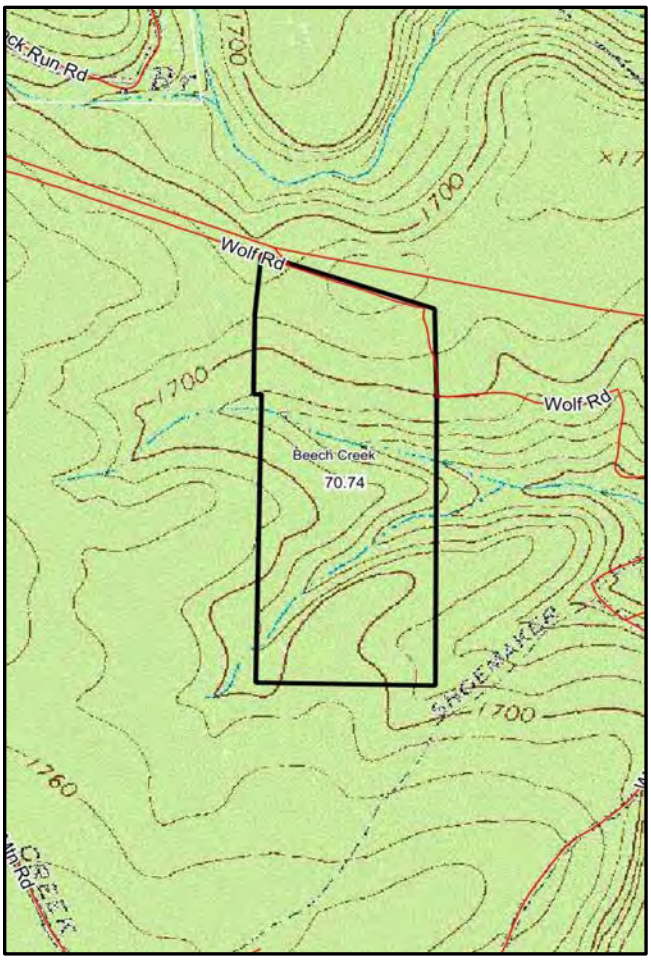
The property transfered with all rights. There are two old conventional wells existing on the property. The immediate area has a number of conventional wells. There are three Marcellus Shale wells located 2 miles southeast of the tract. There are three Marcellus Shale wells 1.5 tp 3 miles north to west of the tract that have been capped.

The tract is approximately ½ mile from a State Forest.

Sale is verified with buyer. Buyer's motivation was to establish a hunting camp.

Sales Photos/Maps





Sales Analysis

Property Identification

Sale #	11716719	Date Sold	October-16	Deed Reference	201611274
Tax Parcel ID	See Comments	Sale Price	$560,000	Zoning	RP
Municipal Code	24	Total Acres	143.10	Type of Operation	Woodland
Seller (Grantor)	Eric L. Gottshall	Price Per Acre	$3,913	Specialty Code	12.0
Buyer (Grantee)	Stephen A. Wolfe	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	(1700) Route 414			County Zone	I
County	Tioga	Financing		Zip Code	16938
Township	Morris	Type of Lender	Bank	Previous Sale Date	9/18/89
School District	Southern Tioga	Amount Financed	$605,000		
Nearest Town	Morris	Rate		Verified:	PR/Insp
Distance From	4 miles southwest	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$560,000	Cap Rate	0.00%
Utilities:	On-Site	Flood Plain	10-15%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$7,814	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	3,907	/Acre =	0	50%
Woodland	140.45	Acres X	3,907	/Acre =	548,748	50%
Farmstead	1.44	Acres X	7,814	/Acre =	11,252	100%
Roads & Waste	1.21	Acres X	0	/Acre =	0	0%
Total Land Value	143.10	Acres X	$3,913	/Acre =	$560,000	

Soil Types	%
ChB	15%
MoA	2%
MoC	7%
OgB	1%
OgC	10%
OgD	7%
OTF	43%
Po	12%
Wz	0%

Soil Classifications	
Class I	0%
Class II	27%
Class III	10%
Class IV	10%
Class V	0%
Class VI	7%
Class VII	43%

Pasture Soil Types: None

Woodland Soil Types: ChB, MoA, MoB, OgB, OgC, OgD, OTF, Po, Wz

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: Cabin and small outbuilding - Fair condition with limited utility - No contributory value

Oil & Gas Wells: None

Road Type: Asphalt

Rights Transferred

Fee simple - Property was put under lease for 5 years December 29, 2009 with an ability to extend another 5 years.

Comments

Large wooded tract with a small cabin that has no CV. The property is mostly wooded and is located on Route 414, just west of the Pine Creek Gorge.

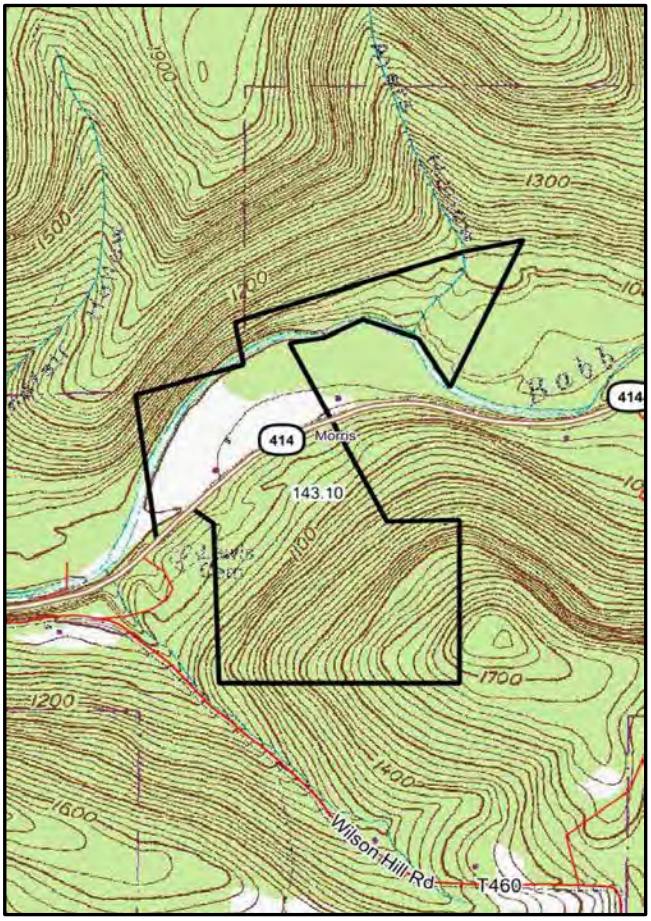
The property has no aerial evidence of any timbering within the last 20 years.

The property was transferred with all its rights. An O&G lease was filed in 2009. No record of extension. There is a Marcellus Shale well 1.5 miles southeast.

The property is adjacent to a State Forest.

The property was a private sale, no MLS histroy was found. Buyer and Seller were attempted to be reached by phone and USPS. No response was received. The public information is deemed reliable.

Sales Photos/Maps



Sales Analysis

Property Identification

Sale #	11716652	Date Sold	September-16	Deed Reference	201608817
Tax Parcel ID	See Comments	Sale Price	$770,000	Zoning	LR
Municipal Code	2	Total Acres	216.60	Type of Operation	Woodland
Seller (Grantor)	Timbervest Partners	Price Per Acre	$3,555	Specialty Code	12.0
Buyer (Grantee)	KLJ Enterprises	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	(206) Parkhurst St			County Zone	I
County	Tioga	Financing		Zip Code	16912
Township	Blossburg	Type of Lender	Individual	Previous Sale Date	1/5/06
School District	Southern Tioga	Amount Financed	$755,709		
Nearest Town	Blossburg	Rate		Verified:	PR/Insp/Buyer
Distance From	Adjacent	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$770,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	< 5%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs, Pipeline	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$7,136	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	3,568	/Acre =	0	50%
Woodland	215.81	Acres X	3,568	/Acre =	770,000	50%
Farmstead	0.00	Acres X	7,136	/Acre =	0	100%
Roads & Waste	0.79	Acres X	0	/Acre =	0	0%
Total Land Value	216.60	Acres X	$3,555	/Acre =	$770,000	

Soil Types	%
ChC	0%
LsD	0%
MaB	30%
MaC	16%
MaD	2%
OTF	46%
SM	5%
--	0%
--	0%

Soil Classifications	
Class I	0%
Class II	30%
Class III	16%
Class IV	2%
Class V	0%
Class VI	0%
Class VII	52%

Pasture Soil Types: None

Woodland Soil Types: ChC, LsD, MaB, MaC, MaD, OTF, SM

Timber Quality: Fair

Topography: Steep

Improvements

Buildings: None

Oil & Gas Wells: None - Gas Gathering Pipeline

Road Type: Gravel

Rights Transferred

Fee simple with no gas leases noted in the last 10 years. Property is crossed by a 75' wide collector gas pipeline.

Comments

Large timber tract located on the east side of Blossburg.

Aerial photography indicates timbering within the last 10 years.

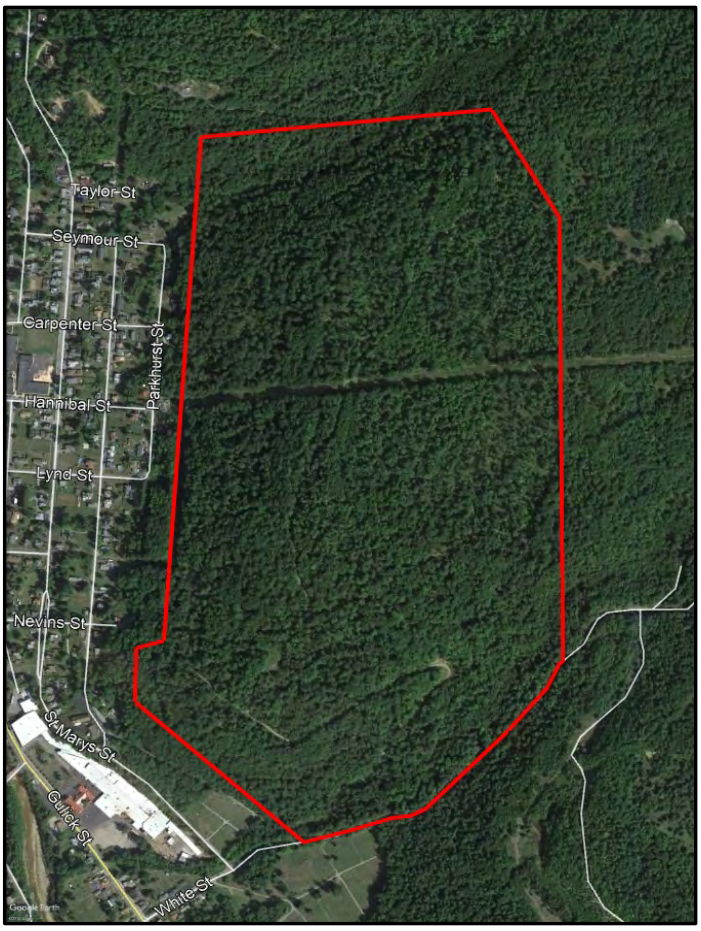
Fee simple with no gas leases noted in the last 10 years. Closest Marcellus Shale well is 0.7 miles from from the tract. There is a 75' wide pipeline that runs east to west from the wells located within 1 mile of the tract.

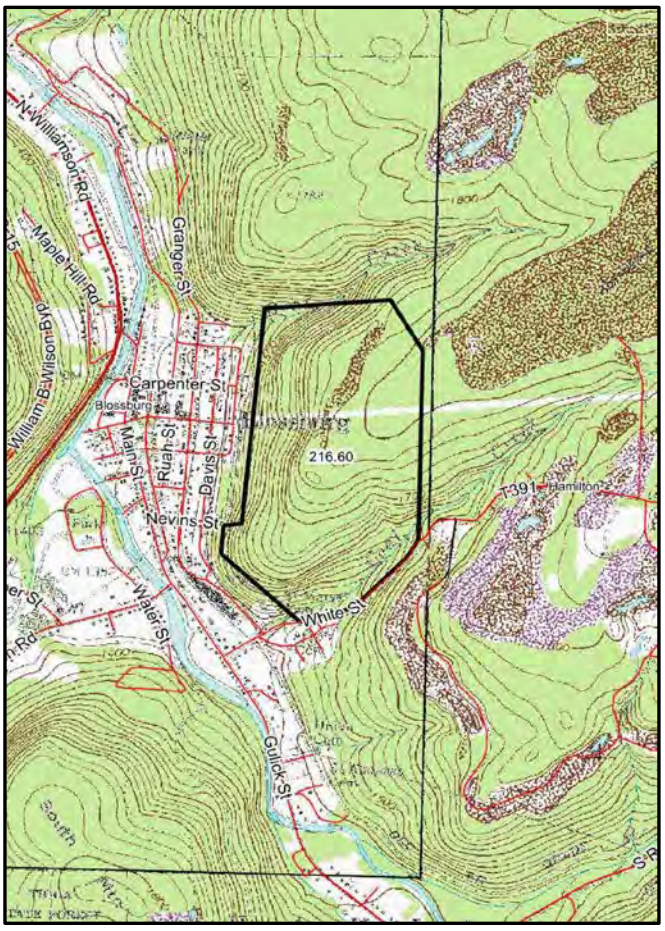
Less than 1 mile south of a State Forest.

Confirmed with buyer. Buyer bought as an investment. Timber rights have been retained by seller, buyer intends to sell surface and retain the subsurface rights.

Sale # 11716652

Sales Photos/Maps





Sales Analysis

Property Identification

Sale #	11716452	Date Sold	July-16	Deed Reference	201606681
Tax Parcel ID	03-02.00-016	Sale Price	$520,000	Zoning	RH
Municipal Code	3	Total Acres	117.50	Type of Operation	Bareland
Seller (Grantor)	Lang Family Trust	Price Per Acre	$4,426	Specialty Code	9.0
Buyer (Grantee)	DHQM, LLC	% Tillable	5%	Highest & Best Use	Cropland
Street Address	1984 North Road			County Zone	I
County	Tioga	Financing		Zip Code	16928
Township	Brookfield	Type of Lender	None	Previous Sale Date	10/26/07
School District	Northern Tioga	Amount Financed	$0		
Nearest Town	Knoxville	Rate		Verified:	PR/Insp/Appr
Distance From	5 miles northwest	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$520,000	Cap Rate	0.00%
Utilities:	On-Site	Flood Plain	< 5%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	6.30	Acres X	$8,416	/Acre =	$53,018	100%
Permanent Pastur	0.00	Acres X	4,208	/Acre =	0	50%
Woodland	109.38	Acres X	4,208	/Acre =	460,249	50%
Farmstead	0.80	Acres X	8,416	/Acre =	6,732	100%
Roads & Waste	1.02	Acres X	0	/Acre =	0	0%
Total Land Value	117.50	Acres X	$4,426	/Acre =	$520,000	

Soil Types	%
LoB	2%
LoD	16%
OTF	15%
Ow	6%
VoC	11%
VvB	3%
VvC	31%
VvD3	12%
WyC	3%

Soil Classifications	
Class I	0%
Class II	8%
Class III	46%
Class IV	3%
Class V	0%
Class VI	28%
Class VII	15%

Pasture Soil Types: None

Woodland Soil Types: LoB, LoD, LRF, OTF, Ow, VoB, VoC, VvB, VvC, VvD3, WyC

Timber Quality: Fair

Topography: Rolling

Improvements

Buildings: 1876 sq ft dwelling that is unoccupied. Fair condition with poor utility

Oil & Gas Wells: None

Road Type: Asphalt

Rights Transferred

The property was transferred with all rights. There was a gas lease dated November 1, 1989 for five years. A five year period extension was allowed, but no filing was located.

Comments

The property is located on the south side of North Road and in close proximity to the New York state line. The property has a dwelling that is unoccupied and appears to have been unoccupied for some time.

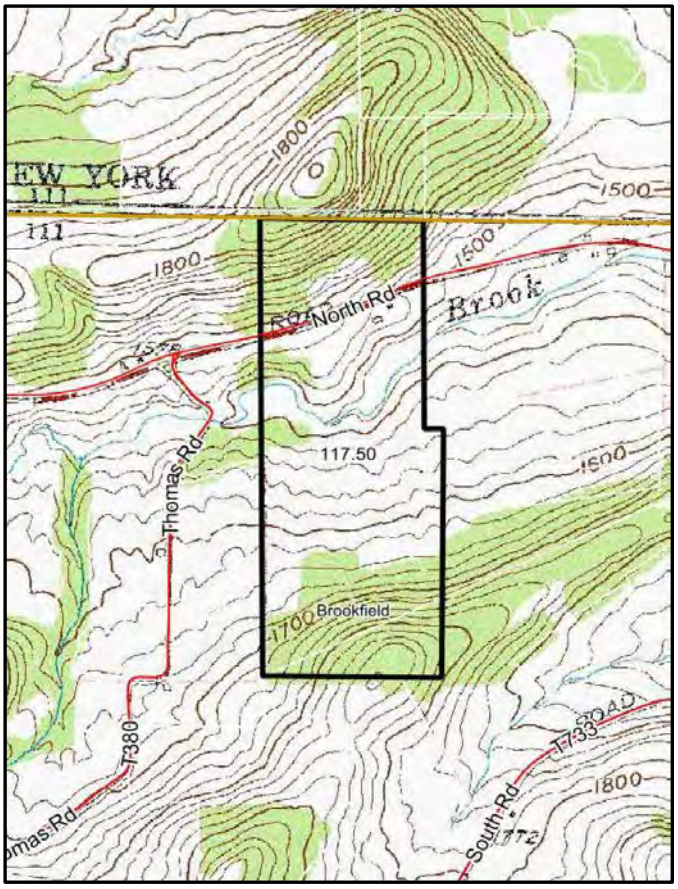
The property is a mixture of mostly woodland and a small amount of open land. The woodland is partially in average condition with the remainder in wet areas with little timber value.

The property has transferred a number of times within the family. No deed reserved any OGM rights. The O&G lease is old and does not appear to have been renewed. It is within 1 mile northwest and 1 mile east of a Marcellus Shale well.

The property is greater than 10 miles to a State Forest.

Sale was veriied with buyer on 9/21/2018. Buyers motivation was as an investiment in the timber and subsurface rights. Seller was an estate settlement.

Sales Photos/Maps



Sales Analysis

Property Identification

Sale #	10518453	Date Sold	July-18	Deed Reference	201802646
Tax Parcel ID	040-005-005	Sale Price	$223,500	Zoning	None
Municipal Code	40	Total Acres	138.90	Type of Operation	Woodland
Seller (Grantor)	Brenda Golanoski	Price Per Acre	$1,609	Specialty Code	12.0
Buyer (Grantee)	Ervin Keim	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	(335) Hillcrest Rd.			County Zone	I
County	Potter	Financing		Zip Code	16923
Township	Bingham	Type of Lender	Bank	Previous Sale Date	6/12/07
School District	Northern Potter	Amount Financed	$115,000		
Nearest Town	Genesee	Rate		Verified:	PR/Insp/Appr
Distance From	4 miles southeast	Term	yrs.	Terms	Arms Length
Road Frontage	None	Cash Equivalency	$223,500	Cap Rate	0.00%
Utilities:	None	Flood Plain	None	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Surface Only

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$3,219	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	1,610	/Acre =	0	50%
Woodland	138.85	Acres X	1,610	/Acre =	223,500	50%
Farmstead	0.00	Acres X	3,219	/Acre =	0	100%
Roads & Waste	0.05	Acres X	0	/Acre =	0	0%
Total Land Value	138.90	Acres X	$1,609	/Acre =	$223,500	

Soil Types	%
MqB	18%
MqD	7%
MqsD	9%
OesD	14%
RoE	7%
VlF	15%
WmD	5%
WosC	4%
WosD	11%

Soil Classifications	
Class I	0%
Class II	20%
Class III	3%
Class IV	2%
Class V	0%
Class VI	48%
Class VII	27%

Pasture Soil Types: Pasture Soils

Woodland Soil Types: MqB, MqD, MqrF, MqsD, OeC, OesD, RoE, ViB, VlD, VlF, WmD, WosC, WosD

Timber Quality: Fair

Topography: Rolling

Improvements

Buildings: None

Oil & Gas Wells: None

Road Type: Gravel

Rights Transferred

Surface only - No lease found in Recorder of deeds

Comments

Wooded tract with limited road frontage on Hillcrest Road. Acreage assumption and aerial location based on deed & plat info, tax maps appear to be incorrect.

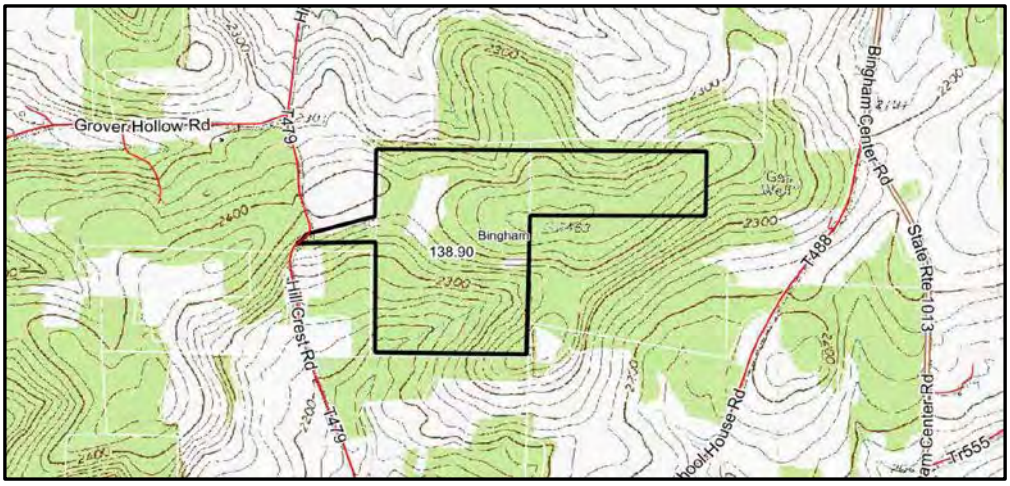
Aerial photography indicates recent timbering in the last 10 years.

Previous owner has retained OGM rights. No record of any O&G lease could be found. The closest Marcellus Shall well is 7 miles to the southeast. There several conventional wells 3 miles south.

Property is 9+ miles north of any State Forest.

Confirmed by Stephen Bolt ARA. Buyer purchased for recreational use. No subsurface rights included.

Sales Photos/Maps



Sales Analysis

Property Identification

Sale #	3517330	Date Sold	May-17	Deed Reference	2017-2003
Tax Parcel ID	16-27603	Sale Price	$205,000	Zoning	RF
Municipal Code	16	Total Acres	131.00	Type of Operation	Woodland
Seller (Grantor)	William Crisp	Price Per Acre	$1,565	Specialty Code	12.0
Buyer (Grantee)	Glenn Condo Jr.	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	458 Addition Ln			County Zone	I
County	Clinton	Financing		Zip Code	16871
Township	West Keating	Type of Lender	None	Previous Sale Date	1/3/01
School District	West Branch Area	Amount Financed	$0		
Nearest Town	Pottersdale	Rate		Verified:	PR/Insp/Buyer
Distance From	4 miles northeast	Term	yrs.	Terms	Arms Length
Road Frontage	Limited	Cash Equivalency	$205,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	None	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Surface Only

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$3,137	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	2,353	/Acre =	0	75%
Woodland	130.69	Acres X	1,569	/Acre =	205,000	50%
Farmstead	0.00	Acres X	3,137	/Acre =	0	100%
Roads & Waste	0.31	Acres X	0	/Acre =	0	0%
Total Land Value	131.00	Acres X	$1,565	/Acre =	$205,000	

Soil Types	%
CfB	7%
ChB	6%
CpD	12%
GpB	1%
HoF	30%
NoA	3%
WgB	40%
--	0%
--	0%

Soil Classifications	
Class I	0%
Class II	1%
Class III	0%
Class IV	3%
Class V	0%
Class VI	40%
Class VII	56%

Pasture Soil Types: None

Woodland Soil Types: CfB, ChB, CpD, GpB, HoF, NoA, WgB

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: Cabin - Limited contributory value

Oil & Gas Wells: None

Road Type: Gravel

Rights Transferred

Surface only - OGM rights reserved by pervious owner. Most recent O&G lease terminated 8/1/2013.

Comments

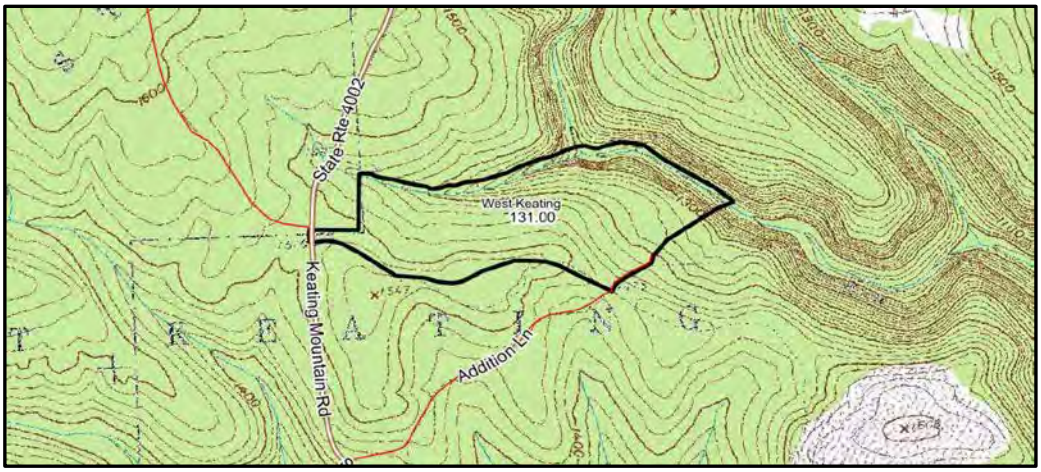
Wooded tract with limited access on Keating-Kaulhaus Road. Property has a cabin that has limited amount of contributory value.

Property was transferred as surface only. There is presently no gas lease. The closest conventional well is 3 miles northeast of the tract. There are a number of conventional wells approximately 6 miles southeast. The closest Marcellus Shale well is approximately 4 miles from the tract. A band of Marcellus Shale wells are located 8 to 16 miles south/southeast of the subject, with a number of them capped.

The subject is adjacent to a State Forest.

Verified with buyer on 9/10/18. Buyer's motivation for buying was to establish a hunting camp.

Sales Photos/Maps



Sales Analysis

Property Identification

Sale #	10516877	Date Sold	December-16	Deed Reference	201700017
Tax Parcel ID	110-004-043	Sale Price	$174,345	Zoning	None
Municipal Code	110	Total Acres	136.00	Type of Operation	Woodland
Seller (Grantor)	Shirlee S. Leete	Price Per Acre	$1,282	Specialty Code	12.0
Buyer (Grantee)	Northern Appalachian Timber	% Tillable	2%	Highest & Best Use	Recreational/Timber
Street Address	(671) Hawks Rd.			County Zone	I
County	Potter	Financing		Zip Code	16948
Township	Harrison	Type of Lender	None	Previous Sale Date	4/6/07
School District	Northern Potter	Amount Financed	$0		
Nearest Town	Ulysses	Rate		Verified:	PR/Insp/Buyer
Distance From	3 miles northeast	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$174,345	Cap Rate	0.00%
Utilities:	None	Flood Plain	None	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Surface Only

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	2.37	Acres X	$2,531	/Acre =	$5,999	100%
Permanent Pastur	0.00	Acres X	1,266	/Acre =	0	50%
Woodland	133.02	Acres X	1,266	/Acre =	168,346	50%
Farmstead	0.00	Acres X	2,531	/Acre =	0	100%
Roads & Waste	0.61	Acres X	0	/Acre =	0	0%
Total Land Value	136.00	Acres X	$1,282	/Acre =	$174,345	

Soil Types	%
LhD	20%
LhE	5%
OeB	6%
OeC	8%
RoE	6%
VlsF	4%
WmB	6%
WmC	27%
WmD	6%

Soil Classifications	
Class I	0%
Class II	6%
Class III	41%
Class IV	29%
Class V	0%
Class VI	11%
Class VII	14%

Pasture Soil Types: None

Woodland Soil Types: LhD, LhE, MqF, MqsD, OeB, OeC, RoE, RoF, VlD, VlsF, WmB, WmC, WmD

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: None

Oil & Gas Wells: None

Road Type: Gravel

Rights Transferred

Surface only. The OGM rights have been retained by previous owner. The pervious owner has an O&G lease for 5 years starting 3/26/2015.

Comments

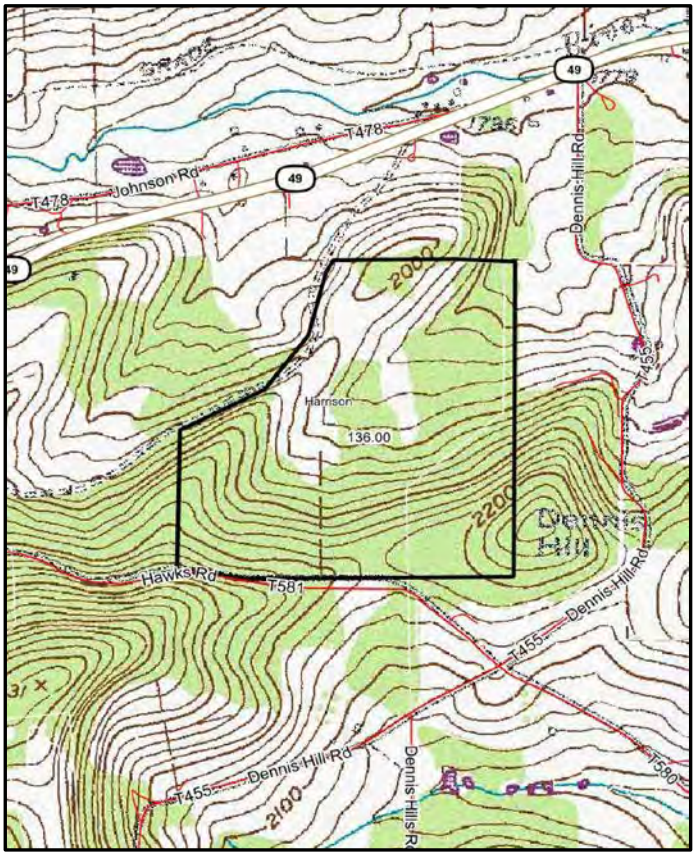
Wooded tract which was sold as surface only sale. The previous owner has retained the OGM rights and had already entered into a lease with JKLM Energy LLC. The closest Marcellus Shale gas well is approximately 3 miles southeast of the subject and is the only well in close proximity. There are a number of conventional wells 2 - 4 miles west of the subject.

Deed states sale amount of $175,344.56 with $103,500 allocated to land and $70,844.56 allocated to timber.

Closest State Forest is >6 miles.

Confirmed with buyer. Buyer is a timber company and purchased several other parcels for their timber. Property had been selective timbered in the last 15 years.

Sales Photos/Maps



Sales Analysis

Property Identification

Sale #	8116792	Date Sold	November-16	Deed Reference	201600014550
Tax Parcel ID	58-345-110	Sale Price	$450,000	Zoning	None
Municipal Code	58	Total Acres	177.98	Type of Operation	Woodland
Seller (Grantor)	Dennis Rearick	Price Per Acre	$2,528	Specialty Code	12.0
Buyer (Grantee)	Robert Berfield Rev Tr	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	(511) Furnace Run Rd			County Zone	I
County	Lycoming	Financing		Zip Code	17740
Township	Watson	Type of Lender	None	Previous Sale Date	9/24/14
School District	Jersey Shore Area	Amount Financed	$0		
Nearest Town	Jersey Shore	Rate		Verified:	PR/Insp/Buyer
Distance From	3 miles northwest	Term	yrs.	Terms	Arms Length
Road Frontage	50' ROW	Cash Equivalency	$450,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	None	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Surface Only

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$5,057	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	2,528	/Acre =	0	50%
Woodland	177.98	Acres X	2,528	/Acre =	450,000	50%
Farmstead	0.00	Acres X	5,057	/Acre =	0	100%
Roads & Waste	0.00	Acres X	0	/Acre =	0	0%
Total Land Value	177.98	Acres X	$2,528	/Acre =	$450,000	

Soil Types	%
BeC	9%
BeD	6%
BuD	10%
DkD	6%
DlE	11%
LgD	24%
OxD	9%
OxE	15%
WkE	7%

Soil Classifications	
Class I	0%
Class II	3%
Class III	9%
Class IV	6%
Class V	0%
Class VI	49%
Class VII	33%

Pasture Soil Types: None

Woodland Soil Types: BeC, BeD, BuD, DkD, DlE, LgD, OxD, OxE, WkE, BeB

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: No permanent structues of value

Oil & Gas Wells: None

Road Type: Gravel

Rights Transferred

Surface Only - OGM rights retained by previous owner. O&G lease dated 5/10/2006 for 5 years. No record of extension

Comments

Wooded tract with access by 50' shared ROW. Property has some improvements, but they are either not permanent or are not of any value. Buyer indicated there is a good amount of valuable timber.

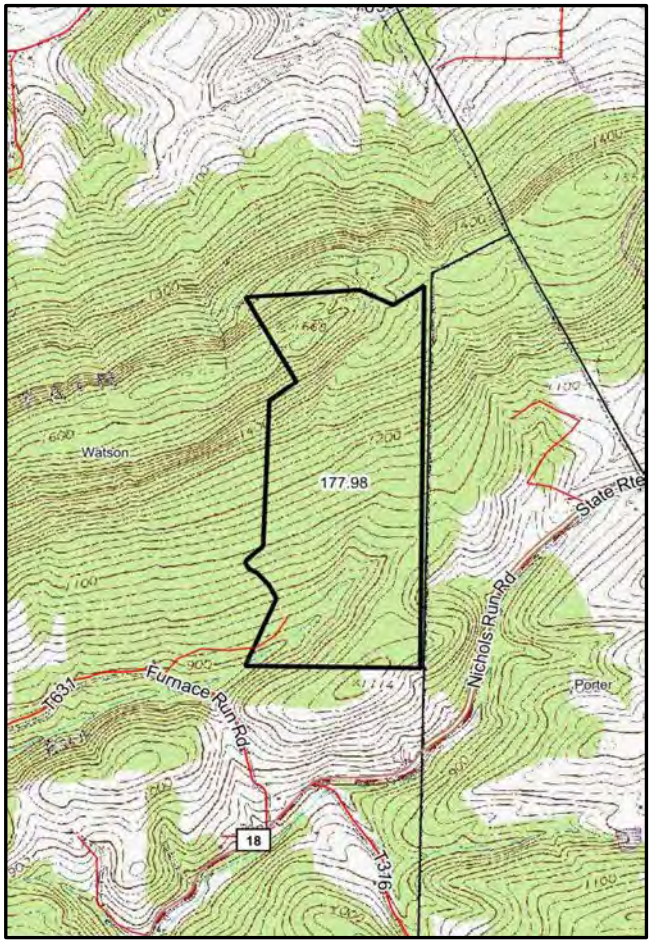
Surface only transfer, subsurface rights retained by previous owner. The closest Marcellus Shale well is 2.5 miles north. There are numerous wells to the north.

State forest is withing 2.5 miles of the subject.

Previous sale date 9/29/2014 was a transfer of 1/2 interest, giving the seller 100% ownership.

Confirmed with buyer on 9/6/2018. Buyer motivated by investment and a desire to conserve. Seller was going through divorce.

Sales Photos/Maps



Sales Analysis

Property Identification

Sale #	3316791	Date Sold	November-16	Deed Reference	201613275
Tax Parcel ID	1230K0600000017	Sale Price	$721,000	Zoning	RA
Municipal Code	123	Total Acres	340.13	Type of Operation	Woodland
Seller (Grantor)	Timbervest Part PA	Price Per Acre	$2,120	Specialty Code	12.0
Buyer (Grantee)	Hawk Forest LLC	% Tillable	2%	Highest & Best Use	Recreational/Timber
Street Address	(423) Baneyville Rd.			County Zone	I
County	Clearfield	Financing		Zip Code	16830
Township	Lawrence	Type of Lender	None	Previous Sale Date	1/5/06
School District	Clearfield Area	Amount Financed	$0		
Nearest Town	Clearfield	Rate		Verified:	PR/Insp/Buyer
Distance From	4 miles northeast	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$721,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	0%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Surface Only

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	5.34	Acres X	$4,188	/Acre =	$22,363	100%
Permanent Pastur	0.00	Acres X	2,094	/Acre =	0	50%
Woodland	333.65	Acres X	2,094	/Acre =	698,637	50%
Farmstead	0.00	Acres X	4,188	/Acre =	0	100%
Roads & Waste	1.14	Acres X	0	/Acre =	0	0%
Total Land Value	340.13	Acres X	$2,120	/Acre =	$721,000	

Soil Types	%
92D	7%
GlC	8%
Ph	3%
RaB	3%
RaC	2%
RbF	26%
RcD	16%
WhB	16%
WhC	15%

Soil Classifications	
Class I	0%
Class II	22%
Class III	28%
Class IV	17%
Class V	0%
Class VI	7%
Class VII	26%

Pasture Soil Types: None

Woodland Soil Types: 92D, BrB, CaB, ErC, ErD, GlC, Ph, RaB, RaC, RbF, RcD, WhB, WhC

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: None

Oil & Gas Wells: None

Road Type: Gravel

Rights Transferred

Surface only - a previous owner retained subsurface rights- No record of any gas leases

Comments

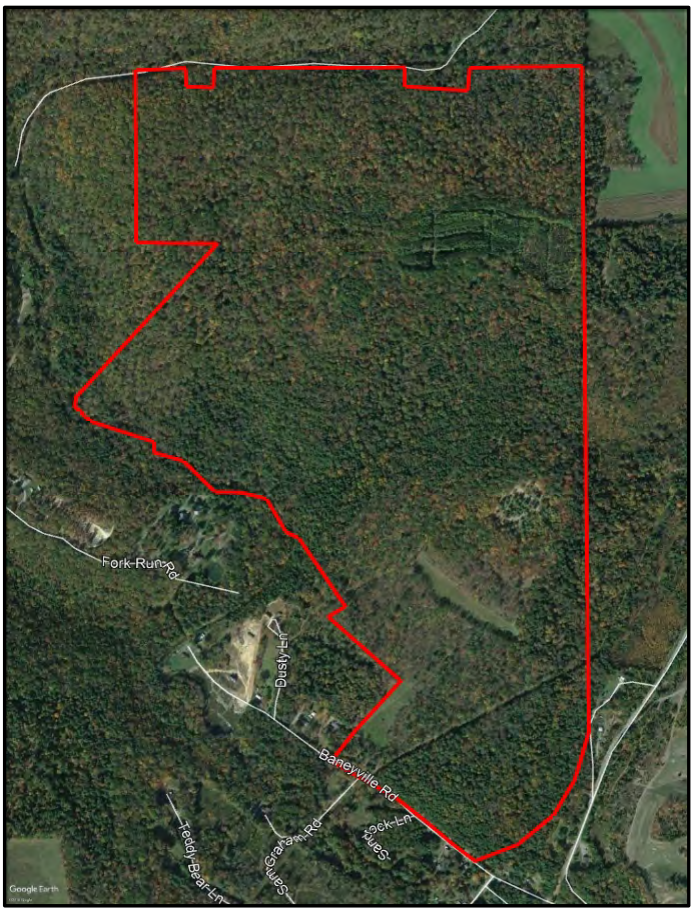
Large wooded tract that has no indication of any type of timber harvest in recent years that were evidenced by aerial photography.

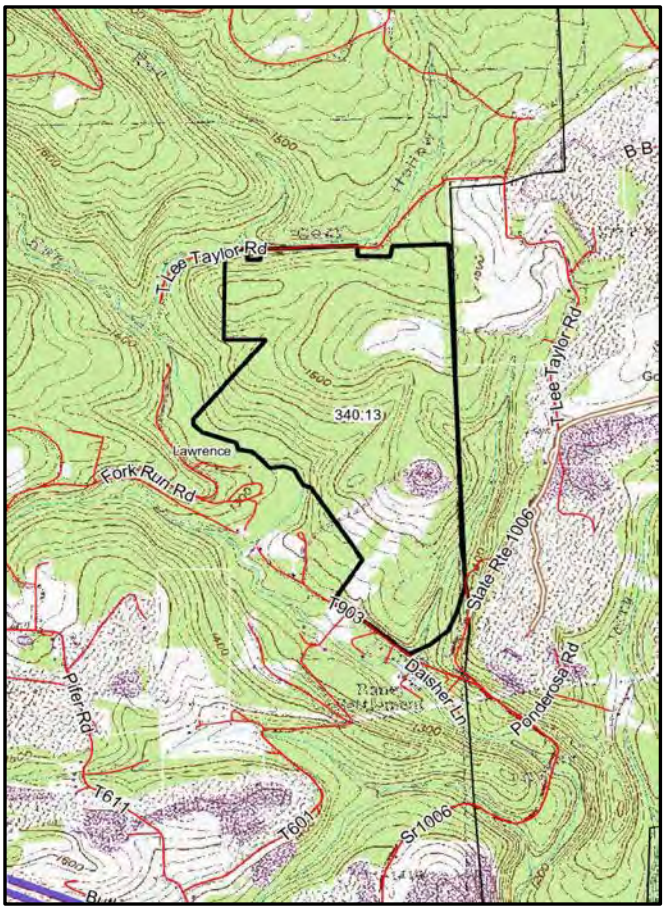
The property was transferred as surface only - a previous owner has retained subsurface rights. There is no record of any gas leases filed. The property is located greater than 3 miles south of any Marcellus Shale or conventional wells.

The property is <2 miles south of State Game Lands and >3 miles east of a State Forest.

Verified with buyer on 9/6/2018. Buyer bought as investment and for recreational purposes. Property is now under contract to to harvest 300,000 bf of lumber.

Sales Photos/Maps





Sales Analysis

Property Identification

Sale #	3316054	Date Sold	January-16	Deed Reference	201601135
Tax Parcel ID	1140N0400000028	Sale Price	$240,000	Zoning	None
Municipal Code	114	Total Acres	112.85	Type of Operation	Woodland
Seller (Grantor)	Harry J Salvatore	Price Per Acre	$2,127	Specialty Code	12.0
Buyer (Grantee)	Joseph B Bower Jr	% Tillable	0%	Highest & Best Use	Recreational/Timber
Street Address	(4576) Gillingham Rd			County Zone	I
County	Clearfield	Financing		Zip Code	16836
Township	Girard	Type of Lender	None	Previous Sale Date	6/20/97
School District	Clearfield Area	Amount Financed	$0		
Nearest Town	Frenchville	Rate		Verified:	PR/Insp/Buyer
Distance From	2 miles northwest	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$240,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	< 5%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs, Pipeline	Rights Transferred	Surface Only

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	0.00	Acres X	$4,288	/Acre =	$0	100%
Permanent Pastur	0.00	Acres X	2,144	/Acre =	0	50%
Woodland	111.94	Acres X	2,144	/Acre =	240,000	50%
Farmstead	0.00	Acres X	4,288	/Acre =	0	100%
Roads & Waste	0.91	Acres X	0	/Acre =	0	0%
Total Land Value	112.85	Acres X	$2,127	/Acre =	$240,000	

Soil Types	%
ErB	34%
ErC	18%
GlC	11%
RcD	18%
WhB	19%
--	0%
--	0%
--	0%
--	0%

Soil Classifications	
Class I	0%
Class II	53%
Class III	30%
Class IV	18%
Class V	0%
Class VI	0%
Class VII	0%

Pasture Soil Types: None

Woodland Soil Types: ErB, ErC, GlC, RcD, WhB

Timber Quality: Average

Topography: Rolling

Improvements

Buildings: None

Oil & Gas Wells: None

Road Type: Asphalt

Rights Transferred

Surface Only - Gas pipeline easement on the eastern edge of property.

Comments

Wooded tract that transferred with surface only rights. A previous owner has retained all subsurface rights.

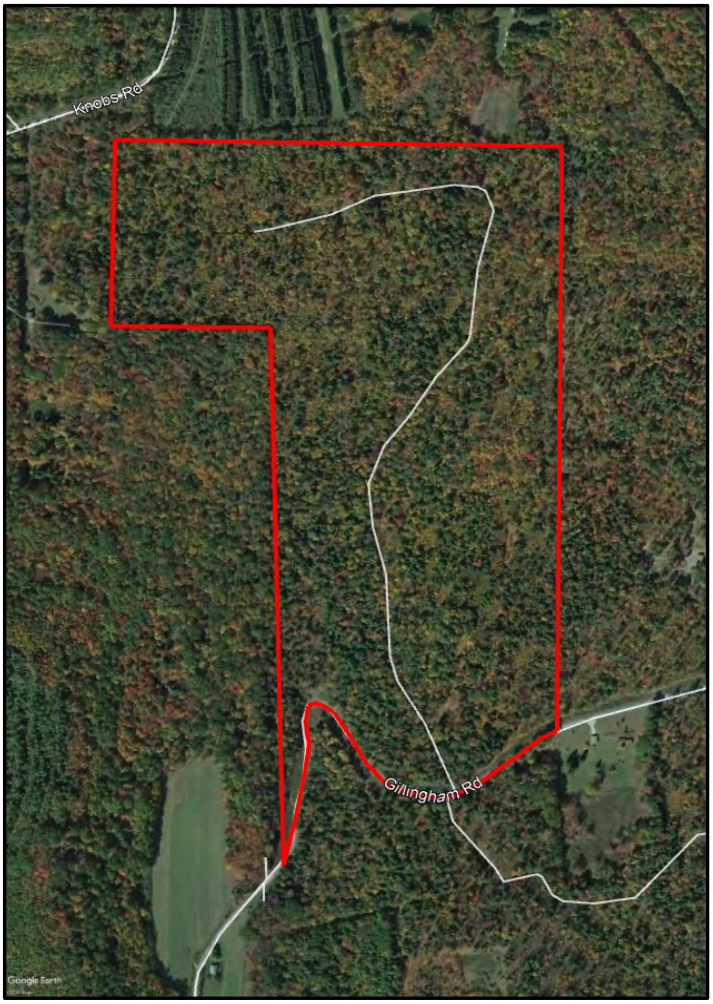
Two Marcellus Shale wells are located 0.8 - 1.5 miles northwest of the subject ane 2 wells are 1.7 to 2 miles southeast of the tract. There are several conventional wells within the sale distance from the tract.

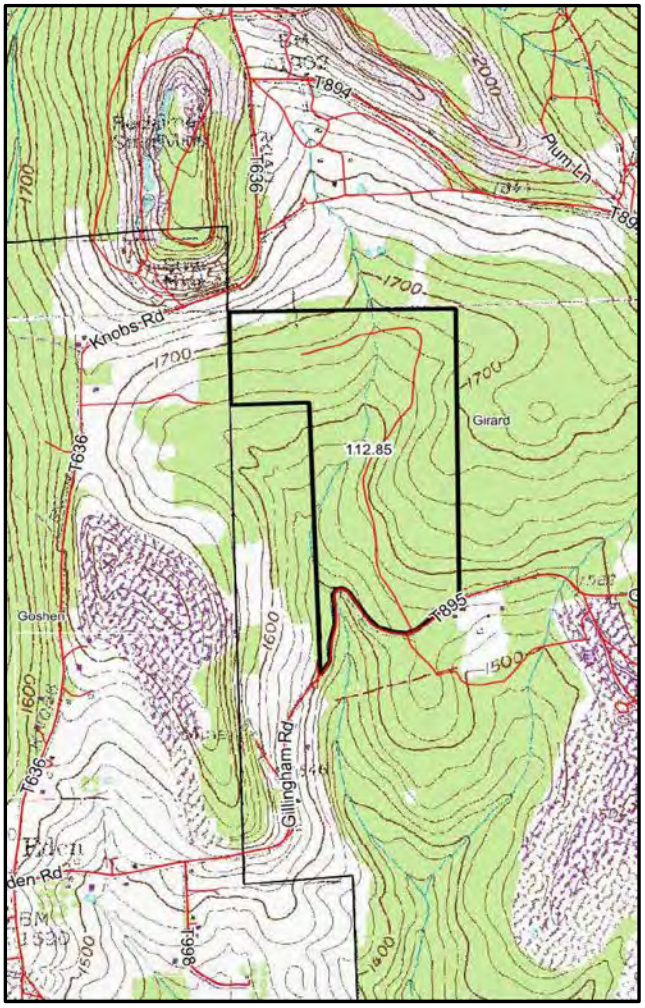
Aerial photography shows some timbering has occured in the last 20 years.

<2 miles south of a State Forest.

Verified with buyer on 9/18/2018. Buyer purchased for hunting, plan in the future to build cabin. Seller owned the property as an investment.

Sales Photos/Maps





Gregory L. Snyder, ARA

Accredited Rural Appraiser

Pennsylvania General Certified Appraiser (GA-001309-L)
Delaware General Certified Appraiser (XI-0000514)
Maryland General Certified Appraiser (31821)

3004 Hempland Road, Suite 3
Lancaster, PA 17601
717.435.9560
greg@snyderassociates.us
www.snyderassociates.us

Professional Experience:

30+ years of agricultural and conservation real estate valuation experience.

Present:	President/Owner Snyder Appraisal Associates, LLC 3004 Hempland Road Lancaster, PA 17601	Prior:	Principal Appraiser Keystone Farm Credit, ACA PO Box 7327 Lancaster, PA 17604

Snyder Appraisal Associates, LLC is an independent fee appraisal company founded in February 2000. We complete 150+ conservation and agricultural type property appraisals annually.

14 years with Keystone Farm Credit includes 8 years lending experience with real estate valuation as a portion of duties. 6 years as staff appraiser responsible for all appraisals in Lancaster, Lebanon, Dauphin and Schuylkill Counties.

Earned Designation:

Accredited Rural Appraiser (ARA)

The ARA designation is conferred on Members of the American Society of Farm Managers and Rural Appraisers (ASFMRA). The experience and education required to become an ARA are significantly more stringent than that required for state certification.

ASFMRA Approved Instructor

Professional Affiliations:

Accredited Member - American Society of Farm Managers and Rural Appraisers
District 1 Vice President– American Society of Farm Managers and Rural Appraisers
Past President & Secretary/Treasurer – Northeast Chapter of the ASFMRA
Affiliate Member - Pennsylvania Farm Bureau
Associate Member - Pennsylvania Land Trust Association
Professional Partner Member - Land Trust Alliance

Education:

Bachelor of Science in Animal Industries, Penn State University

Biannually complete more than 100 hours of Continuing Education (State minimum requirement is 28 hours).

Relevant Coursework:

ASFMRA

A-10 Fundamentals of Rural Appraisal	Timber & Timberland Evaluation
A-12 - Ethics	Oil, Gas & Mineral Valuation
A-20 Principals of Rural Appraisal	Wind Power
A-25 Eminent Domain	Intro to Appraisal Review
A-29 Highest and Best Use	Appraisal Review under USPAP
A-30 Advanced Rural Appraisal	Environmental Regulations
Large Farm Expansion Seminar	Vineyard & Winery Valuation
Large Dairy Facility Appraisal	Greenhouse Valuation
Swine Facility Appraisal	Identifying Intangible Assets
Poultry Facility Appraisal	Property Rights
Valuation of Conservation Easements and other Partial Interest	Yellow Book – Uniform Appraisal Standards of Federal Land Acquisitions
IRS Seminar – Valuation of Donated RE	Permanent Plantings Valuation

McKissock	American Society of Appraisers
PA RE Appraisers Certification & Regulations	Income Producing Property Methodology
DE RE Appraisers Certification & Regulations	Appraisal Report Writing

Appraisal Institute	Lancaster Co Assoc. of Realtors
Subdivision Valuation	Introduction to Commercial Valuation

Appraisals Completed for:

- General crop, livestock, swine, poultry and lifestyle farms.
- Agri-Business – grain centers, greenhouses, mushroom plants, livestock sale facilities, feed mills, orchards, vineyards, permanent plantings, soybean processing, chicken hatchery, chicken processing, rendering plant, cheese plant.
- Natural Resources - timber, minerals, water rights
- Recreational properties, trails, greenways, fish and boat access, PA Game Commission park land. Completed appraisals under PA DCNR, UASFLA, LWCF 6F regulations.
- Land Acquisitions
- Estate Planning and Settlement
- Partial Interests- minority, leasehold, life estates, scenic and conservation easements
- Eminent Domain - compensation including value of land taken plus severance damages
- Expert testimony given in Bankruptcy Court, Board of View and Assessment Hearing Boards
- 2032A – Special Use Appraisals
- FRPP/ALE – NRCS Farm and Ranch Protection Program/Agricultural Land Easement.
- Charitable Contribution or Sale of Rights associated with a Conservation Easement.
- UASFLA compliant appraisals (Yellow Book).

Licenses

DISPLAY THIS CERTIFICATE PROMINENTLY • NOTIFY AGENCY WITHIN 10 DAYS OF ANY CHANGE

Commonwealth of Pennsylvania
Department of State
Bureau of Professional and Occupational Affairs
PO Box 2649 Harrisburg PA 17105-2649

18 0021829

Certificate Type
Certified General Appraiser

Certificate Status
Active

Initial Certification Date
10/20/1994

GREGORY LEE SNYDER
SNYDER APPRAISAL ASSOCIATES
3004 HEMPLAND ROAD SUITE 3
LANCASTER PA 17601

Certificate Number
GA001309L

Expiration Date
06/30/2019

Commissioner of Professional and Occupational Affairs

Signature

ALTERATION OF THIS DOCUMENT IS A CRIMINAL OFFENSE UNDER 18 PA.C.S.S. 4911

LICENSE NO. X1-0000514

STATE OF DELAWARE
DIVISION OF PROFESSIONAL REGULATION
861 Silver Lake Blvd.
Cannon Building, Suite 203
Dover, DE 19904-2467

NOT TRANSFERABLE

PROFESSION: Certified General Real Property Appraiser

EXPIRATION DATE: 10/31/2019

ISSUED TO: Gregory Lee Snyder

MAILING ADDRESS

Gregory Lee Snyder
3004 Hempland Rd
Suite 3
3004 Hempland Rd, Suite 3
Lancaster PA 17601

PROFESSIONAL LICENSE

THIS CERTIFIES THAT THE PERSON NAMED IS HEREBY LICENSED TO CONDUCT OR ENGAGE IN THE PROFESSION INDICATED ABOVE THIS DOCUMENT IS DULY ISSUED UNDER THE LAWS OF THE STATE OF DELAWARE

LICENSEE SIGNATURE

549325

THIS DOCUMENT IS VOID WITHOUT BLUE BACKGROUND. CONTAINS COPY VOID FEATURE & ARTIFICIAL WATERMARK ON THE BACK.

STATE OF MARYLAND
DLLR
DEPARTMENT OF LABOR, LICENSING AND REGULATION

LICENSE * REGISTRATION * CERTIFICATION * PERMIT

STATE OF MARYLAND
DEPARTMENT OF LABOR, LICENSING AND REGULATION

Lawrence J. Hogan, Jr.
Governor
Boyd K. Rutherford
Lt. Governor
Kelly M. Schulz
Secretary

COMMISSION OF RE APPRAISERS & HOME INSPECTORS
CERTIFIES THAT:
GREGORY L SNYDER

IS AN AUTHORIZED: 04- CERTIFIED GENERAL

LIC/REG/CERT	EXPIRATION	EFFECTIVE	CONTROL NO
31821	08-20-2019	07-25-2016	4882615

Signature of Bearer

Secretary DLLR

WHERE REQUIRED BY LAW THIS MUST BE CONSPICUOUSLY DISPLAYED IN OFFICE TO WHICH IT APPLIES

Appraisal Review Specialists, LLC
3058 Mount Vernon Road
Suite 12
Hurricane, WV 25526
appraisalreview@frontier.com
304.760.2156 office
304.760.2158 fax

Appraisal Review Specialists
appraisalreviewspecialists.com

APPRAISAL REVIEW REPORT

Prepared By:

Philip J. Swartz, AI-GRS
Pennsylvania State Certified
General Real Estate Appraiser
#GA001298-L
Phone: (304) 760-2156
Phone: (570) 412-0043
Email: pswartz@appraisalreviewspecialists.com

May 3, 2019

Ms. Ashley D. Rebert
Chief, Land Conservation & Stewardship Section
Department of Conservation and Natural Resources
Bureau of Recreation and Conservation
Community Parks and Conservation Division
5th Floor, 400 Market Street, Harrisburg, PA 17101-2301

Re: 17 Conversion Sites Over 6 LWCF Areas
Centre, Clearfield, Clinton, Lycoming, Potter & Tioga Counties
Appraisal Report Prepared by Mr. Gregory L. Snyder, ARA

Ms. Rebert:

Pursuant to our agreement, I have had the opportunity to perform a desk technical review (as defined herein) of the 754 Page appraisal report submitted in conjunction with a proposed land exchange. The proposed exchange involves a 982+ Acre replacement property utilized for the creation of an excess bank with the National Park Service, and 17 sites lying in 6 different LWCF that have been converted from recreational use. An appraisal of the 982+ Acre replacement property was previously reviewed. The current work under review involves the 17 conversion sites. As of the effective date, the 17 conversion sites were owned by Commonwealth of Pennsylvania and are located in Centre, Clearfield, Clinton, Lycoming, Potter & Tioga Counties. The 17 separate sites range in size from 0.48 acres to 28.66 acres; total acreage appraised is 138.37 acres. As instructed by the client, the parcels were treated as non-assembled. There are no building improvements and no site improvements of any consequence; natural gas extraction equipment installed on various sites was deemed to represent removeable personal property owned by the leaseholders and was not included in the valuations. The submitted appraisal report was prepared by Gregory L. Snyder, ARA, PA State Certified General Real Estate Appraiser #GA 001309-L.

The purpose of this appraisal review is to provide an opinion of the completeness of the report, the apparent accuracy, adequacy and relevance of data utilized in the report, the appropriateness of the appraisal methods and techniques relied upon, and to ultimately provide an opinion as to whether the analysis, opinions, and conclusions are appropriate and reasonable given the data provided and whether the appraisal has been developed and reported in compliance with the Uniform Standards of Professional Appraisal Practice (USPAP) and the assignment conditions noted within the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). No hypothetical conditions, extraordinary assumptions or jurisdictional exceptions were employed in this review.

As part of performing the appraisal review assignment, I have personally read and evaluated the appraisal report and have analyzed information necessary to arrive at a conclusion. In that respect, I have inspected public records and other readily available data in an attempt to verify subject-specific and sale-specific information. As per prior arrangement, I have not personally visited any of the subject sites and have not visited any of the comparable market data identified within the report.

After a thorough review in accordance with the Scope of Work identified, it is my conclusion that the report is prepared and presented in accordance with the requirements of the Uniform Standards of Professional Appraisal Practice (USPAP) and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). Overall, I believe that the value opinions offered within the submitted appraisal report are adequately supported by the data presented and that the content, analyses and conclusions stated in the report under review are within reasonable compliance with the applicable standards and requirements as described herein. While a few minor typographical errors and inconsistencies may have been noted during the review process, these errors and inconsistencies would have no impact upon the valuation of the property or the overall credibility of the report. Finally, as a result of my review, **I RECOMMEND** the appraisal report for use by the agency in establishing Market Value. Explanation of, and support for, my conclusions is provided within the following report.

Should you have any questions or comments, of if you require additional information, please feel free to contact me personally.

Respectfully Submitted,

Philip J. Swartz, AI-GRS
Review Appraiser, Appraisal Review Specialists, LLC.
Pennsylvania State Certified General Real Estate Appraiser #GA001298-L
West Virginia State Certified General Real Estate Appraiser #CG 371
Virginia State Certified General Real Estate Appraiser #4001-012244
Georgia State Certified General Real Estate Appraiser #365609
South Carolina Certified General Real Estate Appraiser #7266
Kentucky State Certified General Real Estate Appraiser #004786
Phone: (304) 760-2156 (office)
Phone: (570) 412-0043 (direct)
Email: pswartz@appraisalreviewspecialists.com
www.appraisalreviewspecialists.com

APPRAISAL REVIEW REPORT

The Uniform Standards of Professional Appraisal Practice (USPAP) defines appraisal review as *"(noun) the act or process of developing an opinion about the quality of another appraiser's work that was performed as part of an appraisal or appraisal review assignment; (adjective) of or pertaining to an opinion about the quality of another appraiser's work that was performed as part of an appraisal or appraisal review assignment."* Regarding federal-aid projects, the Code of Federal Regulations, 49 CFR 24.104 indicates the following: *"A qualified review appraiser shall examine the presentation and analysis of market information in all appraisals to assure that they meet the definition of appraisal found in 49 CFR 24.2(a)(3), appraisal requirements found in 49 CFR 24.103 and other applicable requirements, including, to the extent appropriate, the UASFLA (Uniform Appraisal Standards for Federal Land Acquisitions), and support the appraiser's opinion of value"*. Along the same lines, Section 3.1.1 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) indicates that "*The review of appraisal reports by a qualified reviewing appraiser is required*" while Section 3.1.1(a) suggests that "*A qualified review appraiser shall examine the presentation and analysis of market information in all appraisals to ensure that they meet all applicable appraisal requirements and support the appraiser's opinion of value*."

The Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) indicates that there are two generally recognized types of reviews that can be performed; technical reviews and administrative reviews. An administrative review may be performed by an appraiser or a non-appraiser and is sometimes referred to as a compliance review. The content and scope of an administrative review will vary with the intended use and intended user of the administrative review. Some federal agencies have specific policies regarding the development and use of administrative reviews. An administrative review may include confirmation that the appraisal report conforms to contract/assignment letter requirements and to applicable federal law for federal land acquisition appraisals, and/ or that the report includes a signed certification stating that the report has been prepared in compliance with the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). The administrative reviewer may also verify if the correct subject property has been appraised, if photographs of the subject property and comparable market data are included, if the analyses reflect the government's most recent project plans, and if the factual data and the mathematics presented in the appraisal report are correct. The administrative reviewer shall not, however, form an opinion regarding the quality of the analysis, judgment, or opinion(s) of value contained within the appraisal report under review. As such, administrative reviews do not meet the requirements of 49 C.F.R. §24.104. Administrative reviewers often use a checklist as a guide in making their determinations.

A technical review is developed and reported by an appraiser in accordance with the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA), which require conformity with USPAP and with agency polices, rules, and regulations. As per Section 3.2 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA), in completing a technical review, the review appraiser renders opinions on the quality of an appraisal report and whether the opinion(s) of value are adequately supported and in compliance with all appropriate standards, laws, and regulations relating to the appraisal of property for federal acquisition purposes. In addition, as a part of a technical review, the review appraiser may reach a conclusion regarding whether to approve (or recommend approval of), modify, or not accept or modify the conclusions presented in the appraisal report under review. If appropriate to the assignment, the agency review appraiser performing a technical review may render a separate opinion of value. However, if the review appraiser renders a separate opinion of value, the value opinion must be developed and reported in accordance with the appraisal development and content requirements for the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). The development of such opinions and further review of the initial reviewer's opinion of value and the support therefore may also be subject to the pertinent agency's policies, rules, and/or regulations.

Technical reviews may be conducted as either desk reviews or field reviews. A desk review involves, in addition to confirmation that the report was prepared in accordance with the requirements of USPAP and other applicable assignment conditions, a thorough review and analysis of the information and analysis contained in the appraisal report under review and a careful examination of the internal logic and consistency offered within the appraisal report. In a desk review, the appraisal reviewer limits the examination to the information and analysis presented within the appraisal report. The data contained within the appraisal report may or may not be confirmed and the reviewer may or may not identify additional comparative market data. A field review involves at least an exterior field inspection of the subject of the work under review and often involves an inspection (generally from the street) of the properties used as comparable data in the appraisal report. In addition, the data contained in the appraisal report is usually independently confirmed during the review process. A field review may be used to obtain additional market data beyond that provided by the appraiser or to resolve factual differences between two appraisals with divergent market value estimates. The field review represents the highest level of due diligence within the appraisal review practice.

This appraisal review serves as a "*desk technical review*" as described in Section 3 of UASFLA and was developed and reported in accordance with Standards 3 & 4 of the 2018-2019 Edition of the Uniform Standards of Professional Appraisal Practice (USPAP) and Section 3 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). The specific details of discussion contained in this report are specific to the needs of the client and are for the intended use and users stated below. The review appraiser is not responsible for any unauthorized use of this report, and personal responsibilities do not extend to any unauthorized third party.

Summary of Salient Facts and Conclusions:

Client:	PA Department of Conservation and Natural Resources Bureau of Recreation and Conservation Community Parks and Conservation Division 5th Floor, 400 Market Street, Harrisburg, PA 17101-2301
Contact:	Ms. Ashley D. Rebert Chief, Land Conservation & Stewardship Section
Intended Users of Review:	Department of Conservation and Natural Resources Bureau of Recreation and Conservation Community Parks and Conservation Division (client), and National Park Service
Intended Use of Review:	To assist the client and the intended users in determining if the appraisal report that is the subject of this review was prepared in compliance with the Uniform Standards of Professional Appraisal Practice (USPAP) and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) as well as other laws, regulations and policies applicable to the overall scope of the appraisal assignment
Purpose of the Review:	The purpose of this appraisal review is to provide an opinion of the completeness of the report, the apparent accuracy, adequacy and relevance of data utilized in the report, the appropriateness of the appraisal methods and techniques relied upon, and to ultimately provide an opinion as to whether the analysis, opinions, and conclusions are appropriate and reasonable given the data provided and whether the appraisal has been developed and reported in compliance with the Uniform Standards of Professional Appraisal Practice (USPAP) and the assignment conditions noted within the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA)
Type of Appraisal Review:	Desk Technical Review, as described herein
Opinion of Value By Reviewer:	None Required
Appraiser Who Completed the Work under Review:	Gregory L. Snyder, ARA, PA State Certified General Real Estate Appraiser GA 001309-L
Effective Date of Work Under Review:	August 22, 2018 (Retrospective Analysis)
Date of the Work under Review:	The letter of transmittal is dated April 26, 2019 and is addressed to Mr. Thomas Ford of the PA Department of Conservation and Natural Resources, Bureau of Recreation and Conservation, Community Parks and Conservation Division, 5th Floor, 400 Market Street, Harrisburg, PA 17101-2301
Date of the Review Report:	May 3, 2019

Summary of Salient Facts and Conclusions: **(Continued)**

Subject of the Work Under Review:	The work under review was submitted in conjunction with a proposed non-assembled land exchange. The proposed exchange involves a 982+ Acre replacement property utilized for the creation of an excess bank with the National Park Service, and 17 sites lying in 6 different LWCF that have been converted from recreational use. An appraisal of the 982+ Acre replacement property was previously reviewed (January 2019). The current work under review involves the 17 conversion sites. As of the effective date, the 17 conversion sites were owned by Commonwealth of Pennsylvania and are located in Centre, Clearfield, Clinton, Lycoming, Potter & Tioga Counties. The 17 separate sites range in size from 0.48 acres to 28.66 acres; total acreage appraised is 138.37 acres. As instructed by the client, the parcels were treated as non-assembled. There are no building improvements and no site improvements of any consequence; natural gas extraction equipment installed on various sites was deemed to represent removeable personal property owned by the leaseholders and was not included in the valuations.
Zoning:	Various – many of the 17 sites are located in areas without local zoning, other sites are zoned Rural Forest or Resource Protection
Public Utilities Available:	Electricity and telephone – the report suggests that public water and sewer services are not readily available to any of the 17 conversion sites as of the date of valuation
Property Rights Valued in the Work Under Review:	Fee Simple Interest in 16 tracts was appraised (Conversion Sites #1 thru #15 and #17). One tract (Conversion Site #16) was appraised as surface only; the subsurface rights were retained by a previous owner.
Appraisal Report Type:	Appraisal Report
Extraordinary Assumptions Relied Upon in the Appraisal:	Per the report, "*The subjects are made up of 17 separate sites which range in size from 0.48 acres to 28.66 acres. The total acreage appraised in this report is 138.37 acres. The boundaries and acreage amounts are based on GIS drawings and acreage amounts provided to the appraiser by the PA DCNR*" and "*The legal description of each site was provided by the client. The descriptions could not be verified by platting or comparing to tax assessment information. It is assumed that all conversion sites are owned by the Commonwealth of Pennsylvania based on legal descriptions provided by client*."

Hypothetical Conditions Relied Upon in the Appraisal:

Per the report, "*In order to appraise State owned land to its Highest and Best Use, a Hypothetical Condition is made that the property is appraised as if it were under private ownership*" and "*In order to value the conversion site, the 100 to 200 acres surrounding the subject site needs to be considered. The database shows the lack of sales of small inholding tracts within the State Forests. Further sale data analysis indicates typical wooded recreational tracts range from 100 to 200 acres. Therefore, it is assumed that 100 to 200 acres surrounding the subject tracts are under similar private ownership and will be considered when determining value of the subject parcel*."

Jurisdictional Exceptions Invoked During Appraisal:

The Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) indicate that estimates of market value shall not be linked to a specific market exposure time. This assignment condition is contrary to the requirements of the "*Comment*" to 1-2(c) of USPAP (2018-2019 Edition). Therefore, as suggested in Section 1.2.7.2 of the 2016 Edition of UASFLA, the appraiser has not developed and/or reported an estimate of reasonable exposure time (reference Page 2 of the report).

Source and Definition of Value Relied Upon In Appraisal and Review:

Per Page 6 of the work under review, the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) defines "*Market Value*" as *"the amount in cash, or terms reasonable equivalent to cash, for which in all probability the property would have sold on the effective date of the appraisal, after a reasonable exposure time on the open competitive market, from a willing and reasonably knowledgeable seller to a willing and reasonably knowledgeable buyer, with neither acting under any compulsion to buy or sell, giving due consideration to all available economic uses of the property at the time of the appraisal."*

Appraiser's Larger Parcel Determination:

Page 7 of the work under review includes a detailed Larger Parcel analysis. Relying on instruction provided by the client (to treat the exchange as non-assembled) and guidance provided in Section 1.12 of UASFLA (Special Considerations in Appraisals for Federal Land Exchanges), the report suggests that each of the 17 conversion sites "*represents its own larger parcel*." With this, individual analyses and valuations of each of the 17 conversion sites was provided.

Appraiser's Determination of Highest & Best Use – Before Acquisition:

The highest and best use for each of the conversion sites is identified as recreational woodland.

Summary of Salient Facts and Conclusions: **(Continued)**

Conclusion of Value – Before Acquisition – Cost Approach:	Not Developed
Conclusion of Value – Before Acquisition – Sales Comparison Approach:	Conversion Site #1 – $16,000 Conversion Site #2 – $32,000 Conversion Site #3 – $18,000 Conversion Site #4 – $25,000 Conversion Site #5 – $35,000 Conversion Site #6 – $135,000 Conversion Site #7 – $86,000 Conversion Site #8 – $25,000 Conversion Site #9 – $58,000 Conversion Site #10 – $95,000 Conversion Site #11 – $4,000 Conversion Site #12 – $41,000 Conversion Site #13 – $6,000 Conversion Site #14 – $2,000 Conversion Site #15 – $8,000 Conversion Site #16 – $2,000 Conversion Site #17 – $37,000
Conclusion of Value – Before Acquisition – Income Approach:	Not Developed
Overall Conclusion of Value – Before Acquisition - Reconciled:	Conversion Site #1 – $16,000 Conversion Site #2 – $32,000 Conversion Site #3 – $18,000 Conversion Site #4 – $25,000 Conversion Site #5 – $35,000 Conversion Site #6 – $135,000 Conversion Site #7 – $86,000 Conversion Site #8 – $25,000 Conversion Site #9 – $58,000 Conversion Site #10 – $95,000 Conversion Site #11 – $4,000 Conversion Site #12 – $41,000 Conversion Site #13 – $6,000 Conversion Site #14 – $2,000 Conversion Site #15 – $8,000 Conversion Site #16 – $2,000 Conversion Site #17 – $37,000
Review Report Conclusion:	Recommended for Use by Agency in Estimating Market Value
Extraordinary Assumptions and/or Hypothetical Conditions Relied Upon in the Review:	None

Assumptions and Limiting Conditions:

This review report is made contingent upon and subject to the following assumptions and limiting conditions:

1.) As per prior arrangement with the client, the review appraiser has not made a personal inspection of the subject properties described in the work under review and has not made a personal inspection of the comparable market data presented within the work under review. To that end, my scope of work has been limited to an examination and review of the data and analysis presented within the submitted appraisal report. As part of the investigation and research process, data specific to the subjects of the work under review and the comparables was verified through public records available online. However, my scope was otherwise limited to a thorough review of the facts and data presented in the appraisal report, an analysis of the statements, opinions and conclusions set forth in the report and an examination of the internal logic and consistency in the appraisal report.

2.) The review appraiser is not responsible for matters of a legal nature that affect either the properties being appraised or the title to the property. The review appraiser assumes that the title is good and marketable and does not render any opinions about the title. Responsible ownership and competent property management are assumed unless otherwise stated.

3.) The review appraiser has relied upon data presented in the work under review relative to flood zoning at the subject properties. The review appraiser has NOT independently examined available flood maps provided by the Federal Emergency Management Agency (or other data sources). Because the review appraiser is not a surveyor, he makes no guarantees, express or implied, regarding the determination regarding flood zoning at the subject properties.

4.) The review appraiser will not give testimony or appear in court because he has made a review report relative to the subject properties in question unless specific arrangements to do so have been made.

5.) The appraiser has noted in the appraisal report under review any adverse conditions (such as the presence of hazardous wastes, toxic substances, etc.) that were observed during the inspection of the subject properties or that became apparent while conducting the normal research involved in performing an appraisal. In this case, no such items were noted, and the reviewer has relied upon the statements made by the appraiser in the work under review as being accurate. Since the review appraiser has NOT made a personal inspection of the subject properties, and has performed only limited verification of the data presented within the report, the reviewer obviously has no knowledge of any hidden or unapparent conditions of the properties or any adverse environmental conditions (including the presence of hazardous wastes, toxic substances, etc.) that would make the properties more or less valuable and has assumed that there are no such conditions but makes no guarantees or warranties, express or implied, regarding the condition of the properties. The reviewer will not be responsible for any such conditions that do exist or for any engineering or testing that might be required to discover whether such conditions exist. Because the reviewer is not an expert in the field of environmental hazards, the review report must not be considered as an environmental assessment of the properties. The reviewer is not qualified to detect hazardous waste and/or toxic materials.

6.) The reviewer obtained the information and opinions that were expressed in the report from sources that he considers reliable and are believed to be true and correct. However, no warranty is given for its accuracy.

Assumptions and Limiting Conditions: **(Continued)**

7.) The reviewer will not disclose the contents of the appraisal report except as provided for in the Uniform Standards of Professional Appraisal Practice or as required by professional appraisal peer review.

8.) It is assumed that all applicable zoning and other land use regulations and restrictions have been complied with unless non-conformity has been stated, defined and considered within the review report.

9.) It is assumed that all required licenses, certificates of occupancy or other legislative or administrative authority from any local, state or national governmental or private entity or organization have been or can be obtained or renewed for any use on which the value estimates contained in this report are based.

10.) It is assumed that the utilization of the land is within the boundaries of the property lines of the properties described and that there is no encroachment or trespass unless otherwise stated in this report.

11.) It is assumed that there is full compliance with all applicable federal, state and local environmental regulations and laws unless otherwise stated in this report.

12.) All engineering plans, maps, etc. provided within the appraisal report and relied upon by the appraiser are assumed to be accurate. All plans, maps, etc. referenced in this report are intended to assist the reader with visualizing the properties or the project.

13.) The review appraiser has stated his understanding of both the intended use and the intended user of this report. The data contained and presented in the report are appropriate for the stated use and for the stated user(s) only. The review appraiser is not responsible for the unauthorized use of the report.

Certification of the Appraiser, Consistent with Standards Rule 4-3 of USPAP and Section 3.8 of UASFLA:

I certify that, to the best of my knowledge and belief:

1. the facts and data reported by the reviewer and used in the review process are true and correct;

2. the reported analyses, opinions, and conclusions in this review report are limited only by the assumptions and limiting conditions stated in this review report and are my personal, impartial, and unbiased professional analyses, opinions, and conclusions;

3. I have no present or prospective interest in the properties that are the subject of the work under review and no personal interest with respect to the parties involved;

4. I have performed no valuation (or other) services, as an appraiser, a review appraiser or in any other capacity, regarding the properties that are the subject of the work under review, within the three-year period immediately preceding acceptance of this assignment;

5. I have no bias with respect to the properties that are the subject of the work under review or to the parties involved with this assignment;

6. my engagement in this assignment was not contingent upon developing or reporting predetermined results or assignment results that favor the cause of the client, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal review;

7. my compensation is not contingent on an action or event resulting from the analyses, opinions, or conclusions in this review report or from its use;

8. my compensation is not contingent upon the analyses, opinions or conclusions reached or reported;

9. the analyses, opinions, and conclusions were developed, and this review report was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA);

10. the analyses, opinions, and conclusions were developed, and this review report was prepared in conformity with the Appraisal Foundation's Uniform Standards of Professional Appraisal Practice (USPAP), except to the extent that the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) required invocation of USPAP's Jurisdictional Exception Rule, as described in Section 1.2.7.2 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA);

11. as per prior arrangement with my client, I have not made a personal inspection of the properties that are the subject of the work under review and have not made a personal inspection of the comparable market sales presented within the work under review;

12. to the best of my knowledge and belief, the report analyses, opinions and conclusions, were developed and this report has been prepared, in conformity with the requirements of the Code of Professional Ethics and the Standards or Professional Appraisal Practice of the Appraisal Institute;

Certification of the Appraiser, Consistent with Standard Rule 4-3 of USPAP and Section 3.8 of UASFLA: (Continued)

13. that the use of this report is subject to the requirements of the Appraisal Institute relating to review by its duly authorized representatives;

14. as of the date of this report, I, Philip J. Swartz, have completed the Standards and Ethics Education Requirement of the Appraisal Institute for Designated Members;

15. no one provided significant appraisal, appraisal review, or appraisal consulting assistance to the person signing this certification.

Signature:_____

Philip J. Swartz, AI-GRS
Review Appraiser, Appraisal Review Specialists, LLC.
Pennsylvania State Certified General Real Estate Appraiser #GA001298-L
West Virginia State Certified General Real Estate Appraiser #CG 371
Virginia State Certified General Real Estate Appraiser #4001-012244
Georgia State Certified General Real Estate Appraiser #365609
South Carolina Certified General Real Estate Appraiser #7266
Kentucky State Certified General Real Estate Appraiser #004786

DATE OF SIGNATURE: May 3, 2019

Scope of Work of the Appraisal Review:

At the request of the client, and as part of performing an appraisal review assignment within the context of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA), the review appraiser is required to prepare an appraisal review report in accordance with Standards 3 and 4 of the Uniform Standards of Professional Appraisal Practice and Section 3 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA).

The appraisal review process included an examination of the appraisal report as well as an examination of the pertinent rules and regulations offered within the Uniform Standards of Professional Appraisal Practice (USPAP) and the applicable assignment conditions included in the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). This was done in order to develop opinions as to the completeness of the work under review, the accuracy, adequacy and relevance of the data provided within the work under review, the propriety of any adjustments to the data within the work under review, the appropriateness of the appraisal methods and techniques used in the work under review, and whether the analyses, opinions, and conclusions in the submitted report are appropriate and reasonable given the data presented. The scope of work in this instance did not include a personal exterior inspection of the subject properties or the comparable market data referenced in the report. I have therefore limited my scope to include an examination and review of the data and analysis presented within the submitted appraisal report. However, as a part of the investigation and research process, data specific to the subjects of the work under review and the comparables was verified through public records available online. My scope of work involves a thorough review of the facts and data presented in the appraisal report, an analysis of the statements, opinions and conclusions set forth in the report and an examination of the internal logic and consistency within the report.

The scope of this appraisal review assignment did not include a personal visit to the subject sites, or the comparable sales presented within the appraisal report. However, subject-specific and sale-specific data presented within the report was verified, to the extent possible, through sources deemed reliable. The factual data provided for the subject properties and the comparable sales was verified, to the extent possible, also through public sources available online. Data available online via the Centre, Clearfield, Clinton, Lycoming, Potter & Tioga County Assessment Offices as well as the online records of the respective local municipalities was examined in an effort to further verify the reported factual data; local MLS data (including Bright MLS) was examined when applicable.

During my review process, and in accordance with the requirements of Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) and 49 CFR §24.104, I contacted the appraiser via e-mail and phone on numerous occasions in an effort to address questions, shortcomings and/or inconsistencies noted during the initial review of the submitted report. I identified several issues that required further attention and/or explanation by the appraiser. The appraiser recognized the issues that were raised, and in an effort to address the items identified, he provided a revised appraisal report received by me on April 26, 2019. After review of the April 26, 2019 revised report, and once all of the items had been successfully addressed, I informed the appraiser of the obligation to provide his client (PA Department of Conservation and Natural Resources) with a copy of the April 26, 2019 revised report for their use. Copies of all appraisal reports reviewed are retained in my office file although a copy of the April 26, 2019 revised report will be submitted along with my review report at the completion of the assignment. This final review report sets forth my opinions and conclusions which have been developed as a result of the technical review process.

Scope of Work of the Appraisal Review: **Continued**

I performed the following eight basic steps in developing and reporting my review:

1. thoroughly read and considered the appraisal report under review;

2. attempted to verify data pertaining to the subject properties and the comparable land sales through the review of public records available online;

3. evaluated the report and considered the appraiser's utilization of and reliance upon recognized appraisal methods and techniques;

4. considered tests of reasonableness in evaluating the overall appropriateness of the analyses, opinions, and conclusions;

5. considered overall development and reporting compliance with USPAP Standard 1 and USPAP Standard 2 and the guidelines set forth within the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA);

6. communicated with the appraiser via email and phone on numerous occasions with regard to questions, comments, shortcomings, errors and/or inconsistencies that required further attention, explanation and/or revision;

7. reviewed and examined a revised appraisal report received on April 26, 2019 and submitted in response to my consultations and communications with the appraiser;

8. formed conclusions regarding the salient issues relevant to the overall appraisal review and issued a final review report in accordance with USPAP Standards 3 and 4, 49 CFR §24.104(c) and Section 3.7 of UASFLA.

As noted earlier, the scope of work for this review assignment ***did not*** include the development of my own independent opinion of value.

Completeness of the Work under Review:

After review of the April 26, 2019 appraisal report, it appears that the report and its communication are complete as presented and appear to meet the requirements mandated by the Uniform Standard of Professional Appraisal Practice 2018-2019 Edition, the requirements of 49 CFR Part §24.103 and the guidelines set forth within the Uniform Appraisal Standards for Federal Land Acquisitions.

The effective date of value (August 22, 2018) represents the last date of physical inspection of the subject properties by the appraiser (inspections occurred over a period of three days from August 20-22, 2018). The report clearly indicates that the owner(s) of the property (or a designee) was given the opportunity to accompany the appraiser during the inspection of the property (see Page i and ii of the report). The report includes a rather thorough identification of the scope of work undertaken by the appraiser during the appraisal process. The scope of work is adequately described throughout the report as well as in a specific section labeled "*Scope of Work*" (see Pages 1 and 2 of the report). Based upon the appraiser's inspection of the subject properties and the data gathered during the development of the appraisal, the report provides a thorough and complete analysis of the subject properties including the relevant physical, economic and legal characteristics of the properties. The property interests appraised are the fee simple rights in Conversion Sites #1 thru #15 and #17 and the surface interest in Conversion Site #16. Natural gas extraction equipment installed on various sites was deemed to represent removeable personal property owned by the leaseholders and was not included in the valuations; no personal property has been included in the valuations. The report indicates that title reports were not provided for the appraiser's consideration. Nonetheless, the individual analyses of the 17 conversion sites discuss easements, encumbrances and other items noted during the routine valuation processes. This includes the discussion of oil, gas & mineral (OGM) leases in place at several of the conversion sites. Identified easements and encumbrances appear to have been considered in the analysis of highest and best use and the subsequent valuation.

The report includes a rather standard set of assumptions and limiting conditions (see Pages 3 & 4 of the report). No unusual limiting conditions are noted within the report and the report contains no significant conditions limiting the use or distribution of the report. Two extraordinary assumptions have been identified. Per the report, "*The subjects are made up of 17 separate sites which range in size from 0.48 acres to 28.66 acres. The total acreage appraised in this report is 138.37 acres. The boundaries and acreage amounts are based on GIS drawings and acreage amounts provided to the appraiser by the PA DCNR*" and "*The legal description of each site was provided by the client. The descriptions could not be verified by platting or comparing to tax assessment information. It is assumed that all conversion sites are owned by the Commonwealth of Pennsylvania based on legal descriptions provided by client*." These extraordinary assumptions were deemed necessary for the purposes of valuation and have been clearly and conspicuously identified within the report in a manner consistent with both USPAP and UASFLA. In any event, these extraordinary assumptions allow for an "*as-is*" valuation of the property. Two hypothetical conditions have also been identified. Per the report, "*In order to appraise State owned land to its Highest and Best Use, a Hypothetical Condition is made that the property is appraised as if it were under private ownership*" and "*In order to value the conversion site, the 100 to 200 acres surrounding the subject site needs to be considered. The database shows the lack of sales of small inholding tracts within the State Forests. Further sale data analysis indicates typical wooded recreational tracts range from 100 to 200 acres. Therefore, it is assumed that 100 to 200 acres surrounding the subject tracts are under similar private ownership and will be considered when determining value of the subject parcel*." The first hypothetical condition is employed via guidance provided in Section 1.12 of UASFLA. The second hypothetical condition appears to be necessary for the purposes of valuation and each has been clearly and conspicuously identified within the report in a manner consistent with both USPAP and UASFLA. As suggested in Section 1.2.7.2 of UASFLA, the appraiser has not developed and/or reported an estimate of reasonable exposure time. The reliance on the jurisdictional exception appears to be properly employed and properly disclosed within the report, as per Standards 1 and 2 of USPAP and Section 1.2.7.2 of UASFLA. The report also properly recognizes the requirements of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) as applicable assignment conditions as discussed within the "*Problem Identification*" section of the "*Scope of Work Rule*" of USPAP.

Completeness of the Work under Review: **(Continued)**

The report includes adequate analyses of the highest and best use of each of the subject sites; in each case, the analyses seem to be adequately supported. The stated highest and best uses (wooded recreational tracts) are consistent with the historic uses (but not necessarily the current uses of the properties) of the properties prior to conversion and appear to be adequately supported by the data provided within the report. The sites were converted, in one form or another, and to one level or another, from public recreational uses, to uses associated with the extraction of OG&M. The determinations as to highest and best use appear to be legally permissible (permissible via local zoning or lack of local zoning), physically possible (given physical characteristics and existence of similar properties in the immediate area), financially feasible (relatively active market for such uses evidenced by the existence of comparable sales) and appropriately supported (similar surrounding land uses). No speculative uses are relied upon and no unusual local approvals would be necessary to utilize the properties to the stated highest and best uses. The comparable land sales provided in the subsequent valuations of the properties appear to offer similar levels of development potential, functional utility, market appeal and highest and best use, given the data provided. With this, the level of development potential and functional utility available at the subject properties appears to have been sufficiently captured within the application of the Sales Comparison Approach to Value. The report also appropriately includes the following:

- an identification of the client, intended uses and intended users of the report,
- the appropriate definition of market value and a citation of the appropriate source of the definition of market value,
- consideration of the impacts of existing land use regulations in the area. The report includes a thorough discussion of municipal zoning including excerpts from the pertinent sections of the local zoning ordinances. While additional data regarding comprehensive plans, subdivision and land development ordinances or other plans impacting land use could have been discussed (if they exist), I believe that the level of data and analysis provided is applicable to the appraisal problem,
- a summary of the appraisal problem (See Page 8 of the report) including an identification of the challenges encountered during the search for comparable data and the overall valuation of the property,
- sufficient photography and mapping to assist the reader in the visualization of the properties,
- a larger parcel discussion indicating that based on instruction provided by the client (to treat the exchange as non-assembled) and guidance provided in Section 1.12 of UASFLA (Special Considerations in Appraisals for Federal Land Exchanges), the report suggests that each of the 17 conversion sites "*represents its own larger parcel*." With this, individual analyses and valuations of each of the 17 conversion sites was provided,
- a sales history for each of the subject sites that meets the requirements set forth within Standards Rule 1-5(b) of USPAP and Section 2.3.2.3.5 of the Uniform Appraisal Standards for Federal Land Acquisitions (USFLA).
- a use history and rental history for each of the subject sites that meet the requirements set forth within Sections 2.3.2.3.4 and 2.3.2.3.6 of the Uniform Appraisal Standards for Federal Land Acquisitions (USFLA),
- the assessment and annual tax load for each of the properties under PA Act 319 Preferential Assessment Program (where applicable) and the market value assessment and annual tax load for the properties,
- a signed certification statement that appears to be consistent with the requirements of Standards Rule 2-3 of USPAP and Section 2.3.1.4 of the Uniform Appraisal Standards for Federal Land Acquisitions (USFLA).

Overall, I believe the report submitted for review to be complete. The level of description provided appears to meet the minimum development and reporting levels outlined in USPAP Standard 1 and Standards Rule 2-2(a) for Appraisal Reports. As well, the report submitted for review appears to contain sufficient data to meet the definition of "*appraisal*" as set forth in 49 CFR §24.103 and appears to be consistent with the requirements of Uniform Appraisal Standards for Federal Land Acquisitions (USFLA).

Apparent Adequacy and Relevance of the Data and the Propriety of any Adjustments in the Work under Review:

In my opinion, the report appears to demonstrate an effective collection and analysis of data sufficient and appropriate to solve the appraisal problem in accordance with the requirements mandated by the Uniform Standard of Professional Appraisal Practice 2018-2019 Edition, 49 CFR Part §24.103 and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA).

A total of 13 comparable land sales are presented within the report (data regarding additional sales that were considered but not necessarily analyzed is also presented within the report – See "*Database*" section on Pages 183 to 185 of the report)). Seven of the sales (Land Sales #1 thru #7) included OGM rights and represent fee simple transactions while the remaining six sales (Land Sales #8 thru #13) lacked OGM rights and represent surface only sales. As noted earlier, the Larger Parcel determinations specify that each conversion site is its own separate larger parcel located within a 100 to 200 acre parcel of similar ownership. With this, the analysis of each of the 17 conversion sites assumes that each of the respective sites serves as a portion of a 100-200 Acre parcel of land in similar ownership. Consequently, the seven comparable land sales (Land Sales #1 thru #7) selected for direct comparison to Conversion Sites #1 thru #15 and #17 range in size from 70.74 Acres to 216.60 Acres. The report indicates that the land sales presented are the most similar sales available and the sales which most accurately represent the value and appeal of the respective subject properties in the marketplace. The seven land sales occurred between July 2016 and February 2018 thus all are fairly recent, as of the effective date. The sales are located in Potter, Lycoming, Tioga and Clinton Counties, like the subject properties. All seven sales appear to be generally similar to the subject properties with respect to general location, development pressures and/or overall physical features (including potential timber quality/quantity, with adjustments considered, when and where applicable) thus all seem to be fairly similar with respect to overall highest and best use.

The six comparable land sales (Land Sales #8 thru #13) selected for direct comparison to Conversion Site #16 range in size from 112.85 Acres to 340.13 Acres. The report indicates that the land sales presented are the most similar sales available and the sales which most accurately represent the value and appeal of the subject property in the marketplace. The six land sales occurred between January 2016 and July 2018 thus all are fairly recent, as of the effective date. Two of the six sales (Sales #8 and #10) are located in Potter County, like the subject while the remaining four sales (Sales #9, #11, #12 and #13) are located in Lycoming, Clearfield and Clinton Counties (all located in the "*PA Wilds*", as described in the report). All six sales appear to be generally similar to the subject property with respect to general location, development pressures and/or overall physical features (including potential timber quality/quantity, with adjustments considered, when and where applicable) thus all seem to be fairly similar with respect to overall highest and best use.

Sales data provided includes photographs of each of the comparables, assessment mapping, USGS mapping, and a general map which depicts the location of each sale property in relation to the subject properties. Data relative to 12 of the 13 comparable sales has been properly verified with a party to the transaction or other knowledgeable party (participating appraiser, broker, etc.). Only Land Sale #5 was not verified with a party to the transaction or other knowledgeable party (participating appraiser, broker, etc.). Nonetheless, the attempts at verification of Land Sale #5 are detailed within the report. Since Sale #5 was not confirmed with a party to the transaction, this sale (in each case) was afforded less emphasis in the reconciliation. In each case, the unit of comparison selected for the analyses was the overall gross sales price per Acre of land area. From my experience, this represents an appropriate and recognized unit of comparison for tracts such as the subject.

Apparent Adequacy and Relevance of the Data and the Propriety of any Adjustments in the Work under Review: (Continued)

The report includes 17 unique adjustment processes which are presented in grid format on various pages of the report. A combination of quantitative and qualitative adjustments were provided; all quantitative adjustments (one sale only (Land Sale #2)) were applied first. Relatively few adjustments were applied to the comparables in each case. The items considered for adjustment seem relevant to the appraisal problem. The adjustment processes are appropriately explained, and the adjustments seem reasonable given the data provided. The adjustments (or lack of adjustments) are supported with comprehensive explanation but no direct sales pairings. As a result of the reasonable level of support and the low number of adjustments required, the conclusions of value appear to be well supported by the adjusted and unadjusted unit rates of the land comparables. Given the number of adjustments applied and the reasonable support for the adjustments applied, the value conclusions offered in the report can be supported, even without consideration for the overall adjustment process that is presented.

The concluded unit value for Conversion Sites #1 thru #4, #13, #14, #15 and #17 ($4,000/Acre) is adequately supported by the overall unit prices indicated by the seven comparable land sales presented both as adjusted ($2,033/Acre to $4,718/Acre) and as unadjusted ($2,033/Acre to $5,333/Acre). The concluded unit value for Conversion Sites #1 thru #4, #13, #14, #15 and #17 ($4,000/Acre) falls within the middle portion of the unadjusted range. Two of the seven sales (Land Sales #1 ($2,033/Acre) and #4 ($2,500/Acre) were deemed to be overall inferior to the subject while the remaining five sales (Land Sales #2 ($4,718/Acre), #3 ($4,000/Acre), #5 ($3,913/Acre), #6 ($3,555/Acre & #7 ($4,426/Acre) were deemed to be overall similar to the subject. The report includes properly explained and reasonably supportable reconciliations of the Sales Comparison Approach to value. The rationale for the reconciliation processes employed has been explained within the report. Application of the concluded unit value of $4,000/Acre to the areas of Conversion Sites #1 thru #4, #13, #14, #15 and #17 (3.88 Acres, 8.07 Acres, 4.44 Acres, 6.25 Acres, 1.47 Acres, 0.48 Acre, 2.05 Acres and 9.32 Acres, respectively) yields rounded land value estimates of $16,000, $32,000, $18,000, $25,000, $6,000, $2,000, $8,000 and $37,000, respectively.

The concluded unit value for Conversion Sites #5 thru #12 ($4,700/Acre) is adequately supported by the overall unit prices indicated by the seven comparable land sales presented both as adjusted ($2,033/Acre to $4,718/Acre) and as unadjusted ($2,033/Acre to $5,333/Acre). The concluded unit value for Conversion Sites #5 thru #12 ($4,700/Acre) falls within the upper portion of the unadjusted range. Two of the seven sales (Land Sales #1 ($2,033/Acre) and #4 ($2,500/Acre) were deemed to be overall inferior to the subject while the remaining five sales (Land Sales #2 ($4,718/Acre), #3 ($4,000/Acre), #5 ($3,913/Acre), #6 ($3,555/Acre & #7 ($4,426/Acre) were deemed to be overall similar to the subject. The report includes properly explained and reasonably supportable reconciliations of the Sales Comparison Approach to value. The rationale for the reconciliation processes employed has been explained within the report. Application of the concluded unit value of $4,700/Acre to the areas of Conversion Sites #5 thru #12 (7.54 Acres, 28.66 Acres, 18.20 Acres, 5.22 Acres, 12.39 Acres, 20.13 Acres, 0.85 Acre and 8.65 Acres, respectively) yields rounded land value estimates of $35,000, $135,000, $86,000, $25,000, $58,000, $95,000, $4,000 and $41,000, respectively.

The concluded unit value for Conversion Site #16 ($2,100/Acre) is adequately supported by the overall unadjusted unit prices indicated by the six comparable land sales presented ($1,282/Acre to $2,528/Acre). The concluded unit value for Conversion Site #16 ($2,100/Acre) falls within the middle portion of the unadjusted range. Two of the six sales (Land Sales #1 ($1,609/Acre) and #3 ($1,282/Acre) were deemed to be overall inferior to the subject while the remaining four sales (Land Sales #2 ($1,565/Acre), #4 ($2,528/Acre), #5 ($2,120/Acre) and #6 ($2,127/Acre) were deemed to be overall similar to the subject. The report includes properly explained and reasonably supportable reconciliation of the Sales Comparison Approach to value. The rationale for the reconciliation process employed has been explained within the report. Application of the concluded unit value of $2,100/Acre to the areas of Conversion Site #16 (0.85 Acre) yields a rounded land value estimate of $2,000.

Appropriateness of the Appraisal Methods and Techniques Used in the Work under Review:

Overall, it appears as though the report includes appropriate appraisal methodology and techniques. Seventeen different indications of market value were estimated by development of only the Sales Comparison Approach to Value. The report indicates that the Income and Cost Approaches to Value were not applicable in this case and the exclusion of the Income and Cost Approaches to Value has been properly explained within the report. Given the type of properties involved (vacant land) and the data set forth within the report, this assertion seems reasonably appropriate. Therefore, in the overall reconciliation, the Sales Comparison Approach to Value was afforded sole emphasis in each case. The reconciled value conclusions are as follows:

Conversion Site #1 – $16,000
Conversion Site #2 – $32,000
Conversion Site #3 – $18,000
Conversion Site #4 – $25,000
Conversion Site #5 – $35,000
Conversion Site #6 – $135,000
Conversion Site #7 – $86,000
Conversion Site #8 – $25,000
Conversion Site #9 – $58,000
Conversion Site #10 – $95,000
Conversion Site #11 – $4,000
Conversion Site #12 – $41,000
Conversion Site #13 – $6,000
Conversion Site #14 – $2,000
Conversion Site #15 – $8,000
Conversion Site #16 – $2,000
Conversion Site #17 – $37,000

Overall Appropriateness of the Analyses, Opinions, and Conclusions Developed and Presented in the Work under Review:

It is my opinion that the analyses, opinions and conclusions are adequately supported by the overall summary of information and analysis provided. As well, it is my conclusion that the report is prepared and presented in accordance with Uniform Standard of Professional Appraisal Practice 2018-2019 Edition, 49 CFR Part §24.103 and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA).

After a through desk technical review in accordance with the scope of work identified in this review report, it is my conclusion that the report is prepared and presented in accordance with 49 CFR Part §24.103, the Uniform Standards of Professional Appraisal Practice and the Uniform Appraisal Standards for Federal Land Acquisitions. Overall, I believe that the value opinions offered within the submitted appraisal report are adequately supported by the data presented and that the content, analyses and conclusions stated in the report under review are in compliance with the applicable standards and requirements as described herein. Further, as a result of my review, **I RECOMMEND** the appraisal report for use by the agency in establishing Market Value.

Philip J. Swartz, AI-GRS

Review Appraiser ♦ State Certified General Real Estate Appraiser – Pennsylvania, Virginia, South Carolina, West Virginia, Kentucky and Georgia

Notable Experience

2007 – Present – Review Appraiser/Partner – Appraisal Review Specialists, LLC, Hurricane, West Virginia

2007 – 2013 – Review Appraiser – ARROW Land Solutions, LLC (formerly Overland, Pacific & Cutler Northeast, LLC), Northumberland & Lewisburg, PA

2002 – 2007 – Real Estate Appraisal Reviewer – Commonwealth of Pennsylvania, Department of Transportation, Harrisburg, PA

2001 – 2002 – Real Estate Appraiser – Commonwealth of Pennsylvania, Department of Transportation, Montoursville, PA

1999 – 2001 – Real Estate Appraisal – Appraisal & Marketing Associates, Inc., Sunbury, PA

1992 – 1999 – Real Estate Sales & Appraisals – Coldwell Banker Penn One Real, Lewisburg, PA
(Partner in subsidiary of Penn One Appraisal Services 94-99)

Full time real estate appraiser performing and reviewing real estate appraisals of varying type in the Commonwealth of Pennsylvania since 1992. Background experience covers full time work in real estate profession since 1992 including sales of real estate and appraising. Property types appraised include residential, commercial, multi-family, industrial, and agricultural as well as valuation of sewer easements, highway easements, conservation easements and the appraisal of numerous properties involved in public acquisition and/or condemnation. Qualified expert witness in Berks, Schuylkill, Tioga, Bradford, Lycoming and Northumberland Counties in PA and Wood, Tucker, Grant and Berkeley Counties in WV.

Advanced and complex technical work involving the independent appraisal and appraisal review of real estate for public use. Responsible for right-of-way appraisal and appraisal review in various locations of PA, GA, WV and VA. Preparing, and reviewing appraisals of all types of real estate, machinery & equipment. Determinations of compensable elements of damage are normally made along with, before and after values, and estimates of damages. Duties involve appraisal and appraisal review assignments ranging from the basic to the most complex. Assignments are received in broad outline and completed work is reviewed in order to insure the results obtained adhere to established policies and procedures.

Reviews real estate and machinery & equipment appraisals submitted by others in various locations in PA, WV, GA and VA. Provides technical guidance in assuring conformance to accepted appraisal techniques and requirements.

Provide expert advice and assistance to local, state and federal agencies in matters of eminent domain valuation and provides expert valuation support for various financial institutions.

Dedicated Review Appraiser with advanced appraisal and appraisal review experience for more than 24 years. More than 14 years in the specialized field of eminent domain appraisal and appraisal review. Highly motivated and willing to assist on valuation issues ranging from simple to the most complex. History of leadership in solving the most complicated of appraisal and appraisal review issues under seemingly unrealistic timeframes. Knowledge of Federal, State, and Local regulations dealing with public acquisitions and property valuation including the Uniform Act, PA Eminent Domain Code, Uniform Appraisal Standards for Federal Land Acquisitions, USPAP and WVDOT, PennDOT and VADOT Right-of-Way Manuals. Proven ability to work independently or as a part of a team. Past participation in development and implementation of policy and operational procedure specific to property valuation for PennDOT. Team member in the development of the Appraisal Section of the Right-of-Way Office database currently utilized by PennDOT. Also participated in the update and revision of the PennDOT Appraisal Invitation to Qualify (ITQ) contact and the update and revision to Right-of-Way Appraisal forms. Qualified expert review appraiser for NRCS/USDA Easement Program covering all 50 states in US. Qualified expert witness in litigation cases for eminent domain and tax assessment appeals in various counties in Pennsylvania. Qualified review appraiser for PennDOT, GA DOT, VADOT, WV DOH, USDA/NRCS and West Virginia Appraiser Certification Board and local financial institutions.

Professional Credentials

PA Licensed Real Estate Salesperson #RS 199524-L (Escrowed)
PA Certified General Real Estate Appraiser #GA-00-1298-L
VA Certified General Real Estate Appraiser #4001-012244
WV Certified General Real Estate Appraiser #CG371
KY Certified General Real Estate Appraiser #004786
SC Certified General Real Estate Appraiser #7266
GA Certified General Real Estate Appraiser #365609
TN Certified General Real Estate Appraiser #5288 (Expired)

Education

B.S. Degree, Business Administration, Clarion University of Pennsylvania Concentration: Real Estate

Professional Associations

Designated Member of Appraisal Institute #35423 (AI-GRS)

Related & Continuing Education

Accounting I & II (Clarion University)
Financial Management (Clarion University)
Legal Environment I & II (Clarion University)
Basic Income Capitalization, Course 310 (Appraisal Institute)
USPAP and PA state Appraisal Law Update (Appraisal Institute)
Appraisal of Non-Conforming Uses (Appraisal Institute)
Residential Design & Functional Utility Seminar (Appraisal Institute)
Land Titles (International Right of Way Association)

Develops special appraisal techniques when necessary to resolve unusual or difficult appraisal problems. Assists and advises agency and fee appraisers and attorneys on any questions pertaining to appraisals during the course of litigation.

Inspects the subject properties in the field and also the comparable sales utilized by the appraisers, when and where applicable.

Checks local zoning and building codes, spot checks title deed information to assure that information contained in the appraisals is authentic.

Appraisal Procedures, Course 120 (Appraisal Institute)
Appraisal Principles, Course 110 (Appraisal Institute)
Litigation Skills for Appraisers (Appraisal Institute)
Eminent Domain & Condemnation Appraising (Appraisal Institute)
Data Confirmation & Verification Techniques (Appraisal Institute)
FHA Appraisal Seminar (Polley Associates)
Tax Assessment & Tax Appeals (DPS Real Estate School)
Appraisal Historic Properties (Lee & Grant Institute)
Easement Valuation (Appraisal Institute)
Valuation of Partial Interests (Appraisal Institute)
Appraisal Review in Eminent Domain (International Right-of-Way Association)
Eminent Domain Modules I, II & III (Corporate Educators, Inc. for PennDOT)
General Applications, Course 320 (Appraisal Institute)
Eminent Domain Appraisal Principles (Appraisal Institute)
7-Hr National USPAP Update Course (Appraisal Institute)
Avoiding USPAP Violations and PA State Appraisal Law (DPS Real Estate School)
Appraisal & Appraisal Review for Federal-Aid Highway Projects (PennDOT for The Federal Highway Administration and the National Highway Institute)
Uniform Appraisal Standards for Federal Land Acquisitions (Appraisal Institute)
Introduction to Machinery & Equipment Valuation (American Society of Appraisers)
Avoiding USPAP Violations & Disciplinary Actions (DPS Real Estate School
2-Hour Delaware State Law Update (McKissock Education)
Eminent Domain and Condemnation (Appraisal Institute)
Business Practice & Ethics (Appraisal Institute)
Oil & Gas Valuation Seminar (American Society of Farm Managers and Rural Appraisers
VDOT Appraisal Workshop & Eminent Domain Trial Tactics (Virginia Department of Transportation)
Valuation of Conservation Easements (Appraisal Institute, Certificate Program)
General Appraiser Market Analysis & Highest & Best Use (Appraisal Institute)
Appraising the Appraisal, Review General (Appraisal Institute)
Mandatory Delaware Appraisal Meeting (DelDOT)
The Appraiser as an Expert Witness: Preparation & Testimony (Appraisal Institute)
Avoiding USPAP Violations and State Disciplinary Actions, PA State Appraiser Law Update (DPS Real Estate School)
VDOT Appraisal Review Workshop (Virginia Department of Transportation)
Valuation of Conservation Easements (American Society of Farm Managers and Rural Appraisers)
Litigation Appraising (Appraisal Institute)
7-Hour National USPAP Update Course (Appraisal Institute)
Review Theory – General (Appraisal Institute)
Marketability Analysis: A 6-Step Process (Appraisal Institute)
Review Case Studies – General (Appraisal Institute)
7-Hour National USPAP Update Course & PA State Law (Appraisal Institute) 2016
Appraisal of Self-Storage Facilities (McKissock Education)
Review Theory – Residential (Appraisal Institute)
Advanced Residential Case Studies, Part I (Appraisal Institute)
Review Case Studies – Residential (Appraisal Institute) Uniform Appraisal Standards for Federal Land Acquisitions: Practical Applications (Appraisal Institute)
IRWA 409 - Integrating Appraisal Standards (International Right-of-Way Association)
Real Estate Statistics, Finance and Valuation Modeling (Appraisal Institute)
Solving Land Puzzles (Appraisal Institute)

APPENDIX D
Recreational Utility Table

Conversion Site	State Forest	County	Municipality	Converted Area (acres)	Recreation Lost	Replacement Land
Tract 324 Pad A	Moshannon	Clearfield	Girard Twp.	6.25	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted access to the area of well pad construction. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Moshannon State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 212 miles from Moshannon State Forest.
Tract 259 Pad B	Sproul	Centre	Burnside Twp.	3.88	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted access to the area of well pad construction. Permanent impacts include gated access on the road leading to the well pad and loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Sproul State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 212 miles from Sproul State Forest.
Tract 706 Pad 10	Sproul	Centre	Burnside Twp.	8.07	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted access to the area of well pad construction. Permanent impacts include gated access on the road leading to the well pad and loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Sproul State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 212 miles from Sproul State Forest.
Tract 284 Pad A	Sproul	Clinton	Grugan	4.44	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Sproul State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 212 miles from Sproul State Forest.
Tract 100 Pad N	Loyalsock	Lycoming	Lewis Twp.	7.54	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Neuman Field Impoundment	Loyalsock	Lycoming	Lewis Twp.	(included with Neuman Field Compressor)	(included with Neuman Field Compressor)	
Tract 100 Pad G	Loyalsock	Lycoming	McIntyre Twp.	5.22	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Pad P	Loyalsock	Lycoming	Lewis Twp.	12.39	Vegetation was cleared to build the well pad and pond. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.

Tract 100 Neuman Field Compressor	Loyalsock	Lycoming	Lewis Twp.	18.20	Vegetation was cleared to build the compressor and pond. Temporary impacts included restricted roads and access to the area where the compressor station and supporting facilities for the station and the gas development efforts were being constructed. Permanent impacts resulted in the loss of land in and around the compressor that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Pad T	Loyalsock	Lycoming	Lewis Twp.	20.13	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Pad P Impoundment	Loyalsock	Lycoming	Lewis Twp.	(included with Pad P)	(included with Pad P)	
Tract 100 Pad R	Loyalsock	Lycoming	Lewis Twp.	8.65	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 154 Pine Hill Impoundment	Susquehannock	Potter	Wharton Twp.	0.48	Vegetation was cleared to build the impoundment. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Susquehannock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Susquehannock State Forest.
Tract 154 Pad A	Susquehannock	Potter	Wharton Twp.	1.47	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Susquehannock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Susquehannock State Forest.
Tract 997 Pine Hill Compressor	Susquehannock	Potter	Wharton Twp.	0.77	Vegetation was cleared to build the compressor. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Susquehannock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Susquehannock State Forest.
Tract 154 Impoundment A	Susquehannock	Potter	Wharton Twp.	2.05	Vegetation was cleared to build the impoundment. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Susquehannock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Susquehannock State Forest.
Tract 594 Pad 3	Tioga	Tioga	Liberty	9.32	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Tioga State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical

					surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 221 miles from Tioga State Forest.
Relocated/New Roads Constructed for the Above Sites						
Brown Road Relocation	Loyalsock	Lycoming	Lewis Twp.	0.85	Vegetation was cleared for the relocation of an intersection of Brown Road. Temporary impacts resulted periods of road closure. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the old road alignment was returned to forest and recreational use.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Loyalsock State Forest.
New Tract 100 Road to Pad N	Loyalsock	Lycoming	Lewis Twp.	28.66	Vegetation was cleared to construct a new access road to Pad N. Temporary impacts resulted in restricted roads and access to the area. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Loyalsock State Forest.
Total Area Converted				**138.37**		

APPENDIX E
PDESFs

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Moshannon State Forest, Tract 324 Pad A		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A* ☐ **Development** *Go to Step 2B* ☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands				X	
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 8/24/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 8/24/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address:	Moshannon State Forest Tract 324 Pad A, Girard Township, Clearfield County	Date of appraisal transmittal letter/waiver:	April 30, 2019
Real property value:	$25,000	Effective date of value:	August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 324 Pad A
Moshannon State Forest
Girard Township, Clearfield County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Moshannon State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 6.25 acres were converted at this site and 60,049.32 acres remain LWCF protected within Moshannon State Forest. Moshannon State Forest is comprised of 190,031 acres total.
   Moshannon State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Moshannon State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in July 2012.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Sproul State Forest, Tract 259 Pad B		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A* ☐ **Development** *Go to Step 2B* ☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 8/24/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 8/24/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address:	Sproul State Forest Tract 259 Pad B, Burnside Township, Centre County	Date of appraisal transmittal letter/waiver:	April 30, 2019
Real property value:	$16,000	Effective date of value:	August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 259 Pad B
Sproul State Forest
Burnside Township, Centre County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Sproul State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 3.88 acres were converted at this site and 208,957.31 acres remain LWCF protected within Sproul State Forest. Sproul State Forest is comprised of 305,450 acres total. Sproul State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Sproul State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in July 2009.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Sproul State Forest, Tract 706 Pad 10		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A* ☐ **Development** *Go to Step 2B* ☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 8/24/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 8/24/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Sproul State Forest Tract 706 Pad 10, Burnside Township, Centre County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $32,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 706 Pad 10
Sproul State Forest
Burnside Township, Centre County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Sproul State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 8.07 acres were converted at this site and 208,957.31 acres remain LWCF protected within Sproul State Forest. Sproul State Forest is comprised of 305,450 acres total. Sproul State Forest is in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Sproul State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in August 2010.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Sproul State Forest, Tract 284 Pad A		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A* ☐ **Development** *Go to Step 2B* ☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 8/31/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 8/31/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Sproul State Forest Tract 284 Pad A, Grugan Township, Clinton County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $18,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 284 Pad A
Sproul State Forest
Grugan Township, Clinton County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Sproul State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 4.44 acres were converted at this site and 208,957.31 acres remain LWCF protected within Sproul State Forest. Sproul State Forest is comprised of 305,450 acres total. Sproul State Forest is in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Sproul State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in October 2014.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Loyalsock State Forest, Tract 100 Pad N		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands		X			
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Loyalsock State Forest Tract 100 Pad N, Lewis Township, Lycoming County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $35,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 100 Pad N
Loyalsock State Forest
Lewis Township, Lycoming County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Loyalsock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 7.54 acres were converted at this site and 54,396.85 acres remain LWCF protected within Loyalsock State Forest. Loyalsock State Forest is comprised of 114,551.97 acres total.
   Loyalsock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Loyalsock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in July 2012.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Loyalsock State Forest, Tract 100 Road to Pad N		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A* ☐ **Development** *Go to Step 2B* ☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality		X			
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing	X				
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)	X				
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)	X				
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Loyalsock State Forest Tract 100 Road to Pad N, Lewis Township, Lycoming County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $135,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 100 New Road to Pad N
Loyalsock State Forest
Lewis Township, Lycoming County
PDESF Narrative

Step 3B.

1. Transmittal letter provided as part of the EA submission.

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for a new road associated with natural gas infrastructure is part of Loyalsock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 28.66 acres were converted at this site and 54,396.85 acres remain LWCF protected within Loyalsock State Forest. Loyalsock State Forest is comprised of 114,551.97 acres total.
   Loyalsock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Loyalsock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental reviews were conducted by the DCNR Bureau of Forestry when the tract was leased, however, DEP permits were not obtained by the operators for new roads.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Loyalsock State Forest, Tract 100 Neuman Field Compressor Station and Impoundment		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

_____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

_____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

_____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

_____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality		X			
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing	X				
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)	X				
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address:	Loyalsock State Forest Tract 100 Neuman Field Compressor Station and Impoundment, Lewis Township, Lycoming County	Date of appraisal transmittal letter/waiver:	April 30, 2019
Real property value:	$86,000	Effective date of value:	August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 100 Neuman Field Compressor Station and Pond
Loyalsock State Forest
Lewis Township, Lycoming County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Loyalsock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 18.23 acres were converted at this site and 54,396.85 acres remain LWCF protected within Loyalsock State Forest. Loyalsock State Forest is comprised of 114,551.97 acres total.
   Loyalsock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Loyalsock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental reviews were conducted by the DCNR Bureau of Forestry when the tract was leased, however, DEP permits were not obtained by the operators for compressor stations and ponds.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Loyalsock State Forest, Tract 100 Pad G		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

_____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

_____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

_____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

_____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Loyalsock State Forest tract 100 Pad G, McIntyre Township, Lycoming County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $25,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 100 Pad G
Loyalsock State Forest
McIntyre Township, Lycoming County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Loyalsock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 5.22 acres were converted at this site and 54,396.85 acres remain LWCF protected within Loyalsock State Forest. Loyalsock State Forest is comprised of 114,551.97 acres total.
   Loyalsock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Loyalsock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in May 2012.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Loyalsock State Forest, Tract 100 Pad P and Impoundment		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address:	Loyalsock State Forest tract 100 Pad P and Impoundment, Lewis Township, Lycoming County	Date of appraisal transmittal letter/waiver:	April 30, 2019
Real property value:	$58,000	Effective date of value:	August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 100 Pad P and Impoundment
Loyalsock State Forest
Lewis Township, Lycoming County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Loyalsock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 12.39 acres were converted at this site and 54,396.85 acres remain LWCF protected within Loyalsock State Forest. Loyalsock State Forest is comprised of 114,551.97 acres total.
   Loyalsock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Loyalsock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in June 2012.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Loyalsock State Forest, Tract 100 Pad T		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Loyalsock State Forest Tract 100 Pad T, Lewis Township, Lycoming County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $95,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 100 Pad T
Loyalsock State Forest
Lewis Township, Lycoming County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Loyalsock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 20.13 acres were converted at this site and 54,396.85 acres remain LWCF protected within Loyalsock State Forest. Loyalsock State Forest is comprised of 114,551.97 acres total.
   Loyalsock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Loyalsock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in March 2013.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Loyalsock State Forest, Tract 100 Pad R		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Loyalsock State Forest Tract 100 Pad R, Lewis Township, Lycoming County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $41,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 100 Pad R
Loyalsock State Forest
Lewis Township, Lycoming County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Loyalsock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 8.65 acres were converted at this site and 54,396.85 acres remain LWCF protected within Loyalsock State Forest. Loyalsock State Forest is comprised of 114,551.97 acres total.
   Loyalsock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Loyalsock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in June 2013.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Loyalsock State Forest, Tract 100 Brown Road Relocation		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

_____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

_____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

_____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

_____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality		X			
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation			X		
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing	X				
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)	X				
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)	X				
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Loyalsock State Forest Tract 100 Brown Road Relocation, Lewis Township, Lycoming County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $4,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 100 Brown Road Relocation
Loyalsock State Forest
Lewis Township, Lycoming County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for a road relocation associated with natural gas infrastructure is part of Loyalsock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 0.85 acres were converted at this site and 54,396.85 acres remain LWCF protected within Loyalsock State Forest. Loyalsock State Forest is comprised of 114,551.97 acres total.
   Loyalsock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Loyalsock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental reviews were conducted by the DCNR Bureau of Forestry when the tract was leased, however, DEP permits were not obtained by the operators for road relocations.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Susquehannock State Forest, Tract 154 Pad A		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	

Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF Alternate State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

_____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

_____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

_____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

_____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 8/31/18
2.
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: Susquehannock State Forest Tract 154 Pad A, Wharton Township, Potter County

Date of appraisal transmittal letter/waiver: April 30, 2019

Real property value: $6,000

Effective date of value: August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 154 Pad A
Susquehannock State Forest
Wharton Township, Potter County
PDESF Narrative

Step 3B.

1. Transmittal letter provided as part of the EA submission.

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Susquehannock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 1.47 acres were converted at this site and 212,656.51 acres remain LWCF protected within Susquehannock State Forest. Susquehannock State Forest is comprised of 265,000 acres total.
   Susquehannock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Susquehannock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in March 2010.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Susquehannock State Forest, Tract 154 Impoundment		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

_____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

_____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

_____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

_____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality		X			
3. Sound (noise impacts)		X			
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)	X				
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 8/31/18
2.
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address:	Susquehannock State Forest Tract 154 Impoundment, Wharton Township, Potter County	Date of appraisal transmittal letter/waiver:	April 30, 2019
Real property value:	$2,000	Effective date of value:	August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 154 Pond
Susquehannock State Forest
Wharton Township, Potter County
PDESF Narrative

Step 3B.

1. Transmittal letter provided as part of the EA submission.

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Susquehannock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 0.48 acres were converted at this site and 212,656.51 acres remain LWCF protected within Susquehannock State Forest. Susquehannock State Forest is comprised of 264,990.68 acres total.
   Susquehannock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Susquehannock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental reviews were conducted by the DCNR Bureau of Forestry when the tract was leased, however, DEP permits were not obtained by the operators for compressor stations and ponds.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Susquehannock State Forest, Tract 154 Impoundment A		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

_____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

_____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

_____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

_____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality		X			
3. Sound (noise impacts)		X			
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)	X				
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 8/31/18
2.
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address:	Susquehannock State Forest Tract 154 Impoundment A, Wharton Township, Potter County	Date of appraisal transmittal letter/waiver:	April 30, 2019
Real property value:	$8,000	Effective date of value:	August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 154 Impoundment A
Susquehannock State Forest
Wharton Township, Potter County
PDESF Narrative

Step 3B.

1. Transmittal letter provided as part of the EA submission.

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Susquehannock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 2.05 acres were converted at this site and 212,656.51 acres remain LWCF protected within Susquehannock State Forest. Susquehannock State Forest is comprised of 264,990.68 acres total.
   Susquehannock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Susquehannock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental reviews were conducted by the DCNR Bureau of Forestry when the tract was leased, however, DEP permits were not obtained by the operators for compressor stations and ponds.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Susquehannock State Forest, Tract 997 Compressor Station		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	
Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*		
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources		

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Seventh Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality		X			
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 8/31/18
2.
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address:	Susquehannock State Forest Tract 997 Compressor Station, Wharton Township, Potter County	Date of appraisal transmittal letter/waiver:	April 30, 2019
Real property value:	$2,000	Effective date of value:	August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 997 Compressor Station
Susquehannock State Forest
Wharton Township, Potter County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Susquehannock State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 0.77 acres were converted at this site and 212,656.51 acres remain LWCF protected in Susquehannock State Forest. Susquehannock State Forest is comprised of 265,000 acres total.
   Susquehannock State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Susquehannock State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental reviews were conducted by the DCNR Bureau of Forestry when the tract was leased, however, DEP permits were not obtained by the operators for compressor stations and ponds.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals <u>only this Cover Page is required</u> because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

Name of LWCF Proposal:		**Date Submitted to NPS:**
Tioga State Forest, Tract 594 Pad 3		
LWCF Project Number:	**Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):**	
	42-00580, 42-01235, 42-01351	

Local or State Project Sponsoring Agency *(recipient, or sub-recipient in case of pass-through grants)*
Bureau of Recreation and Conservation, Department of Conservation and Natural Resources

Name of Local or State Sponsor Contact:		**Title**		
Lauren S. Imgrund		LWCF State Liaison Officer		
Address		**City**	**State**	**Zip Code**
400 Market St, Fifth Floor		Harrisburg	PA	17105
Phone	**Fax**	**Email Address**		
717-772-9085	N/A	limgrund@pa.gov		

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

X **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc. Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

OMB Control No. 1024-0031
Expiration Date 01/31/2020

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
    a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
    b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
    c. Description of the community and population served by the park, including users of the park and uses.
    d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
    a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
    b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
    c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer “yes” or “maybe” for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all “yes” and “maybe” answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable -** Resource does not exist	**No/Negligible Impacts -** Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality			X		
3. Sound (noise impacts)			X		
4. Water quality/quantity	X				
5. Stream flow characteristics	X				
6. Marine/estuarine	X				
7. Floodplains/wetlands	X				
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing	X				
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)		X			
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*			X		
16. Accessibility for populations with disabilities		X			
17. Overall aesthetics, special characteristics/ features			X		
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.					
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure	X				
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)		X			
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	**Yes**	**No**	**To Be Determined**
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Tom Ford, Director of Bureau of Recreation and Conservation, DCNR
2. Ashley Rebert, Chief – Land Conservation and Stewardship Section, DCNR
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental Specialist, DCNR, 9/11/18
2. Alyssa Lynd, Environmental Specialist, DCNR, 9/11/18
3.

State may require signature of LWCF sub-recipient applicant here: _____ **Date:** _____

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address:	Tioga State Forest tract 594 Pad 3, Liberty Township, Tioga County	Date of appraisal transmittal letter/waiver:	April 30, 2019
Real property value:	$37,000	Effective date of value:	August 22, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Lauren S Imgrund Date: 10/3/19

Typed Name	Title	Agency
Lauren S. Imgrund	State Liaison Officer	PA-DCNR

NOTICES

Paperwork Reduction Act Statement

In accordance with the Paperwork Reduction Act (44 U.S.C. 3501), please note the following. This information collection is authorized by the Land and Water Conservation Fund Act of 1965 (54 U.S.C. 2003 et seq.). Your response is required to obtain or retain a benefit. We use this information to obtain descriptive and environmental information about the proposal. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has assigned control number 1024-0031 to this collection.

Estimated Burden Statement

Completion times vary widely depending on the use of the form, from approximately 30 minutes to complete the cover page only to 500 hours for a difficult conversion of use. We estimate that the average completion time for this form is 8 hours for an application, 2 hours for an amendment, and 112 hours for a conversion of use, including the time necessary to review instructions gather data and review the form. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Information Collection Officer, National Park Service, 12201 Sunrise Valley Drive, MS-242 Rm. 2C114, Reston, VA 20192. Please do not send your completed form to this address; but rather to the address at the top of the form.

Tract 594 Pad 3
Tioga State Forest
Liberty Township, Tioga County
PDESF Narrative

Step 3B.

1. **Transmittal letter provided as part of the EA submission.**

2. **Detailed explanation of the need to convert the Section 6(f) parkland.**
   The Section 6(f) parkland that has been converted for natural gas infrastructure is part of Tioga State Forest. Mineral extraction is an element of the PA Bureau of Forestry's mission and it was unknown at the time that some of the well pads, ponds and compressor stations were sited within LWCF funded portions of State Forest land. This is a conversion application to resolve the gas infrastructure conversions.

3. **Explanation of how the conversion is in accord with the SCORP.**
   The Pennsylvania SCORP has a resource management and stewardship section in which action items are listed for sustaining natural resources and public investments. The State Comprehensive Outdoor Recreation Plan (SCORP) specifically states a recommendation to "develop and implement shale-gas best practices for recreation, and pursue new recreation opportunities".
   On-going coordination has occurred with DCNR, the shale operating gas companies, the engineers and the permitting agencies to reduce the footprint of gas development from upstream, mid-steam and downstream facilities. Extensive coordination has been completed by DCNR to require the most pertinent, native vegetative plantings be used to mitigate any temporary surface impacts. Coordination was completed with the hunting community to further define the preferred seed mixes that both game and non-game species prefer. Ongoing coordination and an expanded list of best management practices will continue to enhance how the gas related drilling will be completed in accordance with the SCORP.

4. **The appraisal for the converted sites can be found in Appendix C of the EA document and the appraisal for the replacement land can be found in Appendix F of the EA document.**

5. **Conversion site.**
   A location map of the converted site can be found in Appendix B of the EA document. Approximately 9.32 acres were converted at this site and 63,751.33 acres remain LWCF protected within Tioga State Forest. Tioga State Forest is comprised of 161,890 acres total.
   Tioga State Forest is located in rural northcentral PA and does not necessarily serve one community or population specifically, people travel from across the state to recreate on state forest land, mostly for hunting, fishing and hiking.

6. **Replacement site:**
   A location map for the replacement land, Strawbridge 2 property, can be found in Appendix B of the EA document. The Strawbridge replacement property is located in Elk, Franklin and New London Townships, Chester County. It is comprised of 987 acres adjacent to the White Clay Creek Preserve and provides passive recreation such as hiking, hunting, fishing and wild life watching. The current owner of the replacement land is George Strawbridge and it is currently used for agricultural practices, passive recreation and preservation. Past uses include agriculture and preservation. The replacement site provides the same recreational opportunities as the converted land and given it is located in a more populated region of the state (southeastern), it will be more accessible and require less travel for those in the metro areas of Philadelphia wishing to hunt, fish and hike than the converted site in Tioga State Forest. The PA DCNR will own the replacement land and it will be managed by the DCNR's White Clay Creek Preserve staff. The replacement land will be incorporated in the White Clay Creek Preserve. The existing preserve is not LWCF protected and will not be included in the 6(f) boundary.

7. **NEPA environmental review for the converted and replacement sites.**
   Environmental assessment documents were prepared for the acquisition and use of the Strawbridge 2 property as replacement land and for the conversion of LWCF land in State Forests due to natural gas exploration.

Step 5. Summary of previous environmental review

1. **Date of environmental review, purpose of the env. Review and for whom they were conducted.**
   Previous environmental review conducted for the converted site includes the DEP permit application for the natural gas well pad in March 2013.

2. **Description of the proposed action and alternatives.**
   See EA document.

3. **Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies and Indian tribes.**
   See EA document.

4. **Environmental resources analyzed and determination of impacts for proposed actions and alternatives.**
   See EA document.

5. **Any mitigation measures to be part of the proposed action?**
   Mitigation for the proposed conversion includes the purchase of replacement land.

6. **Intergovernmental review process.**
   Does not exist.

7. **Public comment periods and agency response.**
   See EA document.

8. **Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.**
   The DCNR determined that following the extensive avoidance, minimization and mitigation measures taken, the conversion would not impact the human environment.

9. **Was this proposed LWCF federal action analyzed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified?**
   No, this proposed federal action was not included in any previous environmental reviews.

APPENDIX F
Strawbridge 2 Environmental Assessment

Environmental Assessment

Strawbridge 2 – White Clay Creek Preserve Addition (Replacement Property) for Multiple Land and Water Conservation Fund Conversions throughout Pennsylvania

Elk, Franklin and New London Townships, Chester County, PA

Acquisition of a replacement property to resolve two transportation project conversions of land subject to Section 6(f)(3) of the Land and Water Conservation Fund Act and various other conversions throughout Pennsylvania as noted on the Recreational Usefulness and Excess Value Table.

March 29, 2019

Submitted by:
Pennsylvania Department of Conservation and Natural Resources
Bureau of Recreation and Conservation
400 Market Street
Harrisburg, PA 17101

Submitted to:
National Park Service, Pacific West Region
909 First Avenue
Seattle, Washington 98104

Table of Contents

1. INTRODUCTION 1

I. Proposed Action 2

2. PURPOSE AND NEED 2

3. ALTERNATIVES CONSIDERED 2

4. ENVIRONMENTAL IMPACTS 2

I. Recreation 2

II. Natural 3

a. Wetlands and Watercourses 3

b. Floodplains 3

c. Threatened and/or Endangered Species 3

d. Geologic Resources: Soils, Bedrock, Slopes, Streambeds, Landforms, etc. 4

e. Land Use/Ownership Patterns 4

f. Hazardous, Residual or Municipal Waste Sites 4

g. Air Quality 5

h. Noise 5

III. Cultural 5

a. Above Ground Historic Resources 5

b. Archaeological Resources 5

c. Tribal Notification 6

IV. Socioeconomic 6

a. Environmental Justice Populations 6

b. Tax Base 6

5. CUMULATIVE IMPACTS 6

6. COORDINATION AND OUTREACH 7

I. Agency Coordination 7

II. Public Outreach 7

REFERENCES

PHOTO LOG

APPENDICES

Appendix A – Location Maps
Appendix B – Strawbridge 2 Property Appraisal
Appendix C – Recreational Usefulness & Excess Value Table
Appendix D – PDESF
Appendix E – Wetlands and Watercourses Map
Appendix F – FEMA Floodplain Map
Appendix G – Threatened and Endangered Species Coordination
Appendix H – Phase 1 ESA Report
Appendix I – SHPO Coordination
Appendix J – Tribal Coordination
Appendix K – Environmental Justice Analysis
Appendix L - Public Comments and Responses to Comments

1. INTRODUCTION

The Land and Water Conservation Fund Act ("the Act") (Public Law 88-578; currently codified at 54 U.S.C. §200304 et seq.) aims to expand and protect a public recreation estate from backyard to backcountry for the health and vitality of the American people and our visitors. The Land and Water Conservation Fund ("LWCF") grant program is administered by the National Park Service ("NPS") in cooperation with a Governor designated agency for each state and territory, and provides matching grants for the acquisition, development, or renovation of tribal, state, and local outdoor recreation properties. In accepting grant funding, applicants commit to managing funded properties for public outdoor recreation purposes in perpetuity, or to provide replacement property to which their LWCF responsibilities can be converted (36 C.F.R. 59).

The Pennsylvania Department of Conservation and Natural Resources ("DCNR") is proposing to acquire a 982.6-acre property (see location map in Appendix A), referred to as the Strawbridge 2 – White Clay Creek Preserve Addition ("Replacement Property"), in Chester County to use as replacement for multiple LWCF conversions throughout Pennsylvania. In order for property to be accepted as conversion replacement, it must demonstrate equivalent fair market value, recreational usefulness, and location as that which it is replacing.

The Strawbridge 2 Replacement Property was appraised at more than 13 million dollars (see appraisal in Appendix B) and will, therefore, adequately provide more than enough value for the conversions being bundled. The conversions being bundled for use at the Replacement Property were chosen because of the equivalent recreational usefulness that the Replacement Property will provide. As a statewide provider, DCNR may consider replacement property anywhere in Pennsylvania.

The Replacement Property will be added to the Commonwealth's 2,073-acre White Clay Creek Preserve (Big Elk Creek Section) and will be maintained by the DCNR Bureau of State Parks. It will provide passive recreation such as hiking, hunting, fishing and wildlife watching. The White Clay Creek Preserve is adjacent to the 5,300-acre Fair Hill Natural Resource Management Area in Maryland. The Replacement Property is also 3.5 miles from the Delaware White Clay Creek State Park along the Pennsylvania/Delaware border. The addition of the Replacement Property to the Pennsylvania Preserve would create a unique, contiguous area of public open space spanning two states and offering recreational opportunities for citizens of Pennsylvania, Maryland and Delaware.

Goals in acquiring the Replacement Property, other than for resolving LWCF conversions, are the preservation of extensive and diverse critical natural resources including more than 7 miles of Big Elk Creek and its tributaries, important forested riparian buffers along them, over 353 acres of mature and young woodlands, over 145 acres of floodplain, and moderate and steep slopes. The Replacement Property also contains habitat for various threatened and endangered plant and animal species. The Replacement Property represents a critical resource in a rapidly developing area of southeastern Pennsylvania. This acquisition is in accordance with the State Comprehensive Outdoor Recreation Plan ("SCORP") in which one of the priorities is to use federal LWCF funds to acquire critical wildlife habitat, forested watersheds, wetlands and riparian corridors for nature-based recreation.

The former Old Springlawn Road, which runs through the Replacement Property, has been converted to a public trail along Big Elk Creek maintained by Elk Township for hiking, biking, bird watching and horseback riding. The rest of the Replacement Property is comprised of forest land, rolling hills and agricultural fields. It is anticipated that the recreational activities permissible at the existing White Clay Creek Preserve's Big Elk Creek Section including hunting, hiking, fishing and wildlife watching will be allowed on the Replacement Property.

I. Proposed Action

The DCNR is proposing to transfer LWCF responsibilities of multiple LWCF properties throughout Pennsylvania (see Recreational Usefulness and Excess Value Table in Appendix C) to the Replacement Property. The proposed federal action is to approve this exchange after comparing the recreational usefulness and appraised fair market value of the properties in question. Additionally, the proposed federal action requested also is to establish a conversion replacement bank in the event there is excess fair market value and recreational usefulness at the Replacement Property after completing the conversion process for the conversions listed in Appendix C. The bank would be eligible for replacing additional LWCF conversions for a period of up to five years.

2. PURPOSE AND NEED

The purpose of the proposed Pennsylvania action is to resolve multiple LWCF conversions throughout Pennsylvania. The proposed action is needed to comply with the NPS's guidelines for LWCF funded sites in which land converted to non-recreational uses must be replaced with land of equal or greater value and recreational usefulness. Failure to resolve the conversions would put DCNR out of compliance with program requirements and potentially ineligible to receive additional LWCF funding. It would not change whether or not the Pennsylvania conversion parcels are used for non-recreation purposes and federal approval of those uses is not part of the federal action.

3. ALTERNATIVES CONSIDERED

The DCNR considered three alternatives to address the existing conversions of LWCF land. The first alternative was the "no action" alternative in which the sites with conversions would remain out of compliance. The second alternative was to remove the infrastructure that caused the conversions to make the sites compliant. The third, preferred alternative, was to replace the converted land and recreational usefulness.

The "no action" approach would not resolve the outstanding conversions and, therefore, not meet the purpose and need of the proposed action. Removing infrastructure to return sites back to recreational use would not be a feasible alternative considering the extent and cost of some of the conversions especially those associated with transportation and natural gas production. The DCNR chose to replace the converted land and recreational usefulness by purchasing the Replacement Property.

4. ENVIRONMENTAL IMPACTS

The NPS's Proposal Description and Environmental Screening Form ("PDESF") for the Replacement Property can be found in Appendix D. PDESF's and analysis of environmental impacts for the conversions will be included with the individual NEPA documentation for those sites.

I. Recreation

A summary of the recreation lost at the converted sites can be found in Appendix C. Most of the converted sites provide for some sort of passive recreation. These conversions are being bundled together for replacement by the Replacement Property because the Replacement Property will provide passive recreation opportunities including hunting, hiking, fishing and wildlife watching. Two of the converted sites contained recreational facilities (i.e. playground equipment). Only the value of these two sites are proposed to be replaced at the Replacement Property, the recreational usefulness will still need to be replaced elsewhere (yet to be determined). Given many of the

conversions are small in acreage, one consolidated replacement site provides more recreational opportunities, especially for passive recreational activities, than smaller replacements all over Pennsylvania. In general, the converted areas of each LWCF property were negligible compared to the overall size of the property with the exception of four small neighborhood parks that were completely converted (each less than 1 acre in size).

II. Natural

a. Wetlands and Watercourses

Big Elk Creek is the main watercourse flowing through the Replacement Property from northwest to southeast. According to the Pennsylvania Fish and Boat Commission ("PFBC"), Big Elk Creek is trout stocked seasonally for recreational fishermen. Approximately five unnamed tributaries to Big Elk Creek also exist within the Replacement Property as well as Hodgson Run. Big Elk Creek has a designated use for High Quality-Trout Stocked, Migratory Fishes ("HQ-TSF, MF").

Analysis of the National Wetlands Inventory ("NWI") identified wetlands on the northwest edge of the Replacement Property along Big Elk Creek; a 3.13-acre, palustrine shrub scrub ("PSS") wetland and a 1.7-acre, palustrine forested ("PFO") wetland (see wetland and watercourse mapping in Appendix E).

The proposed action will not impact Big Elk Creek or its tributaries given that no development is proposed for the Replacement Property. Wetlands will also not be impacted as a result of the proposed action. If recreational facilities will be developed in the future, a field wetland identification and delineation will need to be conducted prior to any such development occurring on the Replacement Property.

b. Floodplains

Federal Emergency Management Agency ("FEMA") flood mapping shows that Big Elk Creek has a Zone A FEMA regulated 100-year floodplain (shown in Appendix F). Hodgson Run and one of the unnamed tributaries to Big Elk Creek have FEMA regulated 100-year floodplains as well. Most of the Replacement Property is within a Zone X or area of minimal flood hazard. There will be no impacts to the FEMA regulated 100-year floodplains of Big Elk Creek, Hodgson Run or the unnamed tributary to Big Elk Creek as a result of the proposed action.

c. Threatened and/or Endangered Species

A Pennsylvania Natural Diversity Inventory ("PNDI") review was conducted for the Replacement Property on March 14, 2018, and indicated potential impacts to a species under the jurisdiction of the PFBC as well as the U.S. Fish and Wildlife Service ("USFWS") and conservation measures for multiple plant species under the jurisdiction of the DCNR (see Appendix G).

The USFWS responded that bog turtle populations exist within close proximity of the Replacement Property. The Indiana bat and the northern long-eared bat have potential habitat within the Replacement Property; however, none of these species has known populations present.

Conservation measures consist of contacting the PA Bureau of Forestry for more information on the species and species-specific conservation recommendations if any construction, earth disturbance, or habitat management is proposed for the Replacement

Property. A conservation plan is proposed to be completed with the USFWS as it pertains to the species in reference.

Coordination with the PFBC determined that no adverse impacts are expected to species of special concern. In addition, coordination with the USFWS determined that there are no known populations of bog turtles, Indiana bats, or northern long-eared bats; however, their presence on the Replacement Property is possible. The USFWS recommends that the DCNR develop management plans for early successional vegetation for bog turtles and forest vegetation for both bat species. If development will occur in the future, habitat surveys will be necessary. Likewise, coordination with the DCNR Bureau of Forestry regarding the recommended conservation measures will be necessary if development of facilities will occur in the future.

d. *Geologic Resources: Soils, Bedrock, Slopes, Streambeds, Landforms, etc.*

The Replacement Property is underlain by oligoclase-mica schist of the Glenarm Wissahickon formation. The Glenarm Wissahickon formation is a schist metamorphosed to greenschist facies. Major constituents are quartz, albite, muscovite and chlorite. It also includes gneiss, hornblende gneiss and lenticular amphibolite bodies having ocean-floor basalt chemistry. There are no Outstanding Scenic Geologic Features or Heritage Geology sites within the Replacement Property.

Topography of the Replacement Property ranges from flat to steep slopes with an overall general sloping toward Big Elk Creek. Soils present include Baile silt loam, Chester silt loam, Codorus silt loam, Comus silt loam, Gaila silt loam, Glenelg silt loam, Glenville silt loam, Hatboro silt loam and Manor loam. The majority of soils present are considered Prime Farmland Soils and Soils of Statewide Importance.

The use of the Replacement Property to resolve LWCF conversions will not result in any impacts to bedrock, soils, slopes, streambeds or landforms. These resources will be preserved due to the proposed action.

e. *Land Use/Ownership Patterns*

The Elk Creek Watershed was originally settled by the Lenni Lenape people and then by English Quakers and Scotch-Irish Presbyterians. Its rivers and streams serve as municipal boundaries and powered mills throughout the 18th and 19th centuries. Throughout much of the 19th century the vast majority of the Replacement Property was in agricultural production. According to the Breous Farm Atlas (1883), the Replacement Property was broken up into numerous small farms, before being brought back under one owner by the DuPonts. The Replacement Property is currently privately owned by George Strawbridge and contains agricultural and forested land.

Following DCNR's acquisition of the Replacement Property, agricultural practices will cease within three years. Land use will be forested and open meadows for passive recreation. The DCNR Bureau of State Parks will implement invasive plant species best management practices ("BMPs") to prevent invasive species from taking over the revegetated agricultural land.

f. *Hazardous, Residual or Municipal Waste Sites*

A Phase I Environmental Site Assessment ("ESA") was conducted for the Replacement Property in July, 2017, and updated in July, 2018. It included a records review, review of

historical information, site reconnaissance, property owner interviews and local official interviews. It was concluded that no potential recognized environmental conditions existed. No historical recognized environmental conditions or controlled recognized environmental conditions were identified at the Replacement Property. The complete Phase I ESA and update can be found in Appendix H. No hazardous, residual or municipal waste sites were found at the Replacement Property, therefore, there will be no impacts. Although no hazardous, residual or municipal waste sites were identified, a debris pile was observed near the ruins of the former residence/barns consisting of brick, concrete, wood, metal, tires and wire mesh fencing. This debris pile will be removed and transported to an appropriate permitted off-site facility for recycling or disposal.

g. Air Quality

Although the area in which the Replacement Property is located is rural, Chester County is within a non-attainment area for criteria air pollutants meaning it does not meet the Clean Air Act standards established by the U.S. Environmental Protection Agency ("EPA"). The proposed action is exempt from regional and project level air quality analyses under the National Environmental Policy Act ("NEPA") given that it does not involve development of the Replacement Property or construction of any infrastructure.

h. Noise

Noise levels in the Replacement Property area are assumed to be relatively low given the rural setting and lack of noise generating sources. Major roadways, railroads, developments, etc. do not exist in proximity to the Replacement Property. The proposed action is exempt from conducting a noise analysis under NEPA given that it does not involve development of the Replacement Property or construction of any infrastructure.

There will be no increases in ambient noise levels as a result of the proposed action. The use of the Replacement Property to resolve LWCF conversions will not cause activities or development that will increase noise levels.

III. Cultural

a. Above Ground Historic Resources

Coordination with the Pennsylvania State Historic Preservation Office ("PA SHPO") determined that there are no structures listed or eligible for listing on the National Register of Historic Places ("NRHP") present within the Replacement Property (see Appendix I). It was also determined by the SHPO that given the proposed action no further studies are required regarding above ground historic resources. There are no NRHP listed or eligible resources within the Replacement Property; therefore, there will be no impact to above ground historic resources.

b. Archaeological Resources

Coordination with the PA SHPO determined that there is a high probability for archaeological resources within the Replacement Property; however, the use of the Replacement Property for LWCF conversions will have no effect on such resources (see Appendix I). One of DCNR's goals in acquiring the Replacement Property is to preserve cultural resources. The Replacement Property contains several foundations and ruins from previous

farming operations. Phase I archaeological surveys of the area will need to be conducted prior to any development or ground-disturbing activities on the Replacement Property. The proposed action will have no impact on any archaeological resources; however, a Phase 1 archaeological survey will be required before any development of the site can occur in the future.

c. Tribal Notification

NPS sent consultation invitations to the Delaware Tribe of Indians and the Delaware Nation, Oklahoma in mid-October, 2018 (see Appendix J). NPS received a response from the Delaware Nation on November 6, 2018. They concurred that the acquisition of the Replacement Property would not adversely affect any known tribal resources, however, there is a high probability of archaeological resources present. The Tribe recommends archaeological studies be conducted before any construction activities take place in the future as well as mitigation measures if archaeological sites are found (see Appendix J). The Tribe also recommends protection of indigenous plants and/or re-introduction of indigenous plants to the area.

IV. Socioeconomic

a. Environmental Justice Populations

Analysis of the Pennsylvania Department of Environmental Protection's ("DEP") eMap PA online mapping application did not identify any environmental justice populations using the 2010 census data and 2015 American Community Survey data in proximity to the Replacement Property (see Appendix K). The use of the Replacement Property for LWCF conversions will have no impact on any environmental justice populations.

b. Tax Base

Once owned by the DCNR, the Replacement Property will be immune from state and local taxes. This may impact the local tax base given that the Replacement Property is almost 1,000 acres in size; however, impacts will not be significant. The presence of preserved open space will benefit surrounding property values. This may help offset the decrease in the local tax base from the DCNR's acquisition of the Replacement Property.

5. CUMULATIVE IMPACTS

Cumulative impacts are direct and indirect environmental impacts caused by the combined results of past, current and future activities. Past, current and future activities at the Replacement Property include agriculture, preservation and recreation.

Past and current agricultural uses of the Replacement Property have caused forest fragmentation but have also provided habitat variety and a variety of hunting, hiking, fishing and wildlife watching opportunities. Big Elk Creek is part of the Chesapeake Bay Watershed and efforts have been made regarding farming practices and land management over the years to improve water quality. Following DCNR's acquisition of the Replacement Property, and upon approval of the proposed action by NPS, agricultural practices must cease within three years. Active agriculture is not an allowable use of LWCF Section 6(f) protected land. This will allow the revegetation of riparian forest land and the planting of warm season grasses for habitat and invasive species management

which will be conducted by the DCNR Bureau of State Parks. Potential future recreational facilities may be developed that will provide more variety of recreational opportunities.

DCNR's acquisition of the Replacement Property will preserve critical habitat and open space in an area that has been experiencing increased development. Although there are no known populations of threatened or endangered species on the Replacement Property, there are populations in close proximity and it is possible that they exist within the Replacement Property boundaries, if suitable habitat exists. Acquisition of the Replacement Property will help with species conservation.

It will also provide more recreational opportunities such as hunting, hiking, fishing and wildlife watching for the surrounding population. Southeastern Pennsylvania does not contain many public areas that allow hunting. The Replacement Property will provide hunters and other people with recreation interests who live in the densely populated southeastern Pennsylvania region a closer and more convenient area to recreate.

6. COORDINATION AND OUTREACH

I. Agency Coordination

Coordination with the USFWS, PFBC and DCNR was conducted to determine potential impacts to threatened and/or endangered species as a result of the proposed action. Coordination was also conducted with the PA SHPO to determine the presence of historic resources and potential impacts. Tribal consultation invitation letters were sent by NPS to federally recognized tribes with an identified interest in Chester county.

II. Public Outreach

This EA was advertised on the PA Bulletin January 19 through March 4, 2019 for public review and comment. During the public comment period. Public comments and responses to comments can be found in Appendix L. A public hearing was not requested during the public comment period.

REFERENCES

Federal Emergency Management Agency. 2018. Flood Map Service Center. Retrieved from the internet [June 2018]. https://msc.fema.gov/portal/search

Pennsylvania Department of Conservation and Natural Resources. 2018. Pennsylvania Geology. Retrieved from the internet [May 2018]. http://www.gis.dcnr.state.pa.us/geology/

Pennsylvania Department of Conservation and Natural Resources. 2018. Pennsylvania Natural Diversity Inventory. Retrieved from internet [March 2018]. https://conservationexplorer.dcnr.pa.gov/content/environmental-review

Pennsylvania Department of Environmental Protection. 2018. eMap PA. Retrieved from the internet [June 2018]. http://www.depgis.state.pa.us/emappa/

Pennsylvania Fish and Boat Commission. 2018. Pennsylvania Trout Streams. Retrieved from internet [May 2018]. http://pfbc.maps.arcgis.com/apps/webappviewer/index.html?id=65a89f6592234019bdc5f095eaf5c6ac

Ten Bears Environmental Associates Company. 2017. Phase I Environmental Site Assessment. Strawbridge II Property; Strickersville Road; Landenberg, Chester County, PA. Ten Bears Environmental Associates Company, Newark, Delaware.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS). 2018. Web Soil Survey. Retrieved from internet [July 2018]. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

U.S. Fish and Wildlife Service. 2018. National Wetlands Inventory, Wetlands Mapper. Retrieved from internet [June 2018]. https://www.fws.gov/wetlands/data/Mapper.html

W.H. Kirk & CO. 1883. Breous Official Series of Farm Maps, Chester County. Philadelphia, PA.

STRAWBRIDGE PROPERTY REPRESENTATIVE PHOTOGRAPHS

Photo 1: Gate 1 on Walker Road.

Photo 2: Gate 2 at the northern end of Mt. Olivet Road at Walker Road.

Photo 3: Gate 3 at the southern end of Mt. Olivet Road at Strickersville Road.

Photo 4: Intersection of Strickersville Road and Mt. Olivet Road (closed to traffic).

Photo 5: Mt. Olivet Road looking north (now used as a jogging/walking trail by locals).

Photo 6: Stone barn ruins along Mt. Olivet Road.

Photo 7: West side of Mt. Olivet Road.

Photo 8: East side of Mt. Olivet Road.

Photo 9: Looking south on Mt. Olivet Road toward Strickersville Road (stone barn ruins on right).

Photo 10. Old railroad bridge crossing Strickersville Road at the southeastern property boundary.

Photo 11. Strickersville Road crossing of Big Elk Creek.

Photo 12: Gate 5 at the southern end of the Springlawn Trail on Strickersville Road.

Photo 13: Springlawn Trail southern terminus.

Photo 14: Pond adjacent to Springlawn Trail on Strickersville Road.

Photo 15: Gate 4 along Strickersville Road.

Photo 16: Springlawn Trail.

Photo 17: Springlawn Trail.

Photo 18: East of Springlawn Trail.

Photo 19: Fields on the north side of Strickersville Road.

Photo 20: Gate 6 on Strickersville Road.

Photo 21: Interior of the property looking north.

Photo 22: Interior of the property looking north.

Photo 23: More agricultural fields.

Photo 24: Interior of the property looking east.

Photo 25: Gate 7 at the end of Schoolhouse Road.

Photo 26: Gate 8 at the northwestern end of the Springlawn Trail on Chesterville Road.

Photo 27: Springlawn Trail.

Photo 28: UNT to Big Elk Creek on Springlawn Trail.

Photo 29: Looking southeast from the Springlawn Trail.

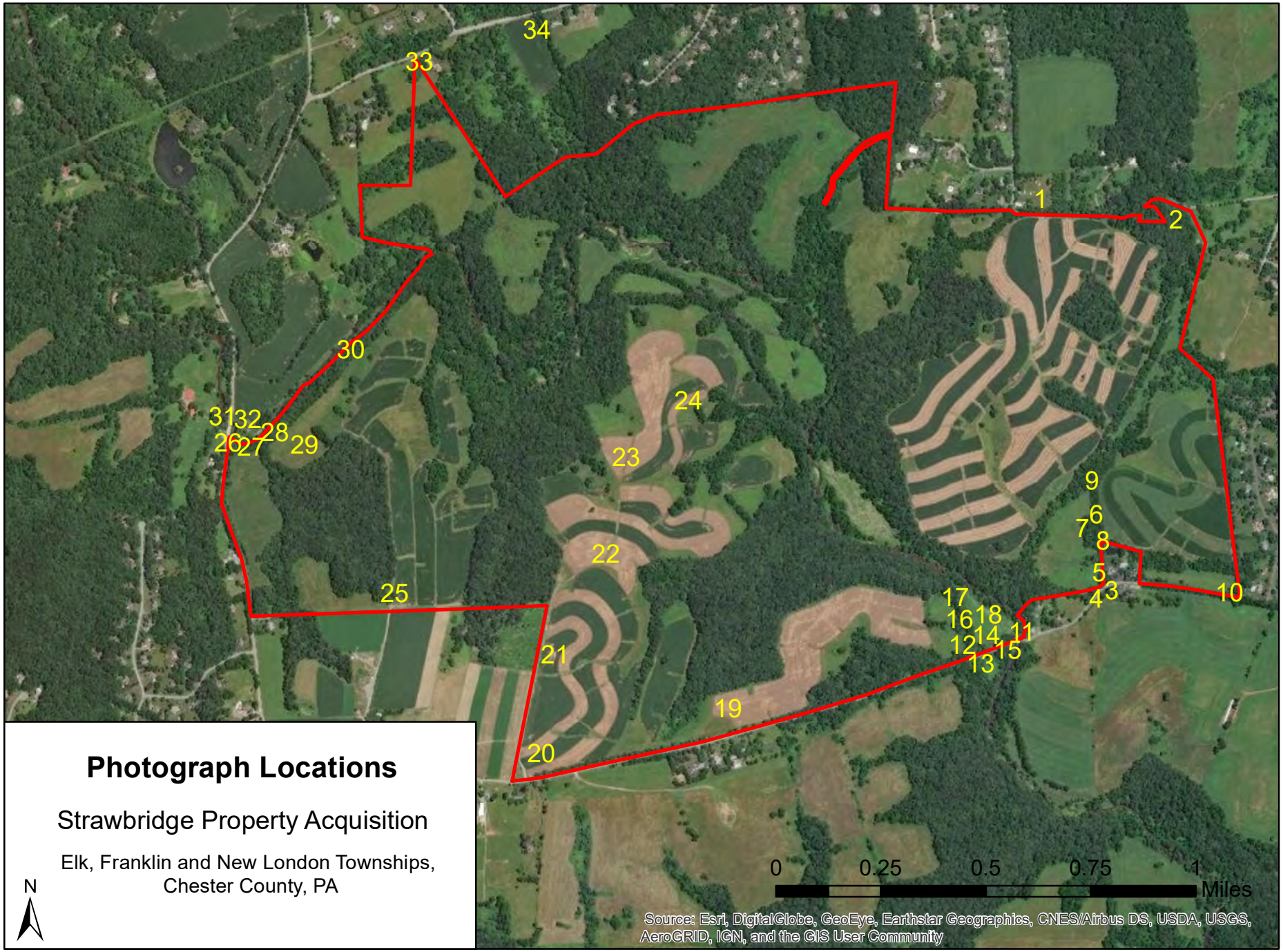
Photo 30: Springlawn Trail.

Photo 31: Chesterville Road crossing of Big Elk Creek adjacent to the Springlawn Trail parking area.

Photo 32: Big Elk Creek from Chesterville Road.

Photo 33: Gate 9 on Chesterville Road.

Photo 34: Hodgson Run, a tributary to Big Elk Creek, from Chesterville Road.

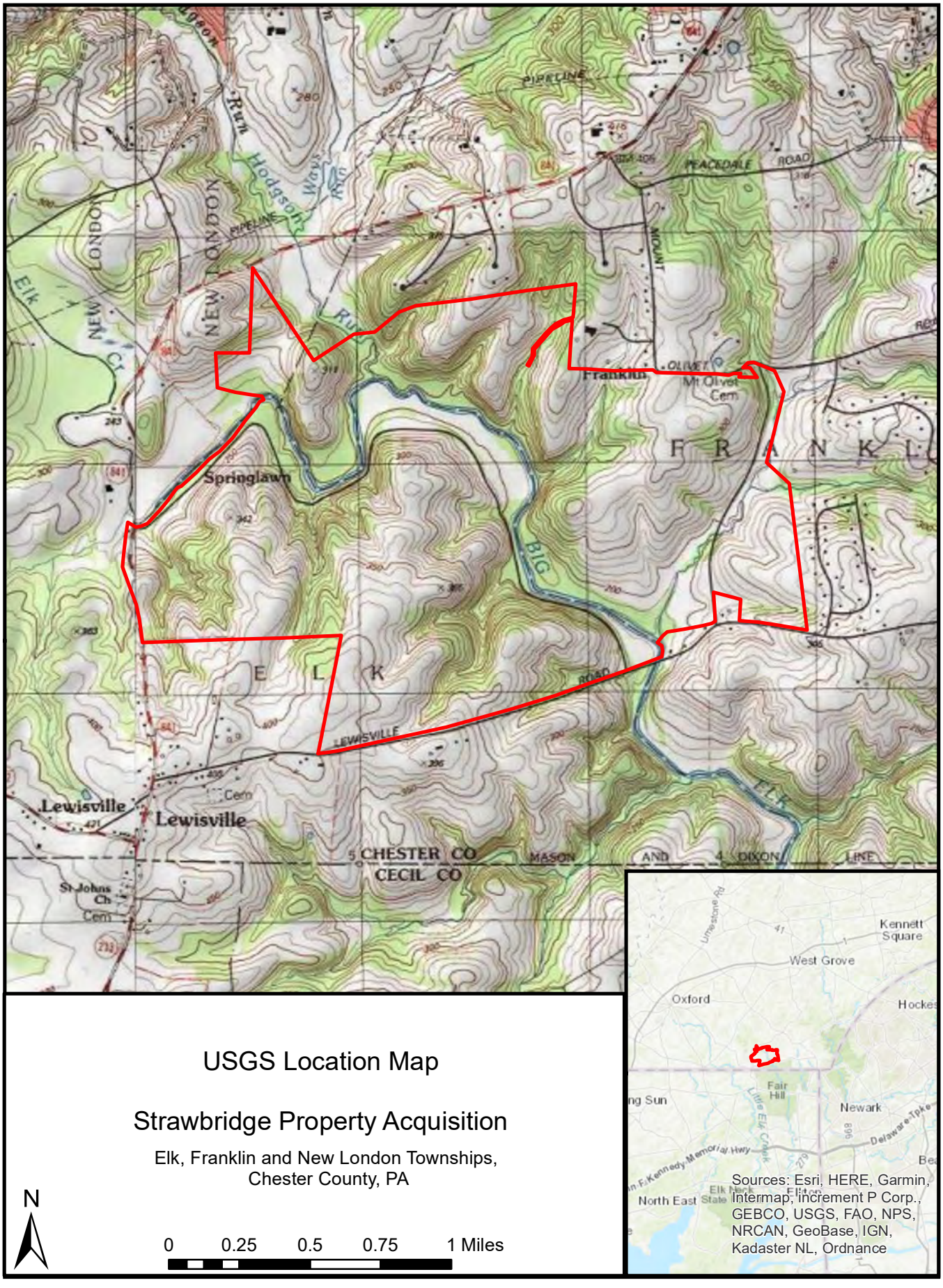


Photograph Locations

Strawbridge Property Acquisition

Elk, Franklin and New London Townships,
Chester County, PA

APPENDIX A
Location Maps



USGS Location Map

Strawbridge Property Acquisition

Elk, Franklin and New London Townships,
Chester County, PA

N

0 0.25 0.5 0.75 1 Miles

6(f) Boundary Map
Grantee: PA DCNR
Park Name:White Clay Creek Preserve Addition
Acres: - 982.6 Strawbridge 2 Replacement Land Acquistion
Local Sponsor Signature: K. Mike Lilly
Date: 2-5-2019
SLO/ASLO Signature: Albert P. Tarbert
Date: 2/22/19
LWCF 42-00157.8, 42-00580.7 & 42-01019.4

ALTA/NSPS LAND TITLE SURVEY
PREPARED FOR
THE CONSERVATION FUND
SHOWN AS
STRAWBRIDGE PHASE II
ALSO KNOWN AS
#1601 CHESTERVILLE ROAD, #1 SPRINGLAWN ROAD
#2057 CHESTERVILLE ROAD, AND #401 STRICKERSVILLE ROAD
UNIFORM PARCEL IDENTIFIERS 70-9-9, 70-9-7, 71-4-52.3, 72-6-1, AND 72-6-15
LOCATED IN EAST GOSHEN TOWNSHIP, CHESTER COUNTY, PENNSYLVANIA

SCALE 1"=200' SEPTEMBER 26, 2017

TRANSITION ENGINEERING & SURVEYING (302) 869-7000 MIDDLETOWN DELAWARE

PROJECT NO.: TCF 194.02.01
DRAWN BY: LAJ/MJJ
CHECKED BY: JT
PATH NO.: V:\01
SHEET NO.: 3 OF 6

"TRANSITION ENGINEERING SURVEYING LLC IS NOT RESPONSIBLE FOR ANY CHANGES MADE TO THIS PLAT AND/OR ITS ELECTRONIC FILE(S)"

APPENDIX B
Strawbridge 2 Property (replacement land) Appraisal

Real Estate Appraisal Report

982.60 Acre Tract
The Conservation Fund
George Strawbridge Jr. &
Trustees under Deed of Trust of George Strawbridge Jr.

North of Stricklersville Road
Elk, Franklin & New London Townships
Chester County, Pennsylvania

Prepared For

Department of Conservation and Natural Resources
5th Floor
400 Market Street
Harrisburg, PA 17105

Date of Report

January 3, 2019

Effective Date of Valuation

June 5, 2018

SNYDER
Appraisal Associates

3004 Hempland Road, Suite 3
Lancaster, PA 17601
717.435.9560

SNYDER
Appraisal Associates

3004 Hempland Road, Suite 3
Lancaster, PA 17601-1389
717.435.9560
www.snyderassociates.us

January 3, 2019

Thomas Ford
Director Bureau of Recreation & Conservation
Department of Conservation & Natural Resources
5th Floor
400 Market Street
Harrisburg, PA 17105

Re: Estimate of Market Value
Approx. 982.60 acres
N of Stricklersville Road,
Elk, Franklin & New London Townships, Chester County, Pennsylvania

Dear Mr. Ford:

We are transmitting a real estate appraisal report of the above referenced property. In accordance with your request, I personally inspected the property on June 5, 2018.

The purpose of this report is to develop an opinion of market value of the 982.60 acre property described in the body of this report. Use of this report is restricted to the intended use of valuing the fee simple interest for the Strawbridge replacement property to create an excess bank with the National Park Service. The intended users are the Pennsylvania Department of Conservation and Natural Resources (client) and the National Park Service.

A *Real Estate Appraisal Report* has been prepared. This report is completed under the Standard Rule 2-2 (a) and performed under Standard 1 of the 2018-2019 Uniform Standards of Professional Appraisal Practice and the Uniform Appraisal Standards for Federal Land Acquisitions. All three approaches to value were considered, but only the Sales Comparison Approach is developed in this report.

We valued the land under the four tests of the Highest and Best Use and conclude that the Highest and Best Use is as an agricultural use.

Hypothetical Condition #1 states that the subject is being appraised as one tract even though it is under two different ownerships. The property is under agreement of sale between George Strawbridge Jr., BNY Mellon, N.A., George Baxter and R. Stewart Strawbridge, Successor Trustees under the Deed of Trust of George Strawbridge Jr. and The Conservation Fund. The agreement is dated March 22, 2017 and the property is to be transferred in three phases. Phase I and II have been completed. It is reasonable to assume the remaining phase will be completed over the next year.

Extraordinary Assumption #1 states that the deeded acreage is not able to be calculated or confirmed by a plat because of missing deed calls in the original deed (W53-873). Therefore the acreage assumed in this report is based on the tax assessment acreages totaling 982.60 acres.

The enclosed report provides the market data and analysis supporting the opinion of market value for the fee simple interest:

As Is **Market Value is $13,756,000**

This opinion of value assumes a purchase in cash or its equivalent (in typically available financing terms) and negotiations free of seller or buyer duress.

The appraised value is qualified by the hypothetical conditions, extraordinary assumptions, limiting conditions, certain definitions, and certifications that are set forth within the report.

The supporting data, analysis, and conclusions on which this valuation is based are contained in the appraisal report and in the appraiser's work file. **THIS LETTER MUST REMAIN ATTACHED TO THE REPORT IN ORDER FOR THE VALUE OPINION SET FORTH TO BE CONSIDERED VALID.**

This report has been completed in compliance with the Uniform Standards of Professional Appraisal Practice (USPAP) adopted by the Appraisal Standards Board of the Appraisal Foundation and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). This appraisal has also been completed in conformity with and is subject to the requirements of the Code of Professional Ethics and Standards of Professional Conduct of the American Society of Farm Managers and Rural Appraisers with which the appraiser is affiliated.

We have verified and attest to the accuracy of the facts presented in this report.

We trust you will find the details of this analysis relevant to your decisions, and we would be pleased to answer any questions you may have.

Sincerely,

SNYDER APPRAISAL ASSOCIATES, LLC

_____

Gregory L. Snyder, ARA
PA State Certified General RE Appraiser
#GA-001309-L
Expires 6/30/2019

Table of Contents

Certification ..... **i**

Summary of Salient Facts and Conclusions ..... **iii**

Introduction **1**

Scope of Work 1
Jurisdictional Exception 2
Statement of Limiting Conditions 2
Hypothetical Conditions 5
Extraordinary Assumptions 5
Purpose 6
Types and Definition of Value Established 6
Intended Use of Appraisal 6
Intended User of Appraisal and Client 6
Property Rights Appraised 6
Larger Parcel 7
Summary of Appraisal Problem 7

Factual Data **8**

Legal Description 8
Market Area Analysis 9
Chester County, Pennsylvania *9*
Site Analysis 15
Acreage *15*
Improvement Description *22*
Fixtures *22*
Use History *22*
Sales History *22*
Rental History *24*
Tax Assessment *24*
Location *24*
Environmental *25*
Zoning & SALDO *25*
Utilities and Street Improvements *28*
Easements *28*
Subsurface Rights *29*
Flood Map Information *29*
Development Factors *30*
Overall Comments of Subject *30*

Analysis and Conclusions **31**

The Valuation Process 31
Highest and Best Use Defined *31*

Methods of Valuation *32*
Sales and Data Analysis 34
Comparable Sale Analysis Process *34*
Database *36*
Land Use Value Allocation *38*
Market Value Analysis 41
Highest and Best Use: *41*
Cost Approach *42*
Income Approach *43*
Sales Comparison Approach *43*
Reconciliation and Correlation *49*

ADDENDA

Engagement Letter
A - Legal Description
B - Title Reports
C - Agreement of Sale
D - Plats
E - Tax Assessment
F - Soil Report
G - Timber Appraisal
H - Comparable Location Maps
I - Comparable Sales
J - Zoning
K - Qualifications
L - Required Trainee Checklist

Certification

The appraiser certifies and agrees that:

1. The statements of fact contained in the report are true and correct.
2. The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions and are the personal, unbiased professional analysis, opinions, and conclusions of the appraiser.
3. The appraiser has no present or prospective interest in the property that is the subject of this report and no personal interest with respect to the parties involved.
4. The compensation received by the appraiser for the appraisal is not contingent on the analyses, opinions, or conclusions reached or reported.
5. I have performed no services, as an appraiser or in any other capacity, regarding the property that is the subject of this report within the three-year period immediately preceding acceptance of this assignment.
6. The appraisal was made and the appraisal report was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.
7. The appraisal was developed and the appraisal report prepared in conformance with the Appraisal Standard Board's *Uniform Standards of Professional Appraisal Practice* and complies with USPAPS Jurisdictional Exception Rule when invoked by section 1.2.7.2 of the *Uniform Appraisal Standards for Federal Land Acquisition*.
8. I have no bias with respect to the property that is the subject of this report or to the parties involved in this report.
9. My engagement in this assignment was not contingent on developing or reporting predetermined results.
10. This appraisal report was made in conformity with and is subject to the requirements of the Code of Professional Ethics and Standards of Professional Conduct of the appraisal organizations with which the appraiser is affiliated.
11. All contingent and limiting conditions imposed by terms of the assignment or by the undersigned are contained herein.
12. The appraiser has made a physical inspection of the property appraised and all comparable sales used in developing the opinion of value. The subject inspection date was June 5, 2018, and the inspection method was on-site inspection. The

property owner, or their representative, was given the opportunity to accompany the appraiser on the subject property inspection.

13. Katie A. Yoder, licensed trainee, provided significant real property professional assistance to the person signing this certification. Her involvement is described in Addendum L.

_____

GREGORY L. SNYDER, ARA
Pennsylvania State Certified General RE Appraiser
GA-001309-L
Expires 6/30/2019

Summary of Salient Facts and Conclusions

Owners of Record:	The Conservation Fund, George Strawbridge Jr. & BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, Successor Trustees under the Deed Trust of George Strawbridge Jr.
Property Address:	N. of Stricklersville Road Landenberg, PA 19350
Property Location/Directions:	The subject is located on the north side of Stricklersville Road, east of the intersection with Chesterville Road (Rt. 841), which is 6 miles southwest of Landenberg.
County:	Chester
Townships:	Elk, Franklin & New London
Deed Reference:	W53-873, B64-175 & 9653-523
Deeded Acreage:	Not Stated
Assumed Acreage:	982.60 Acres
Tax Map Identification:	70-5-6, 70-5-7, 71-4-32.3, 72-6-1, 72-6-10, 70-5-8 & 72-6-4
Tax Assessment – Assessed Value:	$147,120
Present Use:	Crop Farm
Zoning:	47% Agricultural Residential (R-2) - Elk 51% Agricultural/Residential (AR) – Franklin 2% Low Density Residential (R-1) - New London
Easements and Right of Ways:	Unrecorded Utility Pole and Road ROW. 20’ wide trail easement
FEMA Flood Map Zone:	15% in Zone A
Interests Appraised:	Fee Simple
Limits of Fee Simple Rights:	20’ wide trail easement

Highest and Best Use:

As Vacant:	Agricultural w/ future subdivision potential
As Improved:	N/A
Final Determination:	Agricultural w/ future subdivision potential

Date of Inspection:	June 5, 2018
Date of Report:	January 3, 2019
Effective Date of Value Opinions:	June 5, 2018

Indicated Value:

Cost Approach:	Not Developed		
Income Approach:	Not Developed		
Sales Comparison Approach:	$14,000	per acre or	$13,756,000
Final Opinion of Market Value:	$14,000	per acre or	$13,756,000

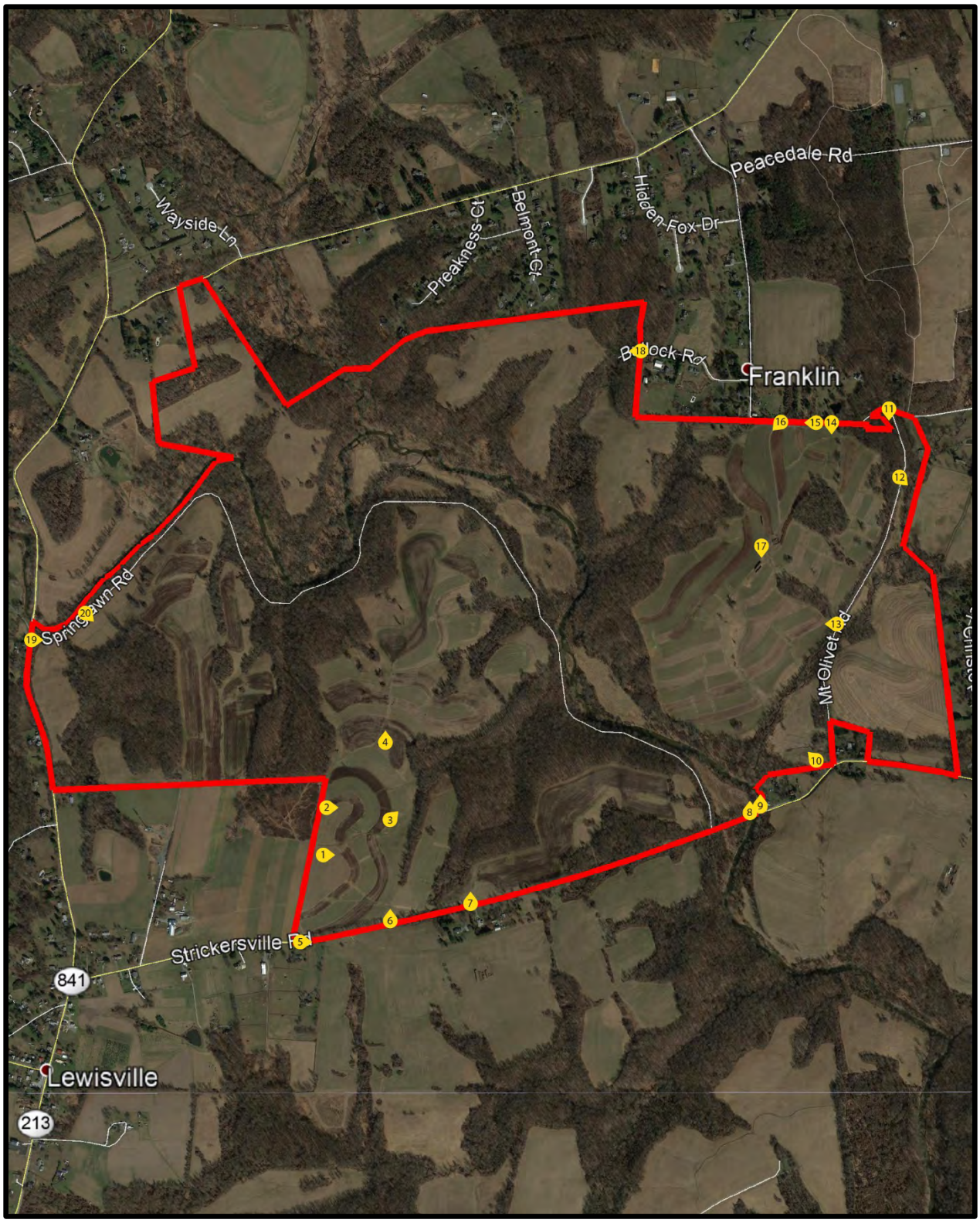


PHOTO LOCATION KEY MAP

#1 Cropland looking east

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#2 Cropland looking east

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#3 Cropland looking northeast

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#4 Cropland looking north

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#5 Lewisville-Stricklersville Road Frontage looking east

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#6 Cropland looking north

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#7 Cropland & Woodland looking north

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#8 Springlawn Trail looking north

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#9 Big Elk Creek looking north

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#10 Cropland looking northwest

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#11 Trail looking south

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#12 Pasture looking southeast

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#13 Cropland looking west

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#14 Cropland looking south

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#15 Walker Road Frontage looking west

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#16 Cropland looking southwest

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#17 Cropland looking south

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#18 Woodland looking west

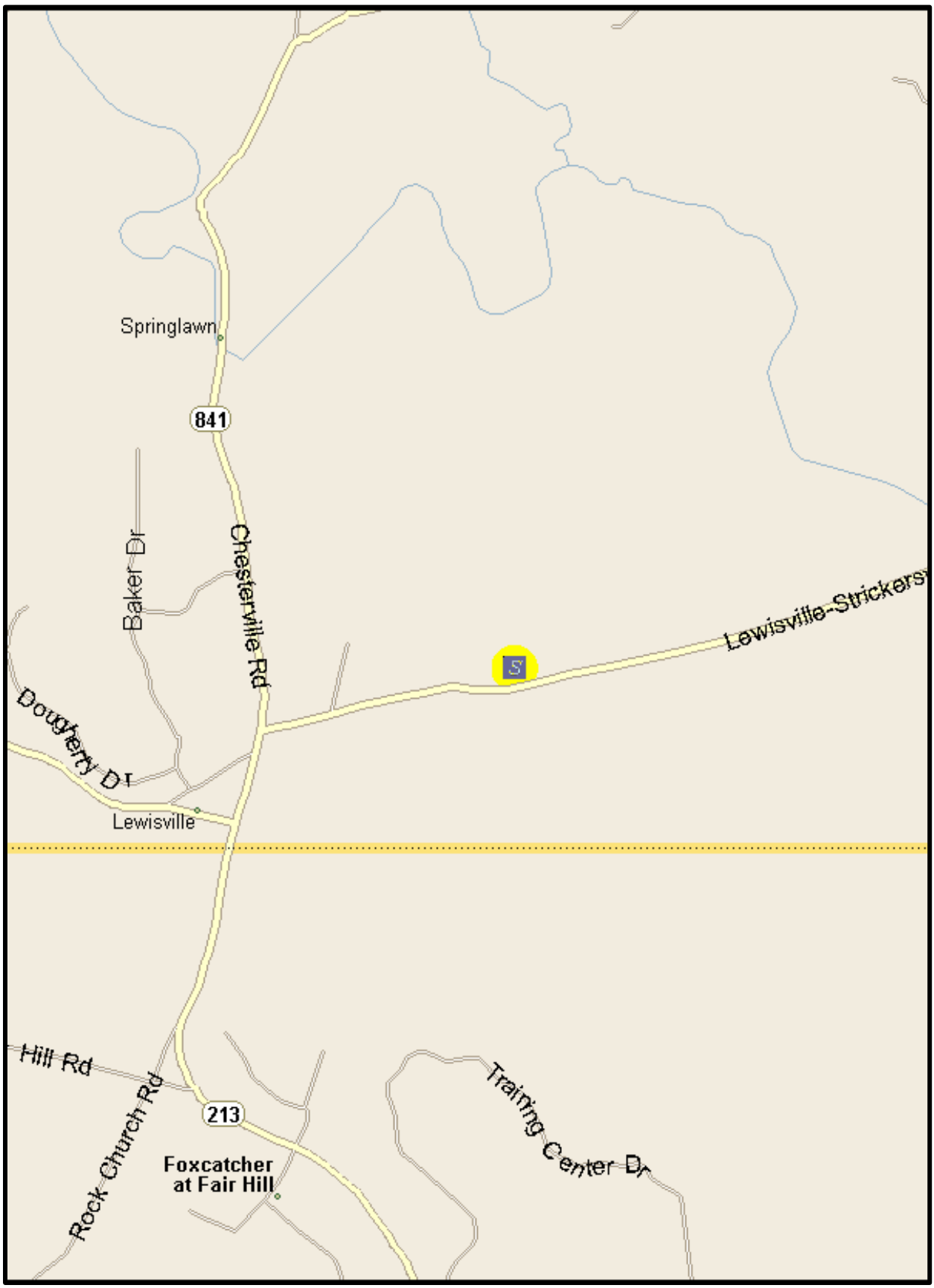
N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#19 Springlawn Trail looking east

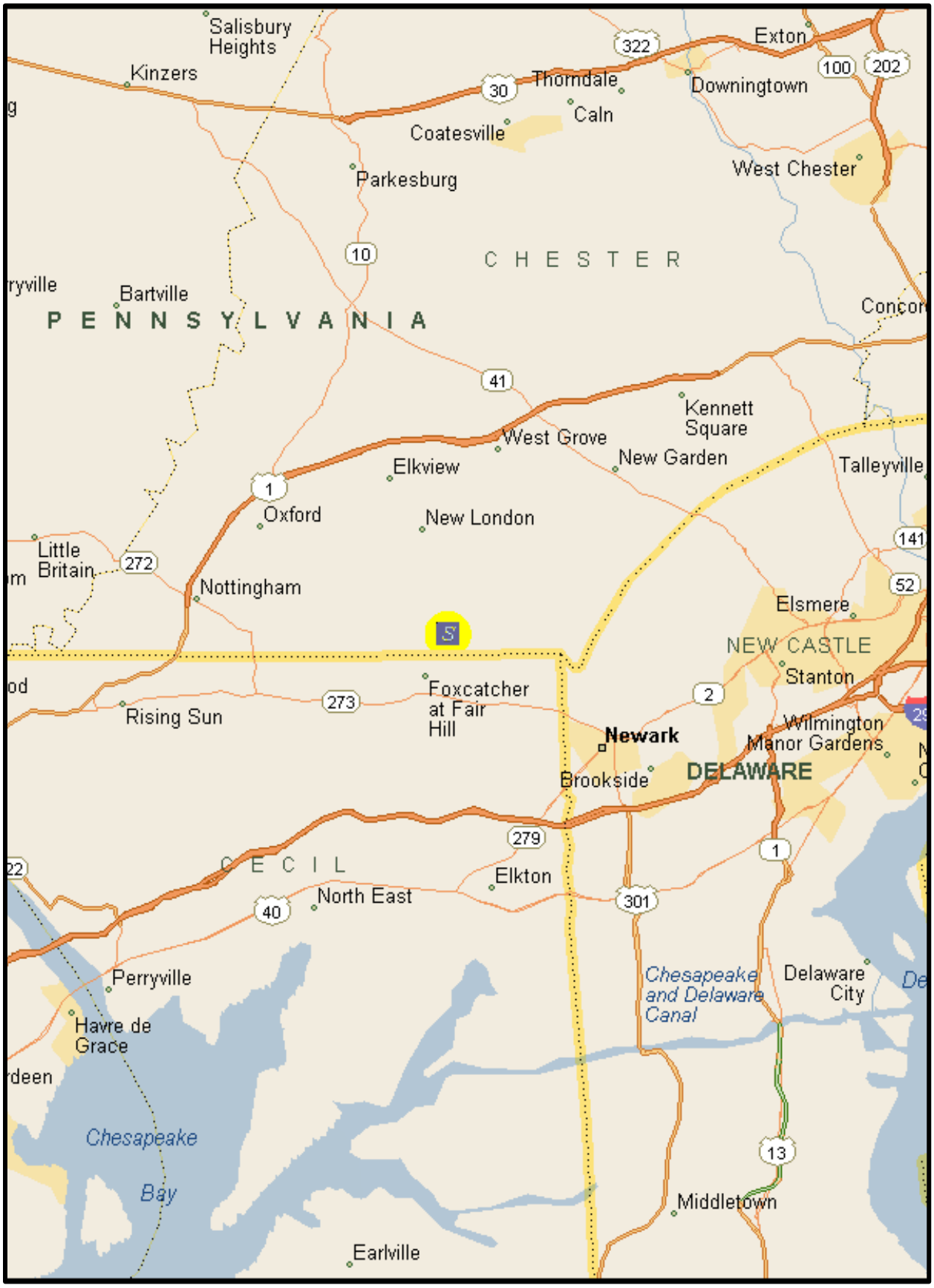
N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018

#20 Cropland looking southeast

N. of Stricklersville Road, Landenberg, PA
Photo by Gregory L. Snyder 6/5/2018



N of Stricklersville Road, Elk, Franklin & New London Townships, Chester County



Regional Map

Introduction

Scope of Work

The scope of this Real Estate Appraisal includes:

1. Determine the type of value to be established in this report;
2. Establish the intended use and user of the report;
3. Ascertain any Limiting Conditions, Hypothetical Conditions and/or Extraordinary Assumptions;
4. Confirm the property rights being appraised;
5. Perform an on-site inspection of the subject including a walking inspection of the property boundaries and improvements to examine physical characteristics. All structures will be inspected noting the type of structure with special emphasis on determining the condition and utility;
6. Review site plans, deed, GIS data, soil maps, tax assessment records, etc. obtained from the Chester County public records and the Owners;
7. Research Recorder of Deeds for easements, deed restrictions, etc.;
8. Review Zoning Ordinance to determine legal restrictions created by Zoning Ordinances;
9. Identify the subject's market area and analyze pertinent characteristics;
10. Describe the subject's market area and the site;
11. Determine the Highest and Best Use of the property:
12. Research and collect comparable data of similar use sales in the subject's market area. Verify information with buyers, sellers, brokers, public records, and/or with other knowledgeable sources. The southeastern portion of the state, including Chester, Lancaster and Berks Counties were searched;
13. Analyze the comparables sales to determine market conditions, locational factors, physical attributes, unit sizes and other pertinent factors and/or adjustments indicated by comparable sales data;
14. Develop the Cost Approach of the subject property;

    The Cost Approach was not developed since there are no improvements.
15. Develop the Income Approach of the subject property;

The Income Approach was not considered a reliable approach for this vacant land tract.

16. Develop the Sales Comparison Approach of the subject property;
17. Reconcile into a final opinion the *As Is* Market Value.

Jurisdictional Exception

The appraisal is being completed under the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) as required by the client. UASFLA requires the definition of Market Value be used as defined in Section 1.2.7.2 (Jurisdictional Exceptions). Purpose of the Appraisal). Contrary to the Uniform Standards of Professional Appraisal Practice (USPAP) Standards Rule 1-2(c), this definition does not call for the estimate of value to be linked to a specific exposure time estimate, but merely that the property be exposed on the open market for a reasonable length of time, given the character and its market. Therefore, the appraiser's estimate of market value shall not be linked to a specific exposure time when conducting appraisals for federal land acquisition purposes under UASFLA.

Also, Section 1.2.4 recognizes that some appraisers' client groups may require the appraiser to estimate marketing time for the property under appraisal. However, such estimates are inappropriate for, and must not be included in, appraisal reports prepared for federal land acquisitions under UASFLA. The request to provide a reasonable marketing time opinion exceeds the normal information required for the conduct of the appraisal process and is, therefore, beyond the scope of appraisal assignment.

UASFLA requirements are in conflict with USPAP. The Exposure Time and Marketing Period will not be developed in this report, which is allowed by a Jurisdictional Exception to USPAP.

Statement of Limiting Conditions

The certification of the appraiser appearing in the appraisal report is subject to the following conditions and as set forth in the report. Acceptance or use of this report constitutes acceptance of the following limiting conditions and assumptions; these can only be modified by written documents executed by both parties.

1. This appraisal is to be used only for the purpose and intended use stated herein. While distribution of this appraisal in its entirety is at the discretion of the client, individual sections shall not be distributed; this report is intended to be used in whole and not in part.
2. The appraiser assumes no responsibility for matters of a legal nature affecting the property appraised or the title thereto, nor does the appraiser render any

opinion as to the title, which is assumed to be good and marketable. The property is appraised as though under responsible ownership. Existing easements or encumbrances are identified in the report; the title search included in the addenda section was used for determining the ownership, easements, and encumbrances detailed in this report.

3. Sketches in the report may show approximate dimensions and are included to assist the reader in visualizing the property. The appraiser made no survey of the property and does not warrant accuracy of any legal descriptions. Exact acreages have not been determined and the appraiser assumes no responsibility for such matters.

4. Necessary licenses, permits, consents, legislative or administrative authority from Federal, State, or Local government, or private entities are assumed to be in place or reasonably attainable.

5. The appraiser is not required to give testimony or appear in court because of having made the appraisal with reference to the property in question, unless arrangements have previously been made. If the appraiser is subpoenaed pursuant a court order, the client agrees to pay Snyder Appraisal Associates, LLC regular per diem rates plus expenses.

6. The appraiser assumes that there are no hidden or unapparent conditions of the property, subsoil, or structures that would render it more or less valuable. The appraiser assumes no responsibility for engineering that might be required to discover such factors.

7. Information, estimates, and opinions furnished to the appraiser and contained in the report or work file were obtained from sources considered to be reliable and believed to be true and correct. The appraiser assumes no responsibility for accuracy of such items.

8. Disclosure of the contents of the appraisal report is governed by the Bylaws and Regulations of the professional appraisal organization and Federal and State laws governing the appraiser.

9. It is assumed the property is in full compliance with all applicable Federal, State, and Local environmental regulations and laws, unless noncompliance is stated, defined, and considered in the appraisal report.

10. It is assumed no hazardous materials or products banned by the Federal, State, or Local safety commissions have been situated on the premises. No environmental impact studies were requested or made in conjunction with this appraisal, and the appraiser hereby reserves the right to alter, amend, rescind, or revise any of

the value opinions, based on subsequent environmental impact studies, research or investigation.

11. Unless otherwise stated in this report, the existence of hazardous substances, including without limitations asbestos, urea-formaldehyde foam insulation, polychlorinated biphenyl, petroleum, leakage, or agricultural chemicals, which may or may not be present on the property, was not called to the attention of the appraiser nor did the appraiser become aware of such during the inspection. The appraiser has no knowledge of the existence of such materials on or in the property unless otherwise stated. The appraiser, however, is not qualified to test for such substances. The presence of such hazardous substances may affect the value of the property. The value opinion developed herein is predicated on the assumption that no hazardous substances exist on or in the property or in such proximity thereto, which could cause a loss in value. No responsibility is assumed for any such hazardous substances, or for any expertise or knowledge required to discover them.
12. ***American with Disabilities Act (ADA) of 1990*** – A civil rights act passed by Congress guaranteeing individuals with disabilities equal opportunity in public accommodations, employment, transportation, government services, and telecommunications. Statutory deadlines became effective on various dates between 1990 and 1997. Snyder Appraisal Associates, LLC has not made a determination regarding the subject's ADA compliance or non-compliance. ***Non-compliance could have a negative impact on value; however, this has not been considered or analyzed in this appraisal.***

Hypothetical Conditions

Hypothetical Condition is defined as:

> "A condition, directly related to a specific assignment, which is contrary to what is known by the appraiser to exist on the effective date of the assignment results, but is used for the purpose of analysis."[1]

1. The subject is being appraised as one tract even though it is under two different ownerships. The property is under agreement of sale between George Strawbridge Jr., BNY Mellon, N.A., George Baxter and R. Stewart Strawbridge, Successor Trustees under the Deed of Trust of George Strawbridge Jr. and The Conservation Fund. The agreement is dated March 22, 2017 and the property is to be transferred in three phases. Phase I and II have been completed. It is reasonable to assume the remaining phase will be completed over the year.

Extraordinary Assumptions

Extraordinary Assumption is defined as:

> "An assignment-specific assumption as of the effective date regarding uncertain information used in an analysis which, if found to be false, could alter the appraiser's opinions or conclusions."[2]

1. The deeded acreage was not able to be calculated or confirmed by a plat because of missing deed calls in the original deed (W53-873). Therefore the acreage assumed in this report is based on the tax assessment acreages totaling 982.60 acres.

[1] *Uniform Standards of Professional Appraisal Practice*, 2018-2019

[2] *Uniform Standards of Professional Appraisal Practice*, 2018-2019

Purpose

The purpose of this appraisal is to provide an opinion of the market value, as defined below, of the subject property. The appraisal must be completed in compliance with Uniform Standards of Professional Appraisal Practice, Uniform Appraisal Standards for Federal Land Acquisitions and appraisal instructions issued by Land and Water Conservation Fund 6F.

Types and Definition of Value Established

The definition of **Market Value** used in this report can be stated as:

Market value is the amount in cash, or on terms reasonably equivalent to cash, for which all probability the property would have sold on the effective date of the appraisal, after a reasonable exposure time on the open competitive market, from a willing and reasonably knowledgeable seller to a willing and reasonably knowledgeable buyer, with neither acting under any compulsion to buy or sell, giving due consideration to all available economic uses of the property.[3]

Intended Use of Appraisal

The intended use of this report is to value the fee simple interest for the Strawbridge replacement property to create an excess bank with the National Park Service.

Intended User of Appraisal and Client

The intended users of the report are the Pennsylvania Department of Conservation and Natural Resources (client) and the National Park Service.

Property Rights Appraised

Fee Simple Estate is "the absolute ownership unencumbered by any other interest or estate, subject only to the limitations imposed by the governmental powers of taxation, eminent domain, police power, and escheat".[4]

The property rights being appraised are also subject to normal right-of-ways granted to government agencies and public utility companies for placing and maintaining utility distribution and drainage systems, as well as other easements and agreements of record.

[3] Section 1.2.4 of *Uniform Appraisal Standards of Federal Land Acquisitions*, 2016
[4] *The Dictionary of Real Estate Appraisal*, Sixth Edition, Appraisal Institute

The Fee Simple Estate of the property was appraised. The Fee Simple Estate is restricted by a 20' wide trail easement. Unrecorded utility and highway easements were also found to be in existence.

Larger Parcel

The Larger Parcel is defined as:

> *"The tract or tracts of land that possess a unity of ownership and have the same, or an integrated, highest and best use."*[5]

The larger parcel is the 982.60 acre tract described in this report. The landowner owns no other real estate contiguous to this tract and this is a LWCF 6F replacement tract.

Summary of Appraisal Problem

The appraisal problem is to determine the Market Value of the fee simple interest being considered for the replacement property for a LCWF 6F conversion and create an excess bank with the National Park Service.

The subject is a larger than typical tract located in southern Chester County.

The challenge in developing this report was locating similar use comparables in a reasonable proximity to the subject.

[5]Section 4.3.3 *Uniform Appraisal Standards for Federal Land Acquisition*, 2016

Factual Data

Legal Description

Property is deeded to:	George Strawbridge, Jr. (70%) and Girard Bank, George Strawbridge Sr. and William C Lickle. Successor Trustees under Deed of Trust of George Strawbridge, Jr. (30%)
Deed Reference #:	W53-873 (Addendum A)
Date of Recording and Purchase:	The most recent transfer was on October 18, 1978 from Springtown Corporation
Deeded Acreage:	1,690.28 Acres
Property is deeded to:	BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, Successor Trustees under Deed of Trust of George Strawbridge, Jr. (30%)
Deed Reference #:	B64-175 (Addendum A)
Date of Recording and Purchase:	The most recent transfer was on August 7, 1984 from Delaware Trust Company, George Strawbridge and William C Lickle. Successor Trustees under Deed of Trust of George Strawbridge, Jr.
Deeded Acreage:	1,690.28 Acres
Property is deeded to:	The Conservation Fund
Deed Reference #:	9653-523 (Addendum A)
Date of Recording and Purchase:	The most recent transfer was on November 9, 2017 from George Strawbridge Jr. (70%) & BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, Successor Trustees under Deed of Trust of George Strawbridge, Jr. (30%)
Deeded Acreage:	254.45 Acres
Property is deeded to:	The Conservation Fund
Deed Reference #:	9847-280 (Addendum A)
Date of Recording and Purchase:	The most recent transfer was on November 9, 2018 from George Strawbridge Jr. & BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, Successor Trustees under Deed of Trust of George Strawbridge, Jr.
Deeded Acreage:	386.23 Acres

Market Area Analysis

The ever changing nature of the basic forces that motivate buyers and sellers within a given market area has a direct impact on the area's real estate values. The forces are usually considered in four major categories:

- Physical considerations
- Social considerations
- Economic considerations
- Governmental considerations

The following general analysis outlines the general economic conditions and future outlook and trends of the subject market area.

Chester County, Pennsylvania

INTRODUCTION

Chester County was organized by William Penn in 1682 as one of the three original counties of Pennsylvania. Chester County originally extended from the Delaware River to the far western part of the County and southwest of the Schuylkill River to the Delaware and Maryland borders. In 1789, the county seat was moved from Chester on the Delaware River to a central location at West Chester, then called Turk's Head. In that same year the present boundaries of Chester County were formed with the establishment of Lancaster, Berks, Montgomery and Delaware Counties.

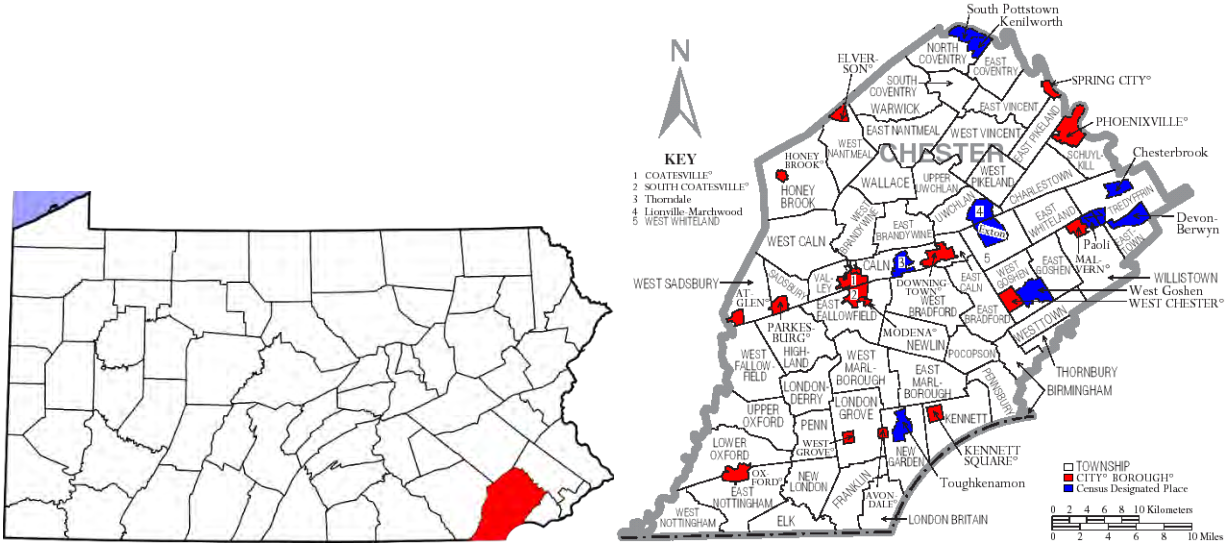
Quakers were influential in the early period, and an older Swedish population that pre-dated William Penn's charter was absorbed. Chester shares with Montgomery County the Valley Forge encampment and with Delaware County the Brandywine Battlefield. Iron works began before the Revolution, followed by production of paper, textiles, and bricks. Accessibility increased with the Lancaster Pike (1795), Schuylkill Navigation Canal (1825), and Columbia Railroad (1840s). In the 1890s the county became a residential location for commuting Philadelphia workers. Chester was an early producer of a valuable mushroom crop, and has long excelled in fruit growing, dairying, livestock breeding, and raising flowers. Thirty percent of the land is farmed. The Pierre du Pont Arboretum and Gardens (Longwood) arose in the nineteenth century. The institute that became Lincoln University was founded in 1854 to educate African Americans, and there were Underground Railroad stations at West Chester, Phoenixville, Oxford, and Kennett Square.

In the 20th century farming and industry continued to prosper while the economy gradually became more financial, trade and service oriented. Today the county offers an

environment that is suitable for a variety of economic activities. “High tech” firms, as well as agriculture and manufacturing coexist in surroundings that are suitable for all.

PHYSICAL CONSIDERATIONS

LOCATION - Chester County is located in southeastern Pennsylvania, and is part of the five county Philadelphia region including Bucks, Delaware, Montgomery and Philadelphia Counties. The County is bordered on the northwest by Berks County, on the east by Montgomery and Delaware Counties, on the west by Lancaster County and on the south by the states of Delaware and Maryland. The county is located 30 miles west of the city of Philadelphia, 103 miles south of New York City and 69 miles north of the city of Baltimore.



GEOGRAPHY -Chester County is part of the Piedmont Province of the Appalachian Highlands. Elevations within the County range from 1,020 feet at Welsh Mountain in northwestern Chester County to 66 feet above sea level where the Schuylkill River flows out of the County at Valley Forge National Park.

Major streams in Chester County include the Schuylkill River, Brandywine Creek, French Creek, the Red and White Clay Creeks, Octoraro Creek, and the Big and Little Elk Creeks. Approximately 82% of the land area in the County drains to the Delaware River and Delaware Bay. The remaining land area drains to the Susquehanna River and Chesapeake Bay.

CLIMATE - The average low temperature in the month of January is 18°F and the average high temperature in the month of July is 84°F. Typical last frosts occur early May. Rainfall ranges a monthly low of 2.4" in February to a monthly high of 4.5" in July.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	38°	41°	52°	64°	74°	82°	86°	84°	78°	66°	55°	44°
Avg. Low	20°	22°	30°	38°	48°	58°	64°	61°	54°	42°	35°	25°
Mean	30°	32°	41°	51°	62°	70°	75°	74°	66°	55°	46°	34°
Avg. Precip.	3.5"	3.1"	3.5"	3.8"	4.4"	4.3"	4.7"	3.9"	4.3"	3.3"	3.9"	3.7"

GEOGRAPHY – The County has a total land area of 756 square miles with an average population density of 659 persons per square mile. The percentage of people living in urban areas is 87% with 13% living in rural areas.

TRANSPORTATION – The main corridors through the county are: Routes 30, 202 & 1 running east/west, Routes 100 and 322 running north/south, and the Pennsylvania Turnpike (Route 76). There are several small airports that handle light aircraft with the Philadelphia International Airport located in close proximity. The county is bisected by commuter railroad line served by Amtrak connecting to Harrisburg and Lancaster to the west and Philadelphia to the east.

SOCIAL *CONSIDERATIONS*

POPULATION - As shown by the following table the population of Chester County in 2010 was estimated to be 498,886 residents.

Year	Population
2000 Census	433,501
2010 Census	498,886
2016 Estimate	519,293
2020 Projection	604,385
2030 Projection	692,054
United States Census & The Center for Rural Pennsylvania	

EDUCATION - The County includes fourteen independent public school districts, a variety of private schools and two vocational education schools. Private schools include Bishop Shanahan, Kimberton Waldorf School, Malvern Preparatory School, West Chester Christian School and Villa Maria Academy for Girls.

On the collegiate level, Immaculata College, Lincoln University, Valley Forge Christian College, Penn State University Great Valley and West Chester University of Pennsylvania all have a long-standing place in the community.

93% of Chester County residents aged 25 year+ have graduated High School. 50.2% have a Bachelor's degree or higher, compared to 29.3% for the State of Pennsylvania (*2012-2016 US Census data*).

ECONOMIC CONSIDERATIONS

According to the 2010 census, Chester County has the highest median household county in Pennsylvania. The county is healthy economically, with over 14,314 employer establishments (*2017 Census*) and a labor force of 276,500. Traditionally, the unemployment rate has been the lowest in the surrounding five-county area.

EMPLOYMENT – The following table identifies the top employers in Chester County:

Major Employers
The Vanguard Group
QVC Network Inc.
County of Chester
Federal Government
The Chester County Hospital
Main Line Hospitals Inc.
PA State System of Higher Education
Giant Food Stores, LLC
The Devereux Foundation
Downingtown Area School District
3rd Quarter 2017 *Quarterly Census of Employment and Wages*

Labor force and unemployment:

Labor Force	County	Pennsylvania
Labor Force	276,500	6,378,000
Employed	267,400	6,081,000
Unemployed	9,100	297,000
Unemployment Rate	3.3%	4.7%
Center for Workforce Information and Analysis *Preliminary April 2018 - Seasonally Adjusted*		

AGRICULTURE - The Statistical Summary the PA Department of Agriculture gives the following 2012 - 2013 statistics:

Total # of Farms	1,731
Land in Farms	166,000
Average Size of Farm	96
Cattle	551
Commercial Dairy	286
Hog	48
Sheep	151
Poultry	278

Livestock on Farms	
Hogs & Pigs	18,329
Cattle & Calves	40,500
Sheep & Lambs	3,032

Cash Receipts	
Field	$34,798,000
Field Vegetables & Potatoes	$4,613,000
Fruits	$1,757,000
Horticulture & Mushrooms	$421,655,000
Total Crops	$462,823,000
Poultry, Meat Animals & Livestock	$33,379,000
Dairy	$81,184,000
Total Livestock & Products	$114,563,000
Government Payments	$2,321,000
Total All	$579,707,000

GOVERNMENTAL CONSIDERATIONS

GOVERNMENT - Pennsylvania mandates the classification of counties according to population size. Chester County is a Third Class Pennsylvania County. Third Class counties in Pennsylvania elect three county commissioners to four year terms. The number of terms is unlimited. One commissioner must be of a minority party.

Each of the 73 municipalities is governed by an elected body - supervisors, councils, or commissioners, depending on the municipal designation. Each is responsible for establishing and administering municipal financial budgets and tax rates, as well as being responsible for land use controls through zoning and subdivision regulations and building permits. Local officials provide Road maintenance and other general services as well.

TAXATION - Taxes in Chester County are paid twice a year. Spring taxes, due in June, are paid to the county and municipality. Fall taxes, due October, are paid to the school districts. Agricultural land greater than ten acres is eligible for preferential taxation (Act 319 - Clean and Green Act). Tying the land accessed value to the value that it generates to the landowner is an important means of addressing tax fairness or equity to the land owner who chooses to use the land in agriculture, despite having other alternatives available. If a property does not continue to meet the requirements for participation in the Act, roll back taxes and penalties are incurred.

NATURAL LANDSCAPES - Natural landscapes of Chester County are made up of woodland, stream corridors, steep hillsides, ridge tops, wetlands, and marshes. These

resources are permanent and essential elements of the physical environment, and are the foundation for the livability of all landscapes. The Chester County planning Commissions vision includes conservation of natural landscapes by encouraging development in and adjacent to existing developed areas, limiting infrastructure to encourage efficient use of existing natural and developed resources.

RURAL LANDSCAPES - Rural landscapes include farms, farm related businesses, and villages, along with some scattered housing sites. They are predominant in the northern, western, and southern areas of Chester County. Chester County has some of the most productive soils in the world. The Planning Commission recognizes it is imperative that these soils remain productive for future generations. Agriculture will continue to be the primary land use in the rural landscape as well as a major component of the economy and an important scenic resource. Suburban encroachment will be reduced by limiting new infrastructure, such as water and sewer systems. Limited development will be directed to soils not well suited for agriculture.

Development in corridors through rural landscapes will be limited and targeted to serve the needs of local residents. Where new growth does take place, access to the corridor will be carefully planned to protect not only the function of the roadway but its scenic character as well.

PRESERVATION/CONSERVATION PROGRAMS – As of July, 2017, the Chester County Agricultural Land Preservation Board has preserved 465 farms in Chester County for a total of 37,534 acres. There are a number of active Conservancies in the area including the Land Conservancy for Southern Chester County.

CONCLUSION

For Chester County, the ability to retain some of its past is challenged by the continuing demand for change. Over many years, the county has worked diligently to retain its unique character and its economic vitality. Chester County's goal is to protect and direct its future given the ever increasing needs dictated by continuing population increase.

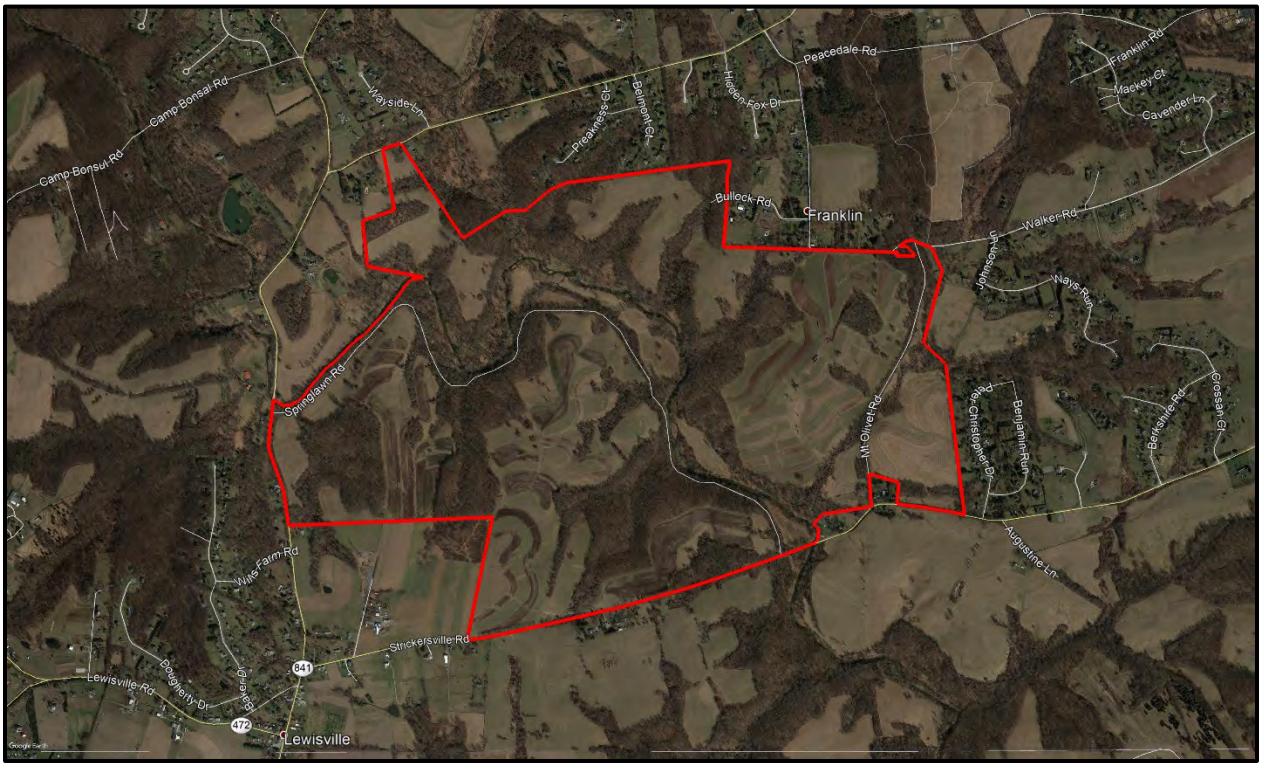
Site Analysis

Acreage

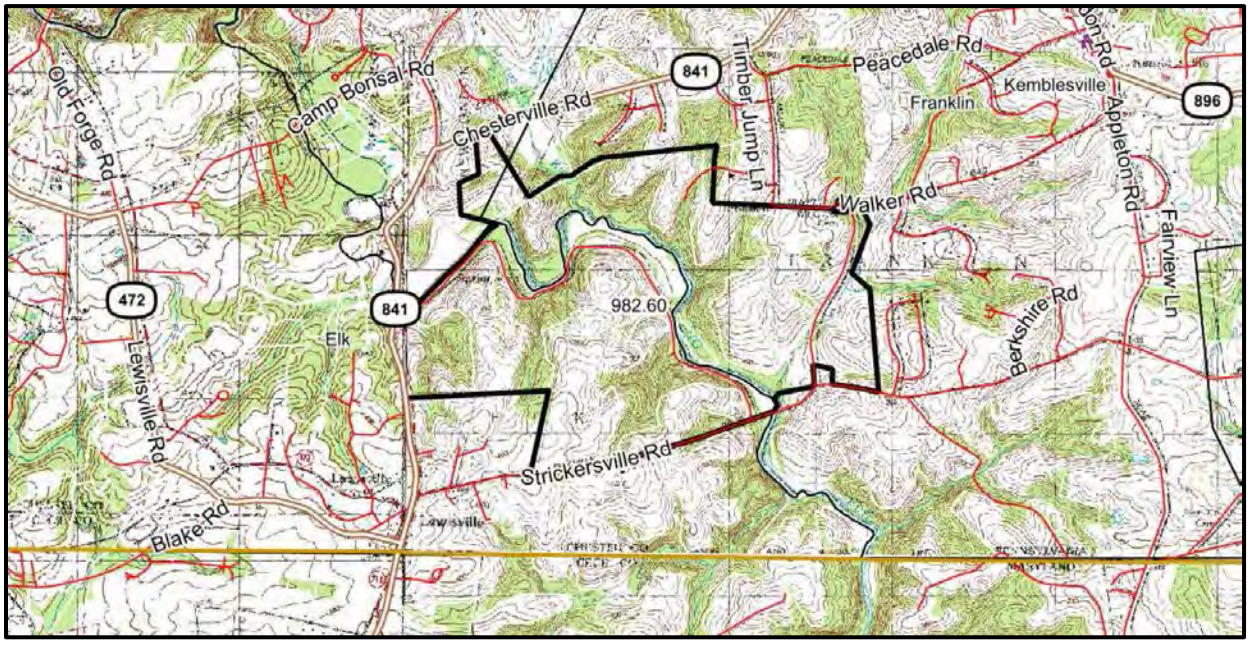
Deeded Acreage: Not Stated Platted Acreage: Not Platted Tax Map Acreage: 982.60

Land Use:	Acres	%
Tillable	530.04	53.9%
Permanent Pasture	0.00	0.0%
Woodland	443.00	45.1%
Farmstead	0.00	0.0%
Waste	9.56	1.0%
Assumed Acreage Total	982.60	100.0%

Acreage amount is based on Extraordinary Assumption #1.



Overall Topography: Rolling



Soils:

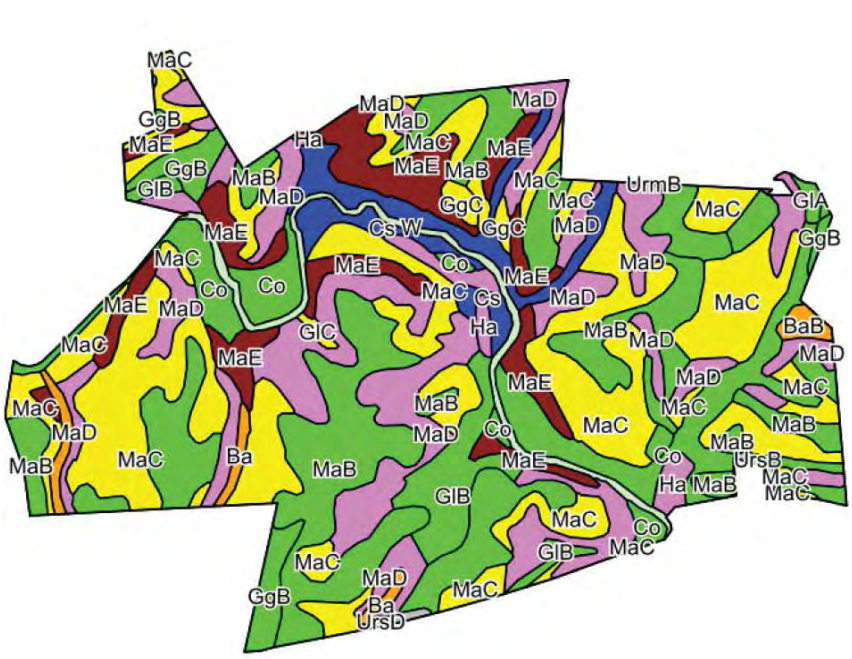
		Soil Type	Class	Yield	Slope	Farmland Importance	Hydric Soils	% of Total Acreage
1	Ba	Baile Silt Loam	5w	0	--	--	Y	1%
2	BaB	Baile Silt Loam	5w	0	3-8%	--	Y	1%
3	Co	Codorus Silt Loam	2w	130	--	Prime	N	8%
4	Cs	Comus Silt Loam	1	175	--	Prime	N	4%
5	GgB	Glenelg Silt Loam	2e	170	3-8%	Prime	N	4%
6	GgC	Glenelg Silt Loam	3e	160	8-15%	State	N	2%
7	GlA	Glenville Silt Loam	2w	100	0-3%	Prime	N	0%
8	GlB	Glenville Silt Loam	2e	100	3-8%	Prime	N	4%
9	GlC	Glenville Silt Loam	3e	95	8-15%	State	N	0%
10	Ha	Hatboro Silt Loam	4w	115	--	--	Y	2%
11	MaB	Manor Loam	2e	115	3-8%	Prime	N	21%
12	MaC	Manor Loam	3e	105	8-15%	State	N	27%
13	MaD	Manor Loam	4e	95	15-25%	--	N	18%
14	MaE	Manor Loam	6e	0	25-35%	--	N	8%
15	UrsB	Urban Land-Manor Complex	8s	0	0-8%	--	N	0%
16	UrsD	Urban Land-Manor Complex	8s	0	8-25%	--	N	0%
17	W	Water	--	0	--	--	N	2%

USDA Soil Capability Classification:

USDA Soil Capability Classes			
I	4%	**V**	1%
II	36%	**VI**	8%
III	29%	**VII**	0%
IV	19%	**VIII**	2%

Percentage of Farm that is Prime Farmland and Soils of State Importance: 69%

Average Shelled Corn Potential of the Tillable Acreage: 110 bushels



Soil Map Unit Descriptions:

Map unit: Ba - Baile silt loam

The Baile component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions, uplands. The parent material consists of local alluvium over residuum weathered from mica schist. Depth to a root restrictive layer, bedrock, lithic, is 60 to 99 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 3 inches during January, February, March, April, November, and December. Organic matter content in the surface horizon is about 3 percent. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: BaB - Baile silt loam, 3 to 8 percent slopes

The Baile component makes up 85 percent of the map unit. Slopes are 3 to 8 percent. This component is on depressions, uplands. The parent material consists of local alluvium over residuum weathered from mica schist. Depth to a root restrictive layer, bedrock, lithic, is 60 to 99 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 3 inches during January, February, March, April, November, and December. Organic matter content in the surface horizon is about 3 percent. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.

Map unit: Co - Codorus silt loam

The Codorus component makes up 85 percent of the map unit. Slopes are 0 to 3 percent. This component is on uplands, flood plains. The parent material consists of alluvium derived from gneiss and/or alluvium derived from mica schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during January, February, March, April, November, and December. Organic matter content in the surface horizon is about 3 percent. Non-irrigated land capability classification is 2w. This soil does not meet hydric criteria.

Map unit: Cs - Comus silt loam

The Comus component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains, uplands. The parent material consists of alluvium derived from granite and gneiss and/or alluvium derived from mica schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Non-irrigated land capability classification is 1. This soil does not meet hydric criteria.

Map unit: GgB - Glenelg silt loam, 3 to 8 percent slopes

The Glenelg component makes up 85 percent of the map unit. Slopes are 3 to 8 percent. This component is on hillslopes, hills. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer, bedrock, paralithic, is 60 to 120 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone

of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: GgC - Glenelg silt loam, 8 to 15 percent slopes

The Glenelg component makes up 85 percent of the map unit. Slopes are 8 to 15 percent. This component is on hillslopes, hills. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer, bedrock, paralithic, is 60 to 120 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: GlA - Glenville silt loam, 0 to 3 percent slopes

The Glenville component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on hillslopes, hills. The parent material consists of colluvium and/or residuum weathered from mica schist. Depth to a root restrictive layer, bedrock, paralithic, is 60 to 99 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 21 inches during January, February, March, April, November, and December. Organic matter content in the surface horizon is about 3 percent. Non-irrigated land capability classification is 2w. This soil does not meet hydric criteria.

Map unit: GlB - Glenville silt loam, 3 to 8 percent slopes

The Glenville component makes up 90 percent of the map unit. Slopes are 3 to 8 percent. This component is on hillslopes, hills. The parent material consists of colluvium derived from schist and/or colluvium derived from gneiss. Depth to a root restrictive layer, fragipan, is 15 to 30 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 21 inches during January, February, March, April, November, and December. Organic matter content in the surface horizon is about 3 percent. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: GlC - Glenville silt loam, 8 to 15 percent slopes

The Glenville component makes up 100 percent of the map unit. Slopes are 8 to 15 percent. This component is on hillslopes, hills. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer, bedrock, paralithic, is 60 to 99 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 21 inches during January, February, March, April, November, and December. Organic matter content in the surface horizon is about 3 percent. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: Ha - Hatboro silt loam

The Hatboro component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on flood plains, valleys. The parent material consists of alluvium derived from metamorphic and sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 60 to 99 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 3 inches during January, February, March, April, May, October, November, and December. Organic matter content in the surface horizon is about 3 percent. Non-irrigated land capability classification is 4w. This soil meets hydric criteria.

Map unit: MaB - Manor loam, 3 to 8 percent slopes

The Manor component makes up 100 percent of the map unit. Slopes are 3 to 8 percent. This component is on hillslopes, uplands. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: MaC - Manor loam, 8 to 15 percent slopes

The Manor component makes up 95 percent of the map unit. Slopes are 8 to 15 percent. This component is on hillslopes, uplands. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone

of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Map unit: MaD - Manor loam, 15 to 25 percent slopes

The Manor component makes up 100 percent of the map unit. Slopes are 15 to 25 percent. This component is on hillslopes, uplands. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Map unit: MaE - Manor loam, 25 to 35 percent slopes

The Manor component makes up 100 percent of the map unit. Slopes are 25 to 35 percent. This component is on hillslopes, uplands. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Non-irrigated land capability classification is 6e. This soil does not meet hydric criteria.

Map unit: UrsB - Urban land-Manor complex, 0 to 8 percent slopes

The Manor component makes up 30 percent of the map unit. Slopes are 0 to 8 percent. This component is on hillslopes, uplands. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.

Map unit: UrsD - Urban land-Manor complex, 8 to 25 percent slopes

The Manor component makes up 30 percent of the map unit. Slopes are 8 to 25 percent. This component is on hillslopes, uplands. The parent material consists of residuum weathered from mica schist. Depth to a root restrictive layer is greater than

60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria.

Timber: A timber appraisal completed by Shannon Henry of Silvix, LLC on August 1, 2018 is attached to the report as addendum G. A high percentage of the timber encountered while cruising the forest was sized well into the saw timber class and of reasonable quality. Using the most recent pricing reported on the PA timber Market Report, we estimate the range of value for merchantable trees on the property to be approximately $300,000 - $500,000, which equates to approximately $300 - $500 per acre.

Improvement Description

None

Fixtures

None

Use History

The property has been used as a crop for many years. Crop fields are presently under cultivation with typical Chester County crops.

Sales History

The property is presently a part of an agreement of sale dated March 22, 2017, which is attached as Addendum C.

The property is to be transferred in three phased transactions.

- Phase I – Tax parcels 72-6-10 (63.5 A), 70-5-7 (71.9 A), 71-4-32.3 (19.3 A), 72-6-1 (14.4 A) & 70-5-6 (96.7 A) for $4,385,000 (Closed – 11/19/2017)
- Phase II – Tax Parcel 72-6-4 (370.1 A) for $6,105,000 (Closed – 11/19/2018)
- Phase III – Tax Parcel 70-5-8 (346.7 A) for $5,725,000 (To be closed – 11/2019)
- Total acreage – 982.60 A – Total Agreed Sale Price - $16,215,000

Financing for the existing and planned transfers was provided by a variety of grants and foundations. The funding sources include Chester County, Commonwealth of PA and Mt. Cuba Center (Alfred I. DuPont Testamentary Trust).

Deed W53-873 was transferred on October 18, 1978 for $2,750,000 from Springtown Corporation to George Strawbridge Jr. (70%) and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Jr., Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971 (30%). The sale was an arm's length sale with no special conditions of sale at the time of transfer. This transfer included additional acreage that is not a part of this appraisal.

Deed B46-175 transferred the 30% on August 7, 1984 from and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Jr., Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971 to Delaware Trust (now BNY Mellon, N.A.), R. Stewart Strawbridge and George J. Baxter, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971. The sale was an arm's length sale with no special conditions of sale at the time of transfer. This transfer included additional acreage that is not a part of this appraisal.

Deed 9653-523 transferred tax parcels 70-5-6, 70-5-7, 71-4-32.3, 72-6-1 & 72-6-10 from George Strawbridge, Jr. (individually) and BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971. The transfer occurred on November 19, 2017 for $4,385,000. The sale was an arm's length sale with no special conditions of sale at time of transfer. This deed transferred 254.45 acres (Phase I of the Agreement of Sale).

A previous transfer was part of deed 9653-523 transfer, which was Deed 4158-1495. It transferred tax parcels 71-4-32.3 & 72-6-1 on March 31, 1997 from Jane F. Trimble to George Strawbridge, Jr. 33.7 acres for $269,000. The sale was an arm's length sale with no special conditions of sale at time of transfer.

Deed 9847-280 transferred parcel 72-6-4 from George Strawbridge, Jr. (individually) and BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, Trustees under Deed of Trust of George Strawbridge, Jr., dated January 20, 1971. The transfer, for $6,105,000, occurred on November 9, 2018, to be made effective November 19, 2018. The sale was an arm's length sale with no special conditions of sale at time of transfer. This deed transferred 386.23 acres (Phase II of the Agreement of Sale).

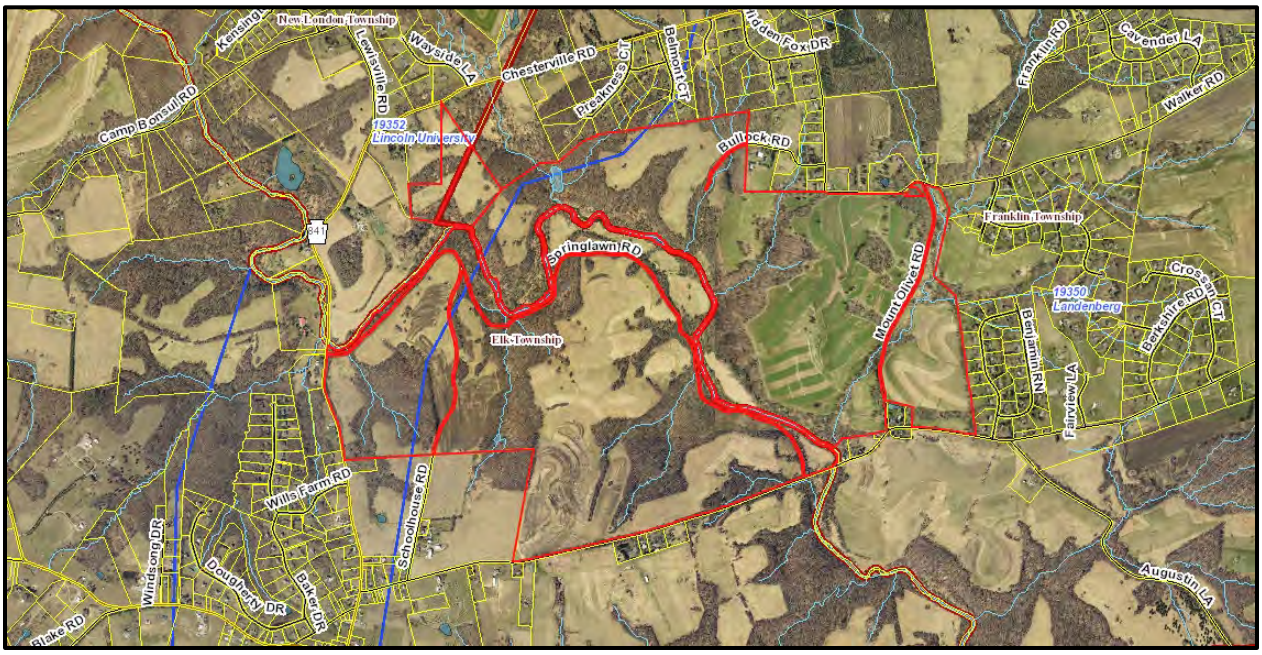
The agreed sales price was based on appraisals completed for the Conservation Fund. Copies of those appraisals were not provided to the appraiser. This appraisal indicates that the buyer is paying above market price.

Rental History

Cropland is leased annually to a local farmer. It was disclosed that the tenant agrees to pay an annual rent of $85.00 per acre of tillable land before January 1. The agreement of sale Section 5.2.D. – Farm leases states the purchaser agrees to allow the Farm Tenant to continue to grow crops on the property, including those portions of the property sold to purchaser in Phase 1 and Phase 2 of this transaction, until at least the date that closing occurs on Phase 3.

Tax Assessment

Tax Assessment Identification:	70-5-6, 70-5-7, 71-4-32.3, 72-6-1, 72-6-10, 70-5-8 & 72-6-4
Market Value Tax Assessment:	$3,779,170
Common Level Ratio:	1.95
Indicated Market Value:	$7,369,382
Act 319 Assessment:	Yes ($147,120)
Annual Market Value Taxes:	$120,208
Annual Act 319 Taxes:	$5,244



Chester County online GIS Tax Map

Location

The subject is located on the north side of Stricklersville Road east of the intersection with Chesterville Road (Rt. 841), which is approximately 6 miles southwest of Landenberg.

Environmental

The scope of this appraisal does not include any environmental audits or testing for hazardous materials. No apparent environmental concerns were noted. However, as in the case of all real estate, the owners of the subject property are advised to have a complete understanding of the environmental issues surrounding the subject site. As such, a Phase I environmental audit is recommended.

Zoning & SALDO

The property is located in three townships, each with a separate zoning district.

47% is located in Elk Township's Agricultural Residential Zone (R-2). The R-2 Agricultural Residential District has been established to achieve the following purposes:

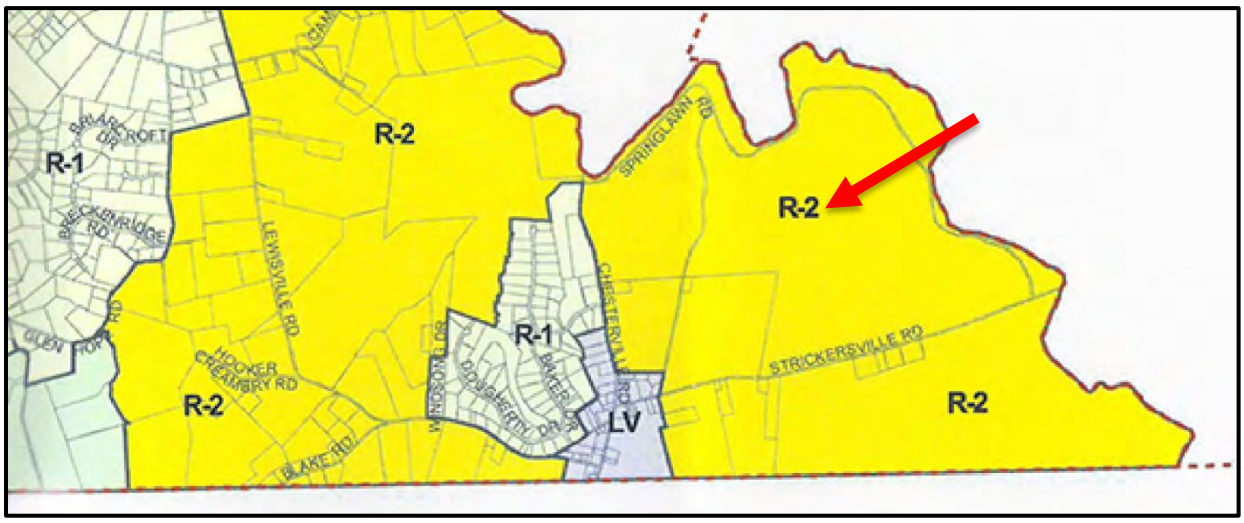
- To implement the Township Comprehensive Plan goal of preserving agricultural lands and the continued prosperity of the agriculture industry in the Township.
- To support the preservation of sensitive environmental features, such as streams, floodplains, wetlands, areas of steep slopes, and areas of soils conditional, for on-lot sewage disposal/systems and variable groundwater yields.
- To provide opportunities for housing types at a density and in a cluster configuration that preserve and protect the rural character of Elk Township and preserve permanent open space areas large enough to support continued agricultural use.
- To limit haphazard and strip development of agricultural lands by providing an opportunity for non-agricultural uses in a planning setting as would be compatible with the rural character of the Township.
- Provide farmers with a variety of agriculture related use opportunities to help supplement farm income.

Permitted uses by right include:

- Non-intensive agricultural uses and related building
- Woodland preserve, game farm and preserve, wildlife sanctuary or other conservation purposes
- Horticultural uses
- Tenant house
- Business associated with agriculture
- Single-family detached dwellings
- Forestry

Minimum Lot Size and Density

- Minimum lot size – 2 acres,
- Minimum lot width – 200 feet
- Maximum building coverage – 8%
- Cluster development is allowed



Portion of Elk Township Zoning Map (subject parcel indicated by red arrow)

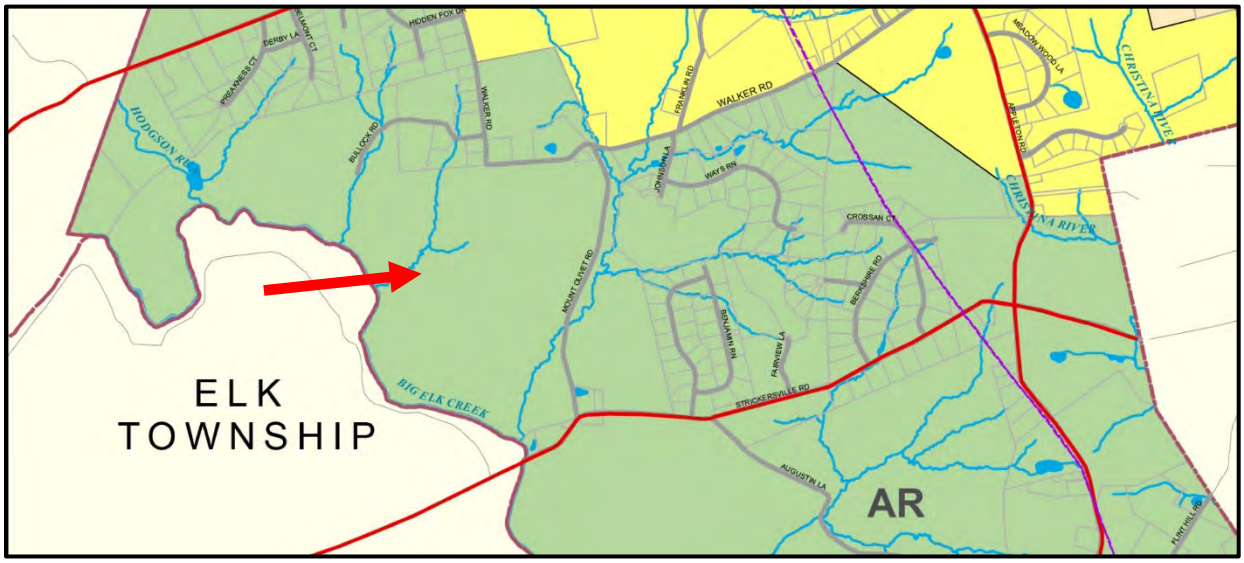
51% is located in Franklin Township's Agricultural/Residential district (AR). The Agricultural/Residential District (AR) has been created to encourage the use of prime agricultural soils for cultivation and to conserve critical environmental areas by maintaining a relatively low density. The AR District has been located along roads which cannot accommodate high traffic volumes. The use of on-site domestic waste disposal systems shall be provided in order to help replenish the supply of ground water.

Permitted uses by right include:

- Agriculture and buildings related to agriculture
- Single-family detached dwellings
- Equestrian uses

Minimum Lot Size and Density

- Minimum lot size – 80,000 SF
- Minimum lot width – 150'
- Maximum building coverage – 8%
- Open space design allowed



Portion of the Franklin Township Zoning Map (subject parcel indicated by red arrow)

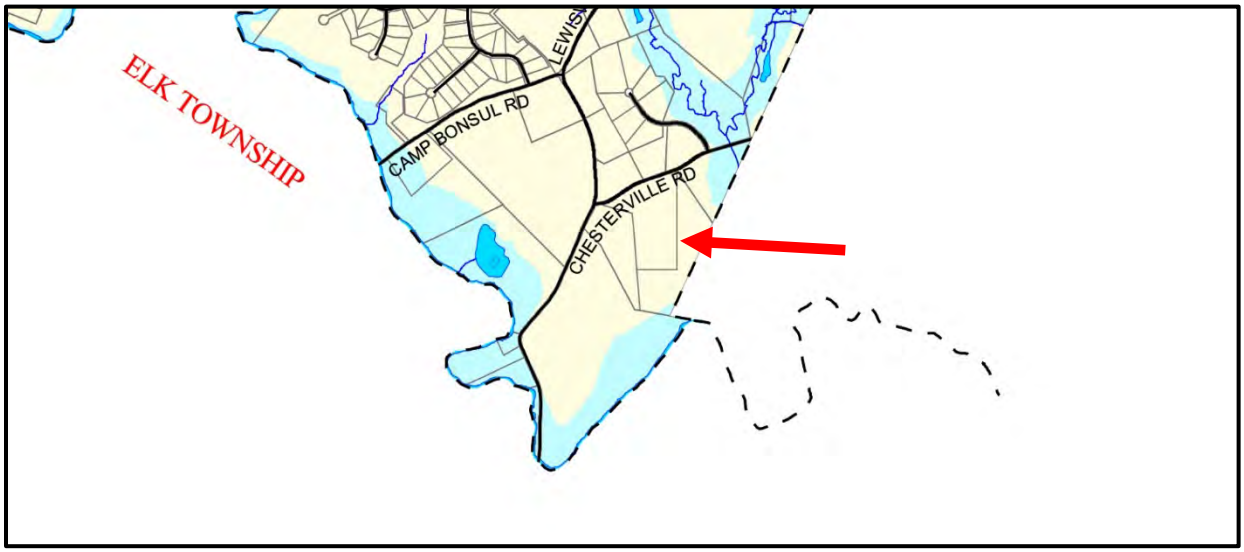
2% is located in New London Township's Low Density Residential district (R-1). The R-1 Low Density Residential District has been created to accommodate housing types which typify the rural residential character of the Township. Properties in the R-1 District may be served by individual on-lot water supply and individual on-lot sewage systems. They may utilize the lot-averaging option to achieve some site design flexibility.

Permitted uses by right include:

- Single-family residential
- Agriculture
- Forestry

Minimum Lot Size and Density

- Minimum lot size – 2 acres
- Minimum lot width – 150'
- Maximum building coverage – 15%
- Lot averaging allowed



Portion of the New London Township Township Zoning Map (subject parcel indicated by red arrow)

The Subdivision and Land Development Ordinances were reviewed for all three townships. The design standards compliment the zoning ordinances. There are no additional requirements included in the SALDO that would prohibit the amount of development permitted under zoning.

Agricultural uses are permitted under all three zoning ordinances. A copy of the relevant zoning ordinance sections are included in Addendum J of this report.

Utilities and Street Improvements

Water Type:	Streams
Sewage Type:	None
Public Utilities:	Electric and telephone service is available
Road Type:	Asphalt

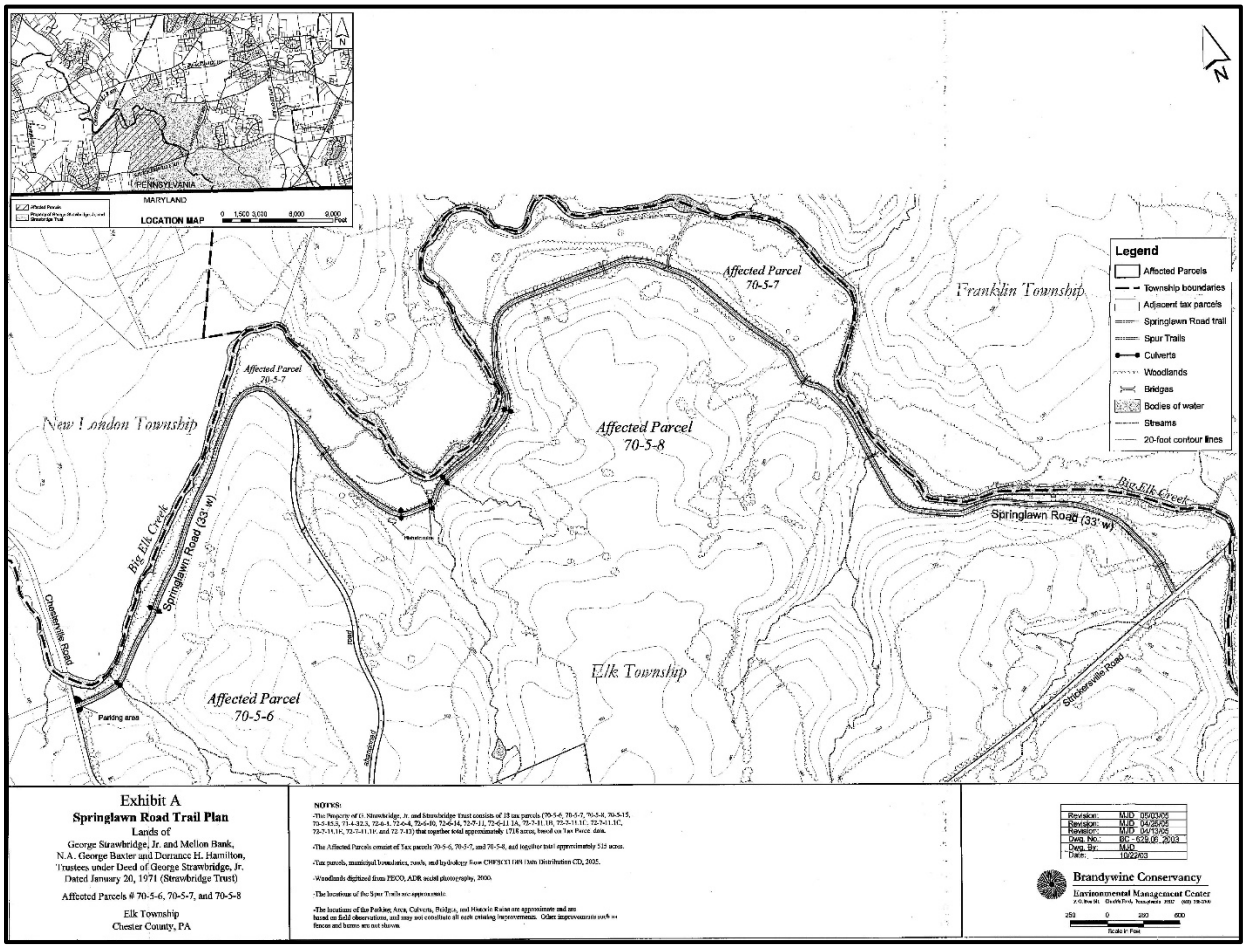
Easements

Unrecorded electric pole, telephone pole and highway ROW's.

The property is subject to 20' trail easement known as the Springlawn Trail that crosses the property. The easement is to Elk Township. Permitted uses are hiking, horseback riding & bicycling. A map of the easement is included below. Record Book 7308-70, 7308-124 and 7308-139 are associated with this trail easement.

Deed Book & Page X14–515 discuss an easement for a pipe for use of spring water. No evidence of this pipeline and its use were noted.

Deed Book & Pages G23-264 and Q35-568 refers to a mill & mill race. The mill no longer exists and the need for a mill race is not needed.



Subsurface Rights

Coal:	None (No coal known to exist in this area)
Oil & Gas:	Owned by Landowner (No oil-gas known to exist in this area)
Other Minerals:	No severance

Flood Map Information

The subject is located on FEMA map 42029C0370G & 42029C0375G (map date 9/29/2017). ~15% is located in Flood Zone A.

Aerial Map indicating subject property with FEMA NFHL overlay

Development Factors

Road Frontage: 6,192 feet (254 ft. on Chesterville Rd, 1,861 ft. on Lewisville-Chesterville Rd. & 5,938 ft. on Stricklersville Rd.)

Soils with Hydric Components: 3%

Overall Comments of Subject

The subject is a large acreage tract with the tillable acreage being tilled at this time. The first portion that has transferred to The Conservation Fund encompasses the Springlawn Trail and is mostly wooded.

The remaining two large tracts (Phase II & III) have most of the tillable land.

On the south border are lands presently owned by the Commonwealth of PA.

Analysis and Conclusions

The Valuation Process

The following is an overall discussion of the process used to develop this appraisal. Highest and Best Use is defined and the Approaches to Value are described.

Highest and Best Use Defined

Highest and Best Use reflects a basic assumption about real estate market behavior; that the price a buyer will pay for a property is based on their conclusions about the most profitable use of the site or property. Determination of Highest and Best Use must be based on careful consideration of prevailing market conditions, trends affecting market participation and change, and the existing use of the subject property.

The Highest and Best Use may be defined as "The highest and most profitable use for which the property is adaptable and needed or likely to be needed in the reasonably near future."[6]

Because the use of land can be limited by the presence of improvements, Highest and Best Use is determined separately for the land or site *as though vacant* and available to be put to its Highest and Best Use, and for the property *as improved*. The Highest and Best Use of land *as though vacant* and property *as improved* must meet the four criteria defined above.

The determination of *as though vacant* Highest and Best Use reflects that land value is derived from potential land use. Land has limited value unless there is a present or anticipated use for it. The amount of value depends on the nature of the land's anticipated use according to the concept of surplus productivity. Among all reasonable, alternative uses, the use that yields the highest present land value, after payments are made for labor, capital, and coordination, is generally regarded as the Highest and Best Use of the land *as though vacant*. This is the "classic" definition of a land residual analysis.

For the purpose of analysis, the appraiser assumes the parcel of land in question is vacant. Even a site with a large building on it can be made vacant by demolishing the building. The question to be answered is: If the land were vacant, what new improvements should be constructed on the site?

[6] Section 4.3.1, *Uniform Appraisal Standards For Federal Land Acquisition*, 2016

The Highest and Best Use of a property as improved refers to the optimal use that could be made of the property including all existing structures. The implication is that the existing improvements should be renovated or retained so long as they continue to contribute to the total market value of the property, or until the return from a new improvement would more than offset the cost of demolishing the existing building and constructing a new one.

The determination of the Highest and Best Use of land *as though vacant* is useful for land or site valuation. Determining the Highest and Best Use of an *improved* property provides a decision regarding continued use or demolition of the property. The reader should note that demolition is indicated when the land *as though vacant* has more value than the parcel as presently improved.

Methods of Valuation

It is normal appraisal practice to assemble as much relevant data from the marketplace as possible. This data is applied in the three recognized approaches to value: the Cost Approach, the Income Approach, and the Sales Comparison Approach.

In the Cost Approach, an estimate of the site's value is derived by comparing the subject site to similar sites that have sold. The subject site is valued in accordance with the conclusions reached in the Highest and Best Use section of this report.

Based on the physical characteristics of the property, the subject's replacement cost new (RCN) can be estimated based on comparative costs derived from the market and from *Marshall & Swift Commercial/Agricultural Estimator*. Accrued depreciation from all observed sources is subtracted from the RCN to yield depreciated replacement cost. The depreciated building value is added to the indicated land value to yield an estimate of value based on the Cost Approach.

The Income Approach analysis is concerned with the present worth of anticipated future benefits derived from ownership of the subject property, expressed in terms of net operating income (NOI) that ownership of a property may be expected to produce. The anticipated stabilized NOI available from owning a property is then converted into a value estimate by applying an appropriate rate derived from market observations.

The Sales Comparison Approach uses sales of similar properties as an indication of value for the subject property. This comparison may be made per square-foot, per acre or any other basis that is recognized in the marketplace and that provides an adequate unit of measure of indicated market value. In this appraisal, the unit of comparison is the price paid per acre for the comparable properties.

The Sales Comparison Approach is essential to almost every appraisal of real property. This approach best mirrors the actions of buyers in the marketplace for similar-type

properties. In this appraisal, information has been presented on recent sales similar in utility and location to the subject property.

After arriving at an indication of value, the results are correlated into a single conclusion of value based on the approach or approaches that have the highest quality or quantity of data available and the ones in which the appraiser has the greatest confidence. Pertinent data and facts used in the appraisal process are analyzed on the following pages of this report.

Sales and Data Analysis

Comparable Sale Analysis Process

When valuing properties that are land intensive, the appraiser's first step is to determine land values using unimproved sales. The sales are analyzed to determine the various values different land types contribute to a property. The land types that are most often differentiated in the subject's market area are tillable, pasture, woodland, farmstead and wasteland.

To establish the ratio of the contributory values (CV) of the various land types, sales that contain only one land type are used to determine the value of that land type. After a single land type's CV has been ascertained, other land type CVs can be determined on parcels with multiple land types. The following example demonstrates the process:

Sale A contains 100 tillable acres and sold for $100,000 or $1,000 per acre. Sale B contains 50 tillable acres and 50 acres of woodland. This property sold for $75,000 or $750 per acre. Both sales occurred on a similar date and with similar conditions of sale. To analyze Sale B's woodland CV the following calculations are completed:

Total sale price for Sale B	$75,000
Less 50 tillable acres @$1,000/acres (from Sale A)	$50,000
Residual value attributable to woodland	$25,000

Therefore, $25,000/50 acres = $500/woodland acre or 50% of the CV of tillable land.

In order to evaluate the contributory value of the improvements, the improved sales are analyzed by the following formula:

Sale Price – Land CV = Improvement CV

The same type of methodology used in determining land uses is used to determine the improvements contributory value. The following example demonstrates that process:

Sale A is the same 100 acres of tillable soils used in the land use calculation above. It sold for $100,000 or $1,000 per acre. Sale B is also 100 acres of tillable soils and contains a 2,000 square foot dwelling. It sold for $175,000 or $1,750 per acre. Both sales sold on similar date with similar conditions of sale. To analyze sale B's building contributory value the following calculations are completed:

Total sale price for Sale B	$175,000
Less Cropland 100 acres @$1,000/A. (From sale A)	$100,000
Residual value attributable to dwelling	$75,000

Sale B contributes $1,000 per acre to land and $750 per acre ($75,000/100 acres) to the improvement. These CVs and their condition and utility are utilized in the development of the sales comparison approach.

Depreciation rates from the comparable sales need to be determined for use in the cost approach. In order to determine the amount of depreciation, the cost new of the improvements must first be established. It is important that the appraiser have a working understanding of the cost new of the improvements.

Two types of costs new can be considered. The *replacement* cost is the estimated cost to construct, at current prices as of the effective appraisal date, a building with utility equivalent to the building being appraised, using modern materials and current standards, design, and layout.[7] The *reproduction* cost is the estimated cost to construct, at current prices as of the effective date of the appraisal, an exact duplicate or replica of the building being appraised, using the same materials, construction standards, design, layout, and quality of workmanship and embodying all the deficiencies, superadequacies, and obsolescence of the subject building.[8]

The use of *replacement* cost eliminates the need to estimate some forms of functional obsolescence. The *reproduction* cost is generally difficult to estimate because identical materials may be unavailable and construction standards may have changed since the improvement was originally built. *Replacement* cost estimates are often preferred in rural property appraisal where obsolescence in farm structures is prevalent, particularly in established farming areas with older structures.

The *replacement* cost new is generally the preferred cost new for use with the types of aged improvements on farms in Chester County. Their actual age is often 100+/- years old.

The following types of ages (defined in *The Dictionary of Real Estate Appraisal*, Sixth Edition published by the Appraisal Institute are important when evaluating comparable sale improvements:

> *Actual Age* is the number of years that have elapsed since construction of an improvement was completed; also called historical or chronological age.
>
> *Useful Life* is the period of time over which a structure may reasonably be expected to perform the function for which it was designed.

[7] *The Dictionary of Real Estate Appraisal*, Sixth Edition, Appraisal Institute
[8] *The Dictionary of Real Estate Appraisal*, Sixth Edition, Appraisal Institute

Effective Age is the age of property based on the amount of observed deterioration and obsolescence it has sustained, which may be different from its chronological age.

Economic Life is the period over which improvements to real property contribute to property value.

Remaining Economic Life is the estimated period during which improvements will continue to contribute to property value; an estimate of the number of years remaining in the economic life of the structure or structural components as of the date of the appraisal; used in the age-life method of estimating depreciation.

Useful life and effective age are the two ages considered in developing the various types of depreciation on the comparable sales and on the subject as well.

The various types of depreciation are then calculated. The types of depreciation used in this report are defined in the *Dictionary of Real Estate Appraisal*, Sixth Edition published by the Appraisal Institute and set forth below:

Physical Deterioration is an element of depreciation; loss in value caused by wear, tear, age and use.

Functional Obsolescence is an element of depreciation resulting from deficiencies or superadequacies in the structure.

External Obsolescence is an element of depreciation; a defect, usually incurable, caused by negative influences outside a site and generally incurable on the part of the owner, landlord, or tenant.

The comparable sales were analyzed to determine the kind and amount of depreciation.

Database

The appraiser maintains a database of approximately 54 sales of land and farms larger than 50 acres in Chester County, southern Berks County and southeastern Lancaster County that have transferred since January 2015. County tax assessment databases, *Parcel Viewer*, *Lancaster Farming* (local farm newspaper), public sale notices, Realtors multi-list information and contacts with realtors and auctioneers in the counties were utilized to locate the sales used in the development of this report.

The sales were verified using a public record source, as well as further verification with buyers, sellers, realtors, auctioneers, lenders, etc. involved in the transfer whenever possible. Sales verification was completed by either direct contact in person, telephone or US Postal Service. When verification was not possible by the mentioned sources and

information appeared arm's length, confirmation was made using available public information verifications.

The following sales 26 sales were considered in the development of this report:

County	Sale #	Cons Ease	Sale Date	Twp	Acres	Sale Price	$/Acre Value	$/Acres Value Land	$/Acre Bldg
Lancaster	7114841	X	Dec-14	Sadsbury	80.96	$900,000	$11,117	$11,117	$0
Chester	2915007		Jan-15	E. Nottingham	54.83	$765,000	$13,952	$13,952	$0
Chester	2915163	X	Mar-15	W. Brandywine	68.63	$430,000	$6,265	$6,265	$0
Chester	2915178		Mar-15	W. Brandywine	75.20	$800,000	$10,638	$8,710	$1,928
Lancaster	7115470	X	Jul-15	Colerain	96.13	$1,152,000	$11,984	$11,901	$83
Chester	2915466		Jul-15	W. Fallowfield	75.40	$1,300,000	$17,241	$17,241	$0
Berks	1115753		Nov-15	Caernarvon	61.50	$413,400	$6,722	$6,722	$0
Chester	2915765	X	Nov-15	Warwick	111.67	$1,147,464	$10,275	$9,308	$967
Chester	2915754		Nov-15	L. Oxford	58.17	$595,000	$10,229	$10,229	$0
Chester	2915840	X	Dec-15	Londonderry	54.10	$600,000	$11,091	$11,091	$0
Chester	2915841	X	Dec-15	Franklin	56.29	$650,000	$11,547	$11,547	$0
Chester	2916020		Jan-16	Elk	73.66	$300,000	$4,073	$4,073	$0
Chester	2916084	X	Feb-16	E. Nottingham	121.39	$1,899,438	$15,647	$13,895	$1,752
Lancaster	7116153	X	Mar-16	Colerain	182.31	$2,000,000	$10,970	$10,444	$526
Chester	2916228		Apr-16	Sadsbury	61.39	$401,300	$6,537	$6,537	$0
Chester	2916234		Apr-16	L. Oxford	130.28	$1,230,000	$9,441	$7,561	$1,880
Chester	2916229	X	Apr-16	Highland	266.90	$2,641,327	$9,896	$8,900	$996
Chester	2916306		May-16	W. Sadsbury	73.55	$750,000	$10,197	$10,197	$0
Chester	2916307		May-16	U. Oxford	125.80	$1,787,000	$14,205	$14,205	$0
Lancaster	7116851		Dec-16	Colerain	162.75	$1,700,000	$10,445	$8,473	$1,972
Chester	2917009		Jan-17	W. Brandywine	86.10	$1,000,000	$11,614	$11,614	$0
Chester	2917454	X	Jul-17	W. Fallowfield	77.05	$1,175,000	$15,250	$15,250	$0
Chester	2917463		Jul-17	London Britain	56.95	$959,078	$16,841	$16,841	$0
Chester	2917539	X	Aug-17	L. Oxford	113.60	$1,190,000	$10,475	$10,475	$0
Chester	2917541	X	Aug-17	Honey Brook	60.00	$1,000,000	$16,667	$16,667	$0
Lancaster	7117832	X	Dec-17	Colerain	116.30	$1,650,000	$14,187	$14,187	$0
				Average	96.11	$1,239,154	$13,640	$13,358	

The sales range from 54.83 to 266.90 acres in size. Total value per acre and the land contributory value ranges from $4,073 to 17,271 per acre.

Of the 26 selected sales, half are subject to conservation easements. There were no large acreage sales similar in size to the subject in this particular market. In order to find similar large acreage tracts one would have to go to another market area, which will require large location adjustments. This indicates that the typical buyer of land in this particular market area is not looking for or requiring a parcel size greater than 200 acres.

Land Use Value Allocation

The first analysis of the comparable sales is to determine the contributory value of the three major land uses in Chester County (tillable, pasture and woodland).

The first comparison determines the percentage difference between tillable acreage and woodland acreage. Pairings are made with land size as similar as possible and with similar date of sale. Additionally, all comparables were similar in financing and terms of sale. A number of bareland comparables in Chester County and comparable sales from Berks and Lancaster County were considered. Additionally, historical or older sales needed to be considered. Following are several matched pairings:

	Sale #1		Sale #2		
Database #	1114331		1114007		
Selling Price	$320,000		$227,000		
Acres	35.43		35.71		
Total Sale $/A	$9,032		$6,357		
Date of Sale	May-14		Jan-14		
	Acres	$/Acre	Acres	$/Acre	Ratio
Tillable Acres	35.43	$9,032	0.00	$0	100%
Woodland Acres	0.00	$0	35.71	$6,357	70%

	Sale #1		Sale #2		
Database #	1114007		1114834		
Selling Price	$227,000		$300,602		
Acres	35.71		37.58		
Price/A	$6,357		$7,999		
Date of Sale	Jan-14		Dec-14		
	Acres	$/Acre	Acres	$/Acre	
Woodland Acres	35.71	$6,357	1.77		
Tillable Acres	0.00	$0	35.81		
Sale #2 Analysis			Total	/Acre	
$/Total			$300,602		Ratio
$/Wood indicated by Sale #1			$11,251	$6,357	79%
Indicated $/Tillable			$289,351	$8,080	100%

	Sale #1		Sale #2		
Database #	1114832		1114834		
Selling Price	$277,000		$300,602		
Acres	52.96		37.58		
Price/A	$5,230		$7,999		
Date of Sale	Jan-14		Dec-14		
	Acres	$/Acre	Acres	$/Acre	
Woodland Acres	52.96	$5,230	1.77		
Tillable Acres	0.00	$0	35.81		
Sale #2 Analysis			Total	/Acre	
$/Total			$300,602		Ratio
$/Wood indicated by Sale #1			$9,258	$5,230	64%
Indicated $/Tillable			$291,344	$8,136	100%

	Sale #1		Sale #2		
Database #	1116169		1117766		
Selling Price	$350,000		$410,000		
Acres	53.14		50.51		
Price/A	$6,586		$8,117		
Date of Sale	Mar-16		Dec-14		
	Acres	$/Acre	Acres	$/Acre	
Woodland Acres	53.14	$6,586	22.32		
Tillable Acres	0.00	$0	28.19		
Sale #2 Analysis			Total	/Acre	
$/Total			$410,000		Ratio
$/Wood indicated by Sale #1			$147,008	$6,586	71%
Indicated $/Tillable			$262,992	$9,329	100%

The four pairings indicate the following woodland percentages: 70%, 79%, 64% and 71%. A tillable to woodland land value ratio of 100:70 was established.

The next step determines the indicated value ratio of pasture to tillable land. The following pairings were used to determine this value:

	Sale #1		Sale #2		
Database #	1114834		1114602		
Selling Price	$300,602		$310,000		
Acres	37.58		40.74		
Price/A	$7,999		$7,609		
Date of Sale	Dec-14		Sep-14		
	Acres		Acres		
Tillable Acres	35.14		29.09		
Woodland Acres	2.44		0.00		
Pasture Acres	0.00		11.65		
Sale #1 Analysis	Acres	Adj A.	$/Acre	Ratio	
Tillable Acres	35.14	35.14	$8,158	100%	
Woodland Acres	2.44	1.71	$5,711	70%	
Pasture Acres	37.58	36.85	$7,999		
Sale #2 Analysis		Acres	Total	/Acre	
$/Total			$310,000		Ratio
$/Tillable		29.09	$237,313	$8,158	100%
$/Wood		0.00	$0	$5,711	70%
Indicated $/Pasture		11.65	$72,687	$6,239	76%

The pairing indicates pasture a percentages of 76%. A tillable to pasture land value ratio of 100:80 was established.

The farmstead is usually situated on the tillable portions of the farm and therefore its value is considered equal in value to the tillable soils. All improvements such as excavation, drives, wells, etc. have been included in the value of the improvements.

Therefore, the following land value ratios were determined:

Tillable –	100%
Pasture –	80%
Woodland –	70%
Farmstead –	100%

Market Value Analysis

Highest and Best Use:

The following is a discussion of the four criteria of the Highest and Best Use in regard to the subject property.

As Vacant

Legally Permissible: The subject property is located in three townships (47% Elk Twp., 51% Franklin Twp., and 2% New London Twp.), each with its own separate zoning district. The property's present land use is 54% tillable. This use is permitted under the three zoning districts. Zoning allows for subdivision of agricultural parcels and single-family dwelling lots. The *As Vacant* use for agricultural uses is legally permissible under present zoning with the ability to be subdivided in the future.

This tract is specified to be a LWCF 6F replacement tract and is the larger parcel considered in this report.

Physically Possible: The property is 54% tillable with an average yield potential for the area. The remaining acreage is wooded with slopes that are gentle to rolling. There is an estimated value of $300 to $500 per acre marketable timber within the woodland acreage.

Development of the property into several single-family residences is considered physically possible. The density is not able to be determined without a development plan, but due to the size of the property, the development into large acreage tracts is physically possible.

It should be noted that a portion of the property located in Elk County, formerly known as Springlawn Road has been vacated and a grant of Public Trail Easement has been filed. The location of the easement is in the wooded areas of the tract and does not cause any limitations for the use of the property.

Financially Feasible: The property's use for crop growing and timber harvesting is financially feasible. The amount of marketable timber is a small and insignificant portion of the total market value of the subject. It is unlikely that a buyer would be purchasing the subject property for timber income.

Also, the ideal building(s) for the subject site must be considered. The building(s) should conform and be consistent with the uses in the neighborhood and be in sufficient demand to provide an adequate net return for the owner or investor. Some type of

agricultural operation that maximizes the use of the property would be most financially feasible.

Without a completed development plan, the ability to develop the property is limited. There is demand for some development tracts, but the location and size of the tract reduces the financial feasibility of development into single family residential lots.

Maximally Productive: The present use for agricultural use is a legally permissible and physically possible use. When considering the financial feasible uses, the most likely purchase of this tract is for continued use as an agricultural use with future potential for subdivision. The database analysis did not uncover a tract as large as the subject, but does indicate that the typical buyer in this market is not looking for a large tract similar to the subject. It legally permissible and physically possible to subdivide the tract into typical 75 to 125 acre farm tracts. There are elements of risk associated with buying a large tract like the subject. Those risks include factors such as zoning and other municipal regulations, as well as the time required to market 10+ tracts. But since the market does show a demand for 75-125 acre tracts, it appears unlikely there would be significant community push back for subdivision in the future. A potential buyer desiring this large a land mass would look favorably on the opportunity to buy this large a tract.

The potential buyer is either looking to acquire a large land base to establish an estate type farm or to hold for future subdivision.

The *As Vacant* maximally productive use of the subject site is the continued agricultural use with future subdivision potential.

***As Vacant* Conclusion:** Because of the reasons stated above, the final conclusion of Highest and Best Use is *As Vacant* – agricultural with future subdivision potential.

As Improved

N/A

Final Conclusion

The *As Vacant* Use is the final conclusion of Highest and Best Use as agricultural.

Cost Approach

There are no improvements; therefore, the development of the Cost Approach is not necessary.

Income Approach

A vacant land tract of this large size with a mixture of cropland and woodland makes completion of an accurate Income Approach difficult; therefore, the Income Approach was not deemed reliable and was not developed

Sales Comparison Approach

The Sales Comparison Approach is a method of estimating market value where the subject property is compared to similar properties that have been sold.

The Sales Comparison Approach was developed by selecting the most comparable sales available at the time of assignment. Six sales were selected from the general market area. These sales were selected because of their similarity in use and location in market zone. Comparables can be located in **Addendum I**.

General Discussion of Elements of Comparison

In general there is an upward adjustment when the comparable is inferior to the subject for a given element of comparison and a downward adjustment when the comparable is superior to the subject for a given element of comparison. The following chart identifies the differences between the subject and the comparables.

	Sale Date	Rights Transferred	Size	Zoning	% Till	Slope	Road Front	Yield
SUBJECT		Fee Simple	982.60	R1, R2 & AR	54%	Rolling	6,192	110
COMP 1	Dec-17	Restricted (Cons Ease)	116.30	A/CN	61%	Rolling	12,930	163
COMP 2	Jul-17	Restricted (Cons Ease)	77.05	Ag	44%	Rolling	678	151
COMP 3	Apr-17	Fee Simple	107.67	AR	74%	Rolling	7,909	121
COMP 4	Jan-17	Fee Simple	86.10	R-1/R-2	72%	Rolling	3,716	121
COMP 5	May-16	Fee Simple	125.80	AR-1	52%	Rolling	8,263	81
COMP 6	Jul-15	Fee Simple	75.40	Ag	94%	Rolling	4,744	160

Following is a discussion of the various adjustments made to the comparable sales.

The first set of necessary adjustments are for building and land use differences.

Buildings: Because Comparable 3 has a low percentage of improvements, its contributory value per acre of the improvements was negatively adjusted.

Land Use: Existing land use as tillable acreage versus pasture, woodland, farmstead and waste were compared. The following adjustments were made for varying land uses:

	Sales Comp #1			Subject		
Type of Land	Acres	$/A	Total Value	Acres	$/A	Total Value
Tillable	71.01	$16,289	$1,156,686	530.04	$16,289	$8,633,852
Perm Pasture	20.12	$13,031	$262,189	0.00	$13,031	$0
Woodland	20.27	$11,402	$231,125	443.00	$11,402	$5,051,236
Farmstead	0.00	$16,289	$0	0.00	$16,289	$0
Roads & Waste	4.90	$0	$0	9.56	$0	$0
Total	116.30	$14,187	$1,650,000	982.60	$13,927	$13,685,088
			Land Adjustment		-$260	/Acre

	Sales Comp #2			Subject		
Type of Land	Acres	$/A	Total Value	Acres	$/A	Total Value
Tillable	33.94	$17,317	$587,751	530.04	$17,317	$9,178,892
Perm Pasture	39.16	$13,854	$542,518	0.00	$13,854	$0
Woodland	3.69	$12,122	$44,731	443.00	$12,122	$5,370,112
Farmstead	0.00	$17,317	$0	0.00	$17,317	$0
Roads & Waste	0.26	$0	$0	9.56	$0	$0
Total	77.05	$15,250	$1,175,000	982.60	$14,807	$14,549,004
			Land Adjustment		-$443	/Acre

	Sales Comp #3			Subject		
Type of Land	Acres	$/A	Total Value	Acres	$/A	Total Value
Tillable	79.62	$14,255	$1,135,014	530.04	$14,255	$7,555,924
Perm Pasture	6.39	$11,404	$72,874	0.00	$11,404	$0
Woodland	14.94	$9,979	$149,083	443.00	$9,979	$4,420,594
Farmstead	3.72	$14,255	$53,030	0.00	$14,255	$0
Roads & Waste	3.00	$0	$0	9.56	$0	$0
Total	107.67	$13,096	$1,410,000	982.60	$12,189	$11,976,518
			Land Adjustment		-$907	/Acre

	Sales Comp #4			Subject		
Type of Land	Acres	$/A	Total Value	Acres	$/A	Total Value
Tillable	61.78	$12,851	$793,914	530.04	$12,851	$6,811,365
Perm Pasture	0.00	$10,281	$0	0.00	$10,281	$0
Woodland	22.91	$8,995	$206,086	443.00	$8,995	$3,984,990
Farmstead	0.00	$12,851	$0	0.00	$12,851	$0
Roads & Waste	1.41	$0	$0	9.56	$0	$0
Total	86.10	$11,614	$1,000,000	982.60	$10,988	$10,796,356
			Land Adjustment		-$627	/Acre

	Sales Comp #5			Subject		
Type of Land	Acres	$/A	Total Value	Acres	$/A	Total Value
Tillable	65.16	$16,487	$1,074,287	530.04	$16,487	$8,738,723
Perm Pasture	29.72	$13,190	$391,993	0.00	$13,190	$0
Woodland	27.79	$11,541	$320,720	443.00	$11,541	$5,112,592
Farmstead	0.00	$16,487	$0	0.00	$16,487	$0
Roads & Waste	3.13	$0	$0	9.56	$0	$0
Total	125.80	$14,205	$1,787,000	982.60	$14,097	$13,851,315
			Land Adjustment		-$108 /Acre	

	Sales Comp #6			Subject		
Type of Land	Acres	$/A	Total Value	Acres	$/A	Total Value
Tillable	71.16	$17,840	$1,269,528	530.04	$17,840	$9,456,167
Perm Pasture	0.00	$14,272	$0	0.00	$14,272	$0
Woodland	2.44	$12,488	$30,472	443.00	$12,488	$5,532,332
Farmstead	0.00	$17,840	$0	0.00	$17,840	$0
Roads & Waste	1.80	$0	$0	9.56	$0	$0
Total	75.40	$17,241	$1,300,000	982.60	$15,254	$14,988,500
			Land Adjustment		-$1,987 /Acre	

After the comparables have been adjusted for the differences in building and land use, the following adjustment for property rights is made.

Property Rights: Properties can be transferred with varying degree of rights. Some of the sticks in the bundle of rights of a fee simple tract are sometimes transferred to other entities by easements. The subject tract is fee simple and only restricted by a trail easement which encompasses approximately 7 acres or less than 1% of the total acreage. Two of the sales are encumbered by conservation easements, but no value change could be identified and no adjustments were needed.

After the comparables have been adjusted for the property rights difference the following three adjustments were considered.

Financing Terms: The comparable sales are adjusted for financing terms, if necessary. This adjustment renders the sales price to cash equivalent terms where the seller makes favorable financing terms available. The present value of this difference represents an advantage to the comparable sale and warrants a negative adjustment. The transaction price of a property may differ from the price of an identical property because of different financing arrangements. All sales were cash to seller transactions and no adjustments were needed.

Conditions of Sale: An adjustment maybe necessary if there are any unusual circumstances surrounding the transaction such as foreclosure, bulk sales, related parties, assemblages and the like. No adjustments were required to the comparable sales.

Market Conditions: After adjusting all the sales to a cash equivalent price, the sales are brought current by means of a Market Condition adjustment to account for a changing market from the date of each comparable sale to the effective date of this appraisal. No adjustments were made.

After the comparables are adjusted for financing terms, conditions of sale and market conditions, the comparables are then adjusted for the following differences.

Location: The location within the county and the surrounding counties can affect value. Accessibility and location proximity with similar type use properties are considered. Five of the comparables are located in Chester County and one is from the adjoining southern Lancaster County. The comparables are all located in the same market area and no adjustments were needed.

Parcel Size: Farm property values generally have an inverse relationship to size; as property size increases, price per acre decreases. This relationship is due to economy of scale. Typically larger land parcels have a limited market, attracting a smaller pool of potential purchasers and for that reason a discount would be reasonable. There are no tracts similar in size, and the comparables sales range in size from 75.40 to 125.80 acres. A buyer may take into account the time, risk and cost of subdivision. But, because of the lack of data available to compare larger parcels to smaller parcels, no adjustments could be determined. Because of the subject's large size, its potential to be subdivided into typical farm tracts, and the unique opportunity to purchase a large tract like the subject, no adjustments for parcel size were made.

Physical Limitations: Physical characteristics such as road frontage, slopes and site configuration cause differences in values. The tracts are similar in topography and no adjustment was made.

Yield Potential: The productivity of various soils is compared. Soil productivity is not a major driving force in this market as most landowners purchase properties based on location. The comparables vary in yield potential but no differences were noted because of yield potential.

Another component of yield potential is the value of the marketable timber. Since it was determined that the value of the timber is between $300 and 500 per acre, it is considered a small fraction of the overall market value of the subject and was not adjusted for.

Therefore, no adjustments were made. Crop and timber yield potentials were considered in the reconciliation of the Sales Comparison Approach.

Zoning: Zoning differences can limit the possible uses of a property and its future ability to subdivide. The zonings are considered similar and no adjustments could be determined.

Conclusions: A range of $10,988 – 15,254 was established. Adjustments were considered for buildings, land use, conditions of sale, market conditions, parcel size, physical limitations, yield potential and zoning differences. The mean value is $13,543. All comparables were chosen because of similar location and use.

Comparable 1 is located in Colerain Township, Lancaster County. It is subject to a conservation easement; no adjustment could be determined. It is the most recent sale.

Comparable 2 is a recent sale of a vacant land tract that is subject to a conservation easement.

Comparable 3 is an improved tract in Franklin Township. It was purchased to be subdivided into three Plain Sect farms.

Comparable 4 is a vacant land tract with acreage on two sides of the road.

Comparable 5 is the largest acreage tract and has the least amount of net adjustments.

Comparable 6 is the smallest acreage tract and the oldest sale.

In reconciling the selected sales, it reasonable to consider the fact that larger tracts typically sell for less per acre. However, due to the unique opportunity to purchase a tract as large as the subject, the comparables used are the best indicators of market value. Comparable 1 is the most recent sale and is the second largest tract with minimal net adjustments. It was weighted the heaviest. Therefore the value of **$13,756,400** or **$14,000** per acre is considered the indicated value.

As a test of reasonableness, the two recent sales of the subject were considered.

	Sale Date	Acres	Sale Price	$/Acre
Phase I	11/9/2017	254.45	$4,385,000	$17,233
Phase II	11/9/2018	386.23	$6,105,000	$15,807

Phase I was the purchase of most of the center portion of the subject. It is the location of the trail easement. It is mostly an irregular shaped wooded tract and is not representative of the total acreage of the subject. Phase II is the sale of the eastern portion of the tract and has a higher percentage of tillable soils than the total acreage of the subject. It is also not representative of the entire subject tract. These two sales are above the range established by the six selected sales, but do indicate that the select values are reasonable.

The value by the Sales Comparison Approach is **$13,756,000 (rounded).**

Following is the Sales Comparison Approach Adjustment Summary:

Sales Comparison Approach Adjustment Grid

ELEMENT OF COMPARISON	SUBJECT PROPERTY	SALE #1 7117832 Colerain	SALE #2 2917454 West Fallowfield	SALE #3 2917250 Franklin	SALE #4 2917009 West Brandywine	SALE #5 2916307 Upper Oxford	SALE #6 2915466 West Fallowfield
Sales Price		$1,650,000	$1,175,000	$1,600,000	$1,000,000	$1,787,000	$1,300,000
Land Area (Acres)	982.60	116.30	77.05	107.67	86.10	125.80	75.40
Sales Price per Acre		$14,187	$15,250	$14,860	$11,614	$14,205	$17,241
Land Use	54%	61%	44%	74%	72%	52%	94%
Adjustment	% Tillable	-260	-443	-907	-627	-108	-1,987
Improvements Adjustment		0	0	-1,765	0	0	0
Adjusted Sales Price		$13,927	$14,807	$12,189	$10,988	$14,097	$15,254
Rights Transferred	Fee Simple	Restricted (Cons Ease)	Restricted (Cons Ease)	Fee Simple	Fee Simple	Fee Simple	Fee Simple
Adjustment		0	0	0	0	0	0
Adjusted Sales Price		$13,927	$14,807	$12,189	$10,988	$14,097	$15,254
Financing Terms		Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller	Cash to Seller
Adjustment		0	0	0	0	0	0
Conditions of Sale		Arms Length	Arms Length	Arms Length	Arms Length	Arms Length	Arms Length
Adjustment		0	0	0	0	0	0
Market Conditions		Dec-17	Jul-17	Apr-17	Jan-17	May-16	Jul-15
Adjustment		0	0	0	0	0	0
Adjusted Sales Price		$13,927	$14,807	$12,189	$10,988	$14,097	$15,254
Location	Elk, Franklin, &	Colerain	West Fallowfield	Franklin	West Brandywine	Upper Oxford	West Fallowfield
Adjustment	New London	0	0	0	0	0	0
Parcel Size	982.60	116.30	77.05	107.67	86.10	125.80	75.40
Adjustment	acres	0	0	0	0	0	0
Physical Considerations	Rolling	Rolling	Rolling	Rolling	Rolling	Rolling	Rolling
Adjustment		0	0	0	0	0	0
Yield Potential	110	163	151	121	121	81	160
Adjustment	Bushels	0	0	0	0	0	0
Zoning	2% R1, 47% R2	90% A/10% CN	Ag	AR	50% R-1/50% R-2	AR-1	Ag
Adjustment	& 51% AR	0	0	0	0	0	0
Other Adjustment		0	0	0	0	0	0
Final Adjusted Sales Price		$13,927	$14,807	$12,189	$10,988	$14,097	$15,254
Total Net Adjustments		-$260	-$443	-$2,672	-$627	-$108	-$1,987
Total Net % Adjustments		-2%	-3%	-18%	-5%	-1%	-12%

Reconciliation and Correlation

The three generally accepted approaches to value include the Income Approach, the Cost Approach and the Sales Comparison Approach. Only the Sales Comparison Approach was developed to appraise the subject located in Elk, Franklin & New London Townships, Chester County, Pennsylvania.

The following chart summarizes the indicated value estimates for the subject are:

Cost	**Not Developed**
Income	**Not Developed**
Sales	**$13,756,000**

Therefore, the final opinion of Market Value of the fee simple interests of the subject property is estimated as:

$13,756,000
(Thirteen Million Seven Hundred Fifty-Six Thousand Dollars)
Cash or Cash Equivalency

ADDENDA

SNYDER
Appraisal Associates

3004 Hempland Road, Suite 3
Lancaster, PA 17601-1389
717.435.9560
www.snyderassociates.us

May 30, 2018

Thomas P. Ford
Director of Bureau of Recreation & Conservation
Department of Conservation & Natural Resources
5th Floor
400 Market Street
Harrisburg, PA 17105

RE: Proposal for appraisal services to determine Market Value of 982.6± acres located in Elk, Franklin & New London Townships, Chester County.

Dear Mr. Ford:

In accordance with your request, please accept the following as our Proposal to provide real estate appraisal services for the above referenced property.

The value to be established in the appraisal is the opinion of market value for the above referenced acreage. The intended use of the report is a value of the fee simple interest for the for the Strawbridge replacement property to create an excess bank with the National Park Service. The intended user(s) of the report are Pennsylvania Department of Conservation and Natural Resources (DCNR) and the National Park Service.

Definitions - The parties to this agreement are the Pennsylvania Department of Conservation and Natural Resources, hereinafter referred to as *Engager* and Snyder Appraisal Associates, hereinafter referred to as *Appraiser*. The term *Market Value* is derived from the Uniform Appraisal Standards for Federal Land Acquisition, and is defined therein. The term *Work Product* refers to valuation services, provided by Appraisers, which are generally in the form of written reports. The term *Engager* refers to the party engaging the Appraiser.

Property Description – 982.6± acres of real estate identified as tax parcel 70-5-6, 70-5-8, 70-5-7, 72-6-1, 72-6-4, 72-6-10 & 71-4-32.3.

Fees - The fee for this assignment shall not exceed: $3,900.

This includes all travel and incidental expenses. No other fees or expenses shall be payable unless agreed to in advance and authorized by the Engager in writing. This fee

does not include expert witness testimony or other related work explained in further detail later in this proposal.

Payment – Payment will be due and payable within 10 days of presentation of the final work product. Engager will not require information beyond the scope of the assignment.

Service Expectations - Appraiser is required to meet minimum service requirements, as set forth by the Uniform Standards of Professional Appraisal Practice and the American Society of Farm Managers and Rural Appraisers.

Delivery Date - The appraisal assignment shall be completed and the work product delivered to the undersigned within 45 days of our receipt of the **signed, accepted** proposal.

Work Product Quality - Appraiser work product must (at a minimum) meet the requirements of the Uniform Standards of Professional Appraisal Practice (USPAP) as adopted by the Appraisal Foundation; and any other special instructions described herein. To the best of the Appraiser's belief, the appraisal report will conform to the Code of Ethics and Standards of Professional Practice of the American Society of Farm Managers and Rural Appraisers, and the Uniform Standards of Professional Appraisal Practice (USPAP) as established by the Appraisal Foundation.

Scope of Appraisal - The scope of this appraisal includes:

1. Determine the type of value to be established in this report;
2. Establish the intended use and user of the report;
3. Ascertain any Limiting Conditions, Hypothetical Conditions and/or Extraordinary Assumptions;
4. Confirm the property rights being appraised;
5. Perform an on-site inspection of the subject including a walking inspection of the property boundaries and improvements to examine physical characteristics. All structures will be inspected noting the type of structure with special emphasis on determining the condition and utility;
6. Review site plans, deed, GIS data, soil maps, tax assessment records, etc. obtained from the county public records and the Owners;
7. Research Recorder of Deeds for easements, deed restrictions, etc.;
8. Review Zoning Ordinance to determine legal restrictions created by Zoning Ordinances;
9. Identify the subject's market area and analyze pertinent characteristics;
10. Describe the subject's market area and the site;
11. Determine the highest and best use of the property:
12. Research and collect comparable data of similar use sales in the subject's market area. Verify information with buyers, sellers, brokers, public records, and/or with other knowledgeable sources;

13. Analyze the comparable sales to determine market conditions, locational factors, physical attributes, unit sizes and other pertinent factors and/or adjustments indicated by comparable sales data;
14. Develop the Cost Approach value of the subject property;
15. Develop the Income Approach value of the subject property;
16. Develop the Sales Comparison Approach value of the subject property;
17. Reconcile into a final opinion the *As Is* market value.

Please Note: *The Cost and Income Approaches to Value will not be developed in this report since they are not considered relevant to this type of property*

Report Type: The report will be written in a comprehensive manner that identifies and gives a detailed description of all support and conclusions drawn. The report will be prepared in conformance with the Uniform Appraisal Standards for Federal Land Acquisition and the Land and Water Conservation Fund (6F) guidelines.

Environmental Issues - Attention shall be given to potential environmental and special resource issues affecting the property and/or adjacent properties.

Report Deficiencies - In the event the Engager and/or a review Appraiser engaged by the engager discovers deficiencies in the work product and notifies the Appraiser of such deficiencies, the Appraiser shall have an appropriate time period to take corrective actions.

Appraisal Disclosure – The Appraiser may only release the report to other parties only with the formal written authorization of the original client. The Engager also understands and agrees to the disclosure of this report to the American Society of Farm Managers and Rural Appraisals as required by their Code of Ethics for peer review if requested by the AFSMRA.

Appraisal Report Copies - The Appraiser shall submit two complete original appraisal reports with original photographs and signatures unless otherwise specifically requested. Supplementary original copies require an additional fee of $100 for each copy.

Engager Contact - Only the following shall be contacted regarding this assignment:

Thomas P. Ford
DCNR
5th Floor
400 Market Street
Harrisburg, PA 17105

717-783-2659

thoford@pa.gov

Engagement Responsibility - Appraiser will maintain overall engagement responsibility in terms of staffing and quality control. Should the Engager require additional services beyond the scope of this assignment, the Engager understands that such services will be provided and will be billed additionally at $150/hour. In the event that the Engager desires to cancel this contract, written notice thereof shall be delivered to the Appraiser, and Engager agrees to compensate Appraiser for all services rendered at the rate of $150/hour for the time spent prior to receipt of such written cancellation notice.

Engager understands that the fee quoted does not include expert witness testimony, which requires a separate arrangement and is provided solely by Gregory L. Snyder. Any and all litigation support, case evaluation, deposition review or consulting services are billed at $150 per hour. Any appearance whatsoever, regardless of duration, including less than ½ day, for such services in conjunction with expert witness testimony in court, deposition, or arbitration hearing is billed at $1,200 per day (Minimum one-half day for on-call status).

The Appraiser warrants and represents that the Appraiser has no present or contemplated future interest in the real estate that is the subject of this engagement.

Respectfully Submitted,

Gregory L. Snyder, ARA

Digitally signed by Gregory L. Snyder, ARA
DN: cn=Gregory L. Snyder, ARA, o=Snyder Appraisal Associates, ou, email=Greg@snyderassociates.us, c=US
Date: 2018.05.30 16:01:21 -04'00'

Gregory L. Snyder

President

Please sign and return the original of this proposal in the enclosed, stamped envelope. Retain the copy for your records.

Agreed and approved:

Thomas P. Ford 5/31/18

(Signature) (Date)

450/1095 Cert

This Indenture

MADE THE 18th *day of* October *in the year of our Lord one thousand nine hundred and* seventy-eight **Between** SPRINGLAWN CORPORATION, a Pennsylvania Corporation (hereinafter called the GRANTOR) party of the first part, and

GEORGE STRAWBRIDGE, JR., Individually, and GIRARD BANK, GEORGE STRAWBRIDGE, SR. and CHARLES H. MORRIS, JR., Trustees under Deed of Trust of GEORGE STRAWBRIDGE, JR., dated January 20, 1971 (hereinafter called the GRANTEES) party of the second part

RECORDED OCT 20 PM '78

Witnesseth, That the said GRANTOR

for and in consideration of the sum of Two million seven hundred and fifty thousand ($2,750,000.00) dollars lawful money of the United States of America, unto it well and truly paid by the said GRANTEES,

at and before the sealing and delivery of these presents, the receipt whereof is hereby acknowledged, has granted, bargained, sold, aliened, enfeoffed, released and confirmed, and by these presents does grant, bargain, sell, alien, enfeoff, release and confirm unto the said GEORGE STRAWBRIDGE, JR., his heirs

and Assigns, an undivided seventy (70%) percent interest of in and to the premises hereinafter described, and unto the said GIRARD BANK, GEORGE STRAWBRIDGE, SR. and CHARLES H. MORRIS, JR., Trustees under Deed of Trust of George Strawbridge, Jr., dated January 20, 1971, their successors and assigns the remaining thirty (30%) percent interest of in and to the premises hereinafter described. It is the further intention that a tenancy in common is to be created as to the whole thereof.

ALL THOSE TWO CERTAIN tracts of ground situate partly in the Townships of London Britain, Franklin and Elk, County of Chester and State of Pennsylvania described according to a Plan of Property of Springlawn Corp. dated 8-24-1978 made by H² Engineering Assoc. Engineers and Surveyors, Oxford, Pa. as follows, to wit:

PREMISES "A"
BEGINNING at a spike set in the title line of Public Road LR 15020 known as Fairview Elkton Road said road leading in a Northerly direction to Pennsylvania Route 896 and a Southerly direction to Elkton, Md. said spike marking a Northeasterly corner of this about to be described tract and a corner of R. Vannoy; thence leaving said spike by the title line of said road South 01 degree 30 minutes 06 seconds West 463.95 feet to a spike marking a corner of this and

W 53HC 573

Addendum A

a Northwesterly corner of S. Eachus; thence by said lands of Eachus South 87 degrees 27 minutes 36 seconds West 349.22 feet to an iron pin marking a corner of this and a corner of lands of Eachus; thence partly by lands of S. Eachus, J. Luckett, J. Evans, and R. Swan South 09 degrees 55 minutes 54 seconds East 1085.49 feet to an old iron pin marking a corner of this and a corner of lands of R. Swan; thence by said lands of Swan the following four courses and distances to wit: (1) South 20 degrees 39 minutes 45 seconds West 679.70 feet to an iron pin (2) South 04 degrees 36 minutes 49 seconds West 341.47 feet to an iron pin (3) South 00 degrees 35 minutes 04 seconds West 1295.24 feet to an iron pin (4) South 04 degrees 04 minutes 41 seconds East 147.79 feet to an iron pin marking a Southeasterly corner of this and set on the line dividing the State of Pennsylvania from the State of Maryland; thence by the State of Maryland due West crossing over Township line dividing Elk Township from Franklin Township 11271.55 feet to a post marking a Southwesterly corner of this and a Southeasterly corner of R. M. Thompson; thence by said lands of Thompson the following two courses and distances to wit: (1) North 05 degrees 02 minutes 01 second East 1509.75 feet to an iron pin (2) North 83 degrees 52 minutes 04 seconds West 354.76 feet to a spike set in the title line of Public Road LR 15016 known as Lewisville Strickerville Road said road leading in an Easterly direction to Strickerville and a westerly direction to Lewisville said spike marking a Southeasterly corner of lands of N. P. Dougherty; thence by said lands of Dougherty the following three courses and distances to wit:

1 - North 11 degrees 57 minutes 12 seconds East 1765.62' to a stone
2 - South 87 degrees 41 minutes 21 seconds West 1539.62' to a point
3 - South 87 degrees 36 minutes 49 seconds West 1350.72' to a spike marking a corner of this and set in the title line of Pennsylvania Route 841, leading in a northerly direction to Pennsylvania Route 896 and a southerly direction to Lewisville; thence leaving said spike and by the title line of said Pennsylvania Route 841 the following four courses and distances to wit:

1 - North 08 degrees 35 minutes 11 seconds West 498.86' to a spike
2 - North 19 degrees 38 minutes 41 seconds West 418.53' to a spike
3 - North 16 degrees 54 minutes 38 seconds West 251.55' to a spike
4 - North 06 degrees 48 minutes 19 seconds East 476.20' to a spike set for a northwesterly corner of this and a corner of lands of L. T. Stoats, Jr.; thence by said lands of Stoats and also along the southerly side of the water rights right of way conveyed to Springlawn Corporation the following 14 courses and distances to wit:

1 - North 81 degrees 34 minutes 21 seconds East 321.87' to an iron pin
2 - North 47 degrees 27 minutes 26 seconds East 150.43' to an iron pin
3 - North 43 degrees 51 minutes 26 seconds East 242.61' to an iron pin
4 - North 57 degrees 31 minutes 26 seconds East 102.98' to an iron pin
5 - North 40 degrees 11 minutes 26 seconds East 155.16' to an iron pin
6 - North 47 degrees 49 minutes 26 seconds East 187.97' to an iron pin
7 - North 50 degrees 15 minutes 26 seconds East 90.78' to an iron pin
8 - North 38 degrees 02 minutes 26 seconds East 125.30' to an iron pin
9 - North 39 degrees 24 minutes 26 seconds East 214.76' to an iron pin
10 - North 46 degrees 15 minutes 26 seconds East 189.98' to an iron pin
11 - North 44 degrees 09 minutes 26 seconds East 227.40' to an iron pin
12 - North 39 degrees 04 minutes 26 seconds East 360.43' to an iron pin
13 - North 42 degrees 03 minutes 26 seconds East 288.73' to an iron pin
14 - North 55 degrees 03 minutes 26 seconds East 209.01' to an iron pin; thence crossing township line dividing Elk Township, Franklin Township, and partly by lands of aforementioned L. T. Stoats, Jr. and lands of J. R. Frederick North 46 degrees 25 minutes 26 seconds East 858.48' to an iron pin marking a corner of this and a corner of lands of J. R. Frederick;

W 55th St

Addendum A

thence by lands of Frederick North 60 degrees 21 minutes 26 seconds East 387.37' to an iron pin; thence still by Frederick and partly by the water rights right of way granted to Springtown Corporation by Frederick North 51 degrees 47 minutes 26 seconds East 302.81' to a tree; thence still by lands of Frederick and the southerly side of said right of way North 84 degrees 32 minutes 26 seconds East 294.70' to an iron pin marking a corner of Francis Hill; thence by said lands of Hill the following four courses and distances to wit:

1 - North 48 degrees 29 minutes 26 seconds East 291.01' to an iron pin
2 - North 52 degrees 01 minute 26 seconds East 187.62' to an iron pin
3 - North 68 degrees 47 minutes 26 seconds East 231.82' to an iron pin
4 - North 83 degrees 35 minutes 35 seconds East 1584.08' to an old iron pin marking a corner of J. Rowe; thence partly by lands of Rowe and partly by lands of T. Davis North 81 degrees 06 minutes 58 seconds East 779.23' to a point marking a northwesterly corner of lands of R. Riale; thence by said lands of Riale the following two courses and distances to wit:

1 - South 05 degrees 17 minutes 30 seconds West 334.84' to a point
2 - South 01 degrees 09 minutes 30 seconds west 225.12' to a point; thence still partly by lands of Riale and partly by lands of C. Thomas South 69 degrees 10 minutes 30 seconds West 196.00' to a point marking a corner of lands of Thomas; thence by said lands of Thomas South 04 degrees 58 minutes 30 seconds West 455.15' to an old iron pin marking a corner of said lands of Thomas; thence still partly by lands of Thomas and partly by lands of Riale South 87 degrees 56 minutes 30 seconds East 626.16' to an iron pin; thence by lands of Riale South 87 degrees 22 minutes 30 seconds East 580.03' to an old iron pin; thence passing through the title line of Public Road T-303 known as Mt. Olivet Road said road leading in a northerly direction to Peacedale Road and an easterly direction to Pennsylvania Route 896 South 88 degrees 03 minutes 00 seconds East 1201.27' to an iron pin marking a corner of Mt. Olivet School; thence by said lands of Mt. Olivet School the following five courses and distances to wit:

1 - South 00 degrees 06 minutes 57 seconds West 80.89' to an iron pin
2 - North 88 degrees 55 minutes 57 seconds East 270.00' to an iron pin
3 - North 26 degrees 32 minutes 33 seconds West 76.20' to a stone
4 - North 36 degrees 21 minutes 33 seconds West 94.89' to a stump
5 - North 88 degrees 32 minutes 03 seconds West 112.37' to a point set in the title line of aforementioned Public Road T-303; thence by said title line the following three courses and distances to wit:

1 - North 47 degrees 24 minutes 27 seconds East 131.16' to a point
2 - North 79 degrees 45 minutes 27 seconds East 93.81' to a point
3 - South 82 degrees 22 minutes 33 seconds East 56.76' to an iron pin; thence leaving said title line and by lands of D. Johnson the following three courses and distances to wit:

1 - South 37 degrees 09 minutes 33 seconds East 439.64' to an iron pin
2 - South 08 degrees 52 minutes 27 seconds West 1043.47' to an iron pin
3 - South 41 degrees 14 minutes 37 seconds East 536.41' to an iron pin marking a corner of this and a corner of lands of said Johnson; thence partly by said lands of Johnson and partly by lands of A. Del Duco South, 06 degrees 44 minutes 00 seconds East 2116.95' to a spike set in the title line of aforementioned Public Road LR-15016; thence by said title line the following four courses and distances to wit:

M 53MM 575

Addendum A

1 - South 78 degrees 28 minutes 13 seconds East 112.74' to a point
2 - South 77 degrees 59 minutes 13 seconds East 273.31' to a point
3 - South 89 degrees 34 minutes 13 seconds East 137.50' to a point
4 - North 80 degrees 30 minutes 32 seconds East 59.47' to a spike marking a corner of this and a corner of lands of T. R. Crossan; thence by said lands of Crossan South 41 degrees 03 minutes 14 seconds East 614.04' to an iron pin; thence partly by lands of Crossan and partly by lands of aforementioned Vannoy North 72 degrees 34 minutes 16 seconds East 4070.69' to a spike being the first mentioned point and place of beginning.

CONTAINING 1,684.938 Acres be the same more or less.

TOGETHER with the water rights right of way as granted to Springlawn Corporation by L. T. Staats, Jr. situate in Elk Township and New London Township, Chester County, Pennsylvania described as follows.

BEGINNING at a spike set for a northwesterly corner of lands of Springlawn Corporation said spike being set in the title line of Pennsylvania Route 841 said road leading in a southerly direction to Lewisville and a northerly direction to Pennsylvania Route 896; thence leaving said point of beginning and by the title line of Pennsylvania Route 841 North 07 degrees 40 minutes 22 seconds East 256.93' to a point; thence leaving said title line and passing through lands of L. T. Staats, Jr. the following three courses and distances to wit:

1 - North 47 degrees 08 minutes 47 seconds East 1175.88' to a point
2 - North 45 degrees 03 minutes 56 seconds East 740.01' to a point
3 - North 48 degrees 24 minutes 26 seconds East 580.00' to a point set in line of lands of J. R. Frederick also set on Township Line dividing Franklin Township from New London Township; thence by lands of Frederick South 78 degrees 13 minutes 04 seconds East 295.95' to a point set in line of lands of Springlawn Corporation. Thence by said lands the following 15 courses and distances to wit:

1 - South 46 degrees 25 minutes 26 seconds West 67.79' to a point
2 - South 55 degrees 03 minutes 26 seconds West 209.01' to an iron pin
3 - South 42 degrees 03 minutes 26 seconds West 288.73' to an iron pin
4 - South 39 degrees 04 minutes 26 seconds West 360.43' to an iron pin
5 - South 44 degrees 09 minutes 26 seconds West 227.40' to an iron pin
6 - South 46 degrees 15 minutes 26 seconds West 189.98' to an iron pin
7 - South 39 degrees 24 minutes 26 seconds West 214.76' to an iron pin
8 - South 38 degrees 02 minutes 26 seconds West 125.30' to an iron pin
9 - South 50 degrees 15 minutes 26 seconds West 90.78' to an iron pin
10 - South 47 degrees 49 minutes 26 seconds West 187.97' to an iron pin
11 - South 40 degrees 11 minutes 26 seconds West 155.16' to an iron pin
12 - South 57 degrees 31 minutes 26 seconds West 102.98' to an iron pin
13 - South 43 degrees 51 minutes 26 seconds West 242.61' to an iron pin
14 - South 47 degrees 27 minutes 26 seconds West 150.43' to an iron pin
15 - South 81 degrees 34 minutes 21 seconds West 321.82' to point and place of beginning.

CONTAINING 18.451 acres be the same more or less.

MUNICIPAL TRANSFER TAX
PAID IN AMOUNT OF $ 27,500.00

Clarence D. Kent
COLLECTOR

$50.00

RECORDED IN THE OFFICE FOR THE RECORDING OF DEEDS IN AND FOR THE COUNTY OF CHESTER, PENNSYLVANIA, IN DEED BOOK W 53 PAGE 576

Addendum A

ALSO TOGETHER with the use of water rights-right of way as granted to Springlawn Corporation by J. R. Frederick situate in Franklin Township described as follows.

BEGINNING at a point set in line of lands of Springlawn Corporation said point being set South 84 degrees 32 minutes 26 seconds West from an iron pin marking a corner of J. R. Frederick, Francis Hill, and Springlawn Corporation 49.12'; thence leaving said point of beginning and by lands of Springlawn Corporation the following two courses and distances to wit:

1 - South 84 degrees 32 minutes 26 seconds West 245.58' to a tree
2 - South 51 degrees 47 minutes 26 seconds West 135.09' to a point thence leaving said lands of Springlawn Corporation and passing through lands of J. R. Frederick the following five courses and distances to wit:

1 - North 44 degrees 25 minutes 26 seconds West 311.47' to a point
2 - North 73 degrees 27 minutes 56 seconds West 265.84' to a point
3 - North 17 degrees 21 minutes 26 seconds West 343.90' to a point
4 - North 13 degrees 13 minutes 34 seconds East 248.22' to a point
5 - North 20 degrees 01 minutes 26 seconds West 506.78' to a point set in the title line Pennsylvania Route 841 said road leading in an easterly direction to Pennsylvania Route 896 and a Westerly direction to Lewisville thence by the title line of said road north 76 degrees 00 minutes 34 seconds East 45.00' to a point set for a northeasterly corner of this; thence leaving said title line passing through lands of J. R. Frederick the following five courses and distances to wit:

1 - South 19 degrees 02 minutes 26 seconds East 583.01' to a point
2 - South 50 degrees 53 minutes 56 seconds East 383.69' to a point
3 - South 63 degrees 09 minutes 26 seconds East 346.11' to a point
4 - South 45 degrees 30 minutes 26 seconds East 174.22' to a point
5 - South 23 degrees 51 minutes 26 seconds East 193.10' to the point and place of beginning.

CONTAINING 8.260 acres be the same more or less.

EXCEPTING AND RESERVING thereout and therefrom 4.283 acres as granted and conveyed onto R. Rechuba in Deed Book U-30 page 471, S. Greene in Deed Book L-35 page 593, and K. Wells in Deed Book R-52 page 597, situate in Franklin Township, Chester County, Pennsylvania, bounded and described as follows to wit:

BEGINNING at a post set in the intersection of Public Road LR 15016 known as Strickerville Lewisville Road with Public Road T-356 known as Mt. Olivet Road said road leading in a northerly direction to Walker Road, said point being set the following eight courses and distances to wit from a spike set for a southwesterly corner of A. Del Duco and a corner of Springlawn Corporation said point being set in the title line of LR 15016.

1 - North 78 degrees 28 minutes 13 seconds West 520.54' to a point
2 - North 82 degrees 59 minutes 43 seconds West 470.28' to a point
3 - North 84 degrees 03 minutes 22 seconds West 119.76' to an old spike
4 - South 89 degrees 12 minutes 22 seconds West 118.24' to an old spike
5 - South 74 degrees 56 minutes 22 seconds West 83.82' to a point
6 - South 40 degrees 54 minutes 21 seconds West 9.31' to a point

W 5377 577

Addendum A

7 - South 81 degrees 00 minutes 26 seconds West 38.37' to a point
8 - South 56 degrees 49 minutes 44 seconds West 22.86' to said post of beginning; thence leaving said post of beginning and by the title line of aforementioned Public Road LR 15016 the following five courses and distances to wit:

1 - South 44 degrees 57 minutes 36 seconds East 41.00' to a point
2 - South 49 degrees 48 minutes 58 seconds West 149.50' to a point
3 - South 43 degrees 10 minutes 10 seconds West 300.23' to a point
4 - South 73 degrees 48 minutes 54 seconds West 270.00' to a spike
5 - South 67 degrees 36 minutes 37 seconds West 244.60' to a point set in the centerline of a metal bridge; thence leaving said title line and by lands of Springlawn Corporation the following 11 courses and distances to wit:

1 - North 53 degrees 36 minutes 07 seconds East 44.00' to a point
2 - North 37 degrees 31 minutes 07 seconds East 43.00' to a point
3 - North 00 degrees 41 minutes 07 seconds East 30.00' to a pplnt
4 - North 18 degrees 51 minutes 07 seconds East 15.00' to a point
5 - North 33 degrees 21 minutes 07 seconds East 25.00' to a point
6 - North 19 degrees 46 minutes 07 seconds East 52.00' to a point
7 - North 03 degrees 18 minutes 13 seconds West 48.70' to a point
8 - North 22 degrees 54 minutes 53 seconds West 131.82' to a point
9 - North 44 degrees 32 minutes 28 seconds East 90.80' to a post
10 - North 80 degrees 47 minutes 08 seconds East 88.07' to a point
11 - North 81 degrees 12 minutes 24 seconds East 588.35' to a post being the first mentioned point and place of beginning.

CONTAINING 4.283 acres be the same more or less.

ALSO EXCEPTING AND RESERVING thereout and therefrom 4.324 acres granted and conveyed to P. Howland in Deed Book K-36 page 293, W. Worth in Deed Book N-23 page 234 and A. Jozyk in Deed Book Y-37 page 298 situate in Franklin Township, Chester County, Pennsylvania.

BEGINNING at a point set for a corner of this and set in the title line of Public Road LR-15016 known as Strickerville Lewisville Road said road leading in an easterly direction to Public Road LR-15020 and a westerly direction to Lewisville, said point of beginning being set the following two courses and distances from a spike set for a southwesterly corner of A. Del Duca to wit:

1 - North 78 degrees 28 minutes 13 seconds west 520.54' to a point
2 - North 82 degrees 59 minutes 43 seconds West 470.28' to said point of beginning; thence leaving said point of beginning and by lands of Springlawn Corporation the following four courses and distances to wit:

1 - South 7 degrees 31 minutes 13 seconds West 188.93' to an iron pin
2 - North 82 degrees 56 minutes 28 seconds West 221.17' to an iron pin
3 - North 52 degrees 17 minutes 38 seconds West 97.26' to an iron pin
4 - North 02 degrees 13 minutes 38 seconds West 82.65' to a point set in the title line of aforementioned Public Road LR-15016; thence by said title line South 81 degrees 00 minutes 26 seconds West 38.37' to a point set in the title line of Public Road T-356 known as Mt. Olivet Road, said road leading in a northerly direction to Public Road T-303; thence by the

H 53bd 578

Addendum A

title line of Public Road T-356 North 03 degrees 21 minutes 04 seconds West 426.15' to a point set for a northwesterly corner of this and a corner of Springlawn Corporation thence by said lands of Springlawn Corporation the following two courses and distances to wit:

1 - South 75 degrees 33 minutes 04 seconds East 437.50' to an old iron pin
2 - South 07 degrees 06 minutes 56 seconds West 294.48' to the point and place of beginning.

CONTAINING 4.324 acres be the same more or less.

ALSO EXCEPTING AND RESERVING thereout and therefrom 5.005 acres granted and conveyed onto W. Worth in Deed Book X-29 page 565, and W. Worth in Deed Book U-35 page 576 situate in Elk Township, Chester County, Pennsylvania.

BEGINNING at a spike set for a northwesterly corner of this and a corner of Springlawn Corporation, said point being set in the title line of Public Road LR 15016 known as Lewisville Strickerville Road, said point being set north 73 degrees 49 minutes 15 seconds East from an iron pin marking the northeasterly corner of lands of R. H. Thompson 1213.73' to said point of beginning; thence leaving said point of beginning and by the title line the aforementioned Public Road LR 15016 the following two courses and distances to wit:

1 - North 77 degrees 38 minutes 22 seconds East 381.00' to a spike
2 - North 76 degrees 08 minutes 02 seconds East 271.17' to a spike marking a northeasterly corner of this and a corner of Springlawn Corporation; thence by said lands of Springlawn Corporation the following three courses and distances to wit:

1 - South 12 degrees 21 minutes 38 seconds East 314.32' to a point
2 - South 73 degrees 08 minutes 27 seconds West 654.09' to a post
3 - North 12 degrees 21 minutes 38 seconds West 358.50' to the point and place of beginning.

CONTAINING 5.005 acres be the same more or less.

PREMISES "B"

BEGINNING at a spike set in the title line of Public Road T-301 known as Elbow Lane leading in an westerly direction to Public Road LR-15020 and a easterly direction to Pennsylvania Route 896 said spikes marking a westerly corner of this about to be described tract; thence leaving spike of beginning and by the title line of Public Road T-301 the following eight courses and distances to wit:

1 - North 76 degrees 09 minutes 24 seconds East 876.50' to a spike
2 - North 75 degrees 56 minutes 00 seconds East 750.81' to a spike
3 - North 76 degrees 45 minutes 00 seconds East passing over the township line dividing London Britain and Franklin Township 360.17' to a spike.
4 - South 85 degrees 05 minutes 00 seconds East 300.21' to a spike
5 - South 54 degrees 58 minutes 30 seconds East 147.03' to a spike
6 - South 48 degrees 25 minutes 00 seconds East 496.85' to a spike
7 - South 86 degrees 36 minutes 30 seconds East 318.43' to a spike
8 - South 89 degrees 56 minutes 30 seconds East 414.80' to a spike marking an easterly corner of this; thence leaving said title line due south 15.61' to a milestone set on the line dividing the State of Pennsylvania from the State of Maryland; thence by said state line due

west crossing over the township line dividing London Britain Township from Franklin Township 3453.74' to a spike being the first mentioned point and place of beginning.

CONTAINING 16.906 acres be the same more or less.

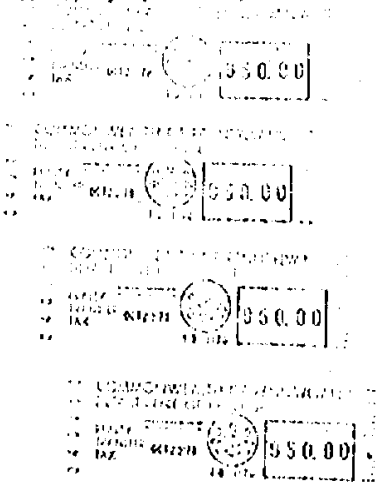
AS TO PREMISES "A"
BEING as to part the same premises which John P. F. Blackstone, Singleman by Deed dated April 17, 1948 and recorded in Chester County in Deed Book Q-24 page 101 conveyed unto Springlawn Corporation, (Pa. Corp.).

BEING as to another part the same premises which Richard T. Swan and Anne H. Swan, by Deed dated July 7, 1959 and recorded in Chester County in Deed Book 0-31 page 394 conveyed unto Springlawn Corporation (Pa. Corp.).

AND BEING as to the remaining part, of the same premises which Center Square, Inc. by Deed dated December 27, 1946 and recorded in Chester County in Deed Book G-22 page 231 conveyed unto Springlawn Corporation, (Pa. Corp.).

AS TO PREMISES "B"
BEING part of the same premises which Center Square, Inc. by Deed dated December 27, 1946 and recorded in Chester County in Deed Book G-22 page 231 conveyed unto Springlawn Corporation, (Pa. Corp.).

UNDER AND SUBJECT to certain Reservations, Rights, Covenants, as of record.



W 53WI 590

Addendum A

Together with all and singular the

Streets, Alleys, Passages, Ways, Waters, Water-courses, Rights, Liberties, Privileges, Hereditaments and Appurtenances whatsoever thereunto belonging or in anywise appertaining, and the Reversions and Remainders, Rents, Issues and Profits thereof; and all the Estate right, title, interest, property, claim and demand whatsoever, of it the said GRANTOR

in law, equity, or otherwise howsoever, of, in and to the same and every part thereof,

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF REVENUE
STATE REALTY TRANSFER TAX 0012578
950.00

To have and to hold the said lots or pieces of ground

Hereditaments and Premises hereby granted, or mentioned and intended so to be, with the Appurtenances unto the said

GRANTEES, their heirs, Successors

and Assigns, to and for the only proper use and behoof of the said

GRANTEES, their heirs, Successors

and Assigns for ever.

UNDER AND SUBJECT as aforesaid.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF REVENUE
STATE REALTY TRANSFER TAX 0012578
950.00

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF REVENUE
STATE REALTY TRANSFER TAX 0012578
950.00

W 53BT 581

Addendum A

And the said GRANTOR, for itself and its successors

Does by these presents covenant, grant and agree to and with the said

GRANTEES, their heirs, Successors and Assigns, that it the said GRANTOR, its successors

all and singular the Hereditaments and Premises hereinbefore described and granted, or mentioned and intended so to be, with the appurtenances, unto the said

GRANTEES, their heirs, Successors and Assigns, against it the said GRANTOR

and against all and every other Person or Persons whomsoever lawfully claiming or to claim the same or any part thereof, by, from or under it, them, or any of them, shall and will

WARRANT and forever DEFEND.

In Witness Whereof, the party of the first part has hereunto affixed its common or corporate seal. Dated the day and year first above written.

Sealed and Delivered
in the presence of us
Barbara A. Lloyd
as to both

SPRINGLAWN CORPORATION
By _____ President
ATTEST: _____ Secretary

$50.00

$50.00

W 5300 502 -10-

Addendum A

Received the day of the date of the above Indenture of the above named GRANTEES, the full consideration above mentioned.

SPRINGLAWN CORPORATION

By _____
President

STATE REALTY TRANSFER TAX $50.00

STATE OF Pennsylvania
COUNTY OF Chester } SS.

On this, the 10th day of October 1978, before me, the undersigned officer, personally appeared David C. Rittenhouse who acknowledged himself to be the President of Springlawn Corporation a corporation, and that he as such President, being authorized to do so, executed the foregoing instrument for the purposes therein contained, by signing the name of the corporation by himself as President.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____
Title of Office

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF REVENUE
STATE REALTY TRANSFER TAX $50.00

W 5301 583

Addendum A

C.-FL-20

COMMONWEALTH LAND TITLE INSURANCE COMPANY

Deed

4R:H3

SPRINGLAWN CORPORATION

TO

GEORGE STRAWBRIDGE, JR., Individually, and GIRARD BANK, GEORGE STRAWBRIDGE, SR. and CHARLES H. MORRIS, JR., Trustees under Deed of Trust of George Strawbridge, Jr., dated Jan. 20, 1971

Premises: 1,714.943 acres in London Britain, Franklin and Elk Townships, County of Chester, Pennsylvania

Rec In Chester Co: Pa. in Bk. 1163 Page 513

H 53001 504

RECORDER OF DEEDS.

Grantee address
900 N Market St
Wilmington, Del
19899

Addendum A

AFFIDAVIT

14755

RECORDER OF DEEDS
CHESTER COUNTY, PA.
'84 AUG 23 P2:04

CERTIFICATE OF AWARD OF REAL ESTATE

TRUST INTER VIVOS: GEORGE STRAWBRIDGE, JR., SETTLOR

NO. 84664

Award of Real Estate to: Delaware Trust Company, George Strawbridge, and William C. Lickle, of 900 Market Street Mall, Wilmington, Delaware 19801, Trustees under Deed of George Strawbridge, Jr. dated January 20, 1971, thirty percent interest.

Commonwealth of Pennsylvania :
ss
County of Montgomery :

I, Nancy Tourlis, 1st Asst Assistant Clerk of the Orphans' Court Division of the Court of Common Pleas for the County of Montgomery, in the Commonwealth of Pennsylvania, do hereby certify the attached to be a true and correct excerpt from the schedule of distribution filed in conformity with adjudication of the Orphans' Court Division of the Court of Common Pleas of Montgomery County upon the first account of Girard Bank, George Strawbridge and Charles H. Norris, Jr., Trustees under Deed of George Strawbridge, Jr., dated January 20, 1971, filed and conformed nisi February 17, 1983, as the same remains on file and is of record in said court.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seal of said Court at Norristown this 7th day of August, 1984.

Nancy Tourlis

Assistant Clerk of the Orphans' Court Division

B 64 175

Addendum A

EXHIBIT "A"

To Delaware Trust Company and George Strawbridge and William C. Lickle, Trustees Under Deed of George Strawbridge, Jr. dated January 20, 1971 their Successors & assigns Premises .30 Int. Springlawn, Chester County, Pa. valued @ and more fully described as follows:

155 200 97

ALL THOSE TWO CERTAIN tracts of ground situate partly in the Townships of London Britain, Franklin and Elk, County of Chester and State of Pennsylvania described according to a Plan of Property of Springlawn Corp. dated 8-24-1978 made by M[illegible] Engineering Assoc. Engineers and Surveyors, Oxford, Pa. as follows, to wit:

PREMISES "A"
BEGINNING at a spike set in the title line of Public Road LR 15020 known as Fairview Elkton Road said road leading in a Northerly direction to Pennsylvania Route 896 and a Southerly direction to Elkton, Md. said spike marking a Northeasterly corner of this about to be described tract and a corner of R. Vannoy; thence leaving said spike by the title line of said road South 01 degree 30 minutes 06 seconds West 463.93 feet to a spike marking a corner of this and a Northwesterly corner of S. Cochus; thence by said lands of Cochus South 87 degrees 27 minutes 35 seconds West 349.22 feet to an iron pin marking a corner of this and a corner of lands of Cochus; thence partly by lands of S. Cochus, J. Tuckett, J. Evans, and R. Swan South 09 degrees 55 minutes 54 seconds East 1035.49 feet to an old iron pin marking a corner of this and a corner of lands of R. Swan; thence by said lands of Swan the following four courses and distances to wit: (1) South 20 degrees 39 minutes 45 seconds West 679.70 feet to an iron pin (2) South 04 degrees 36 minutes 49 seconds West 381.47 feet to an iron pin (3) South 00 degrees 35 minutes 04 seconds West 1295.24 feet to an iron pin (4) South 04 degrees 04 minutes 41 seconds East 187.79 feet to an iron pin marking a Southeasterly corner of this and set on the line dividing the State of Pennsylvania from the State of Maryland; thence by the State of Maryland due West crossing over Township line dividing Elk Township from Franklin Township 11271.55 feet to a post marking a Southwesterly corner of this and a Southeasterly corner of R. M. Thompson; thence by said lands of Thompson the following two courses and distances to wit: (1) North 05 degrees 02 minutes 01 second East 1509.75 feet to an iron pin (2) North 83 degrees 52 minutes 04 seconds West 354.76 feet to a spike set in the title line of Public Road LR 15016 known as Lewisville Strickerville Road said road leading in an Easterly direction to Strickerville and a westerly direction to Lewisville said spike marking a Southeasterly corner of lands of R. P. Dougherty; thence by said lands of Dougherty the following three courses and distances to wit:

1 - North 11 degrees 37 minutes 12 seconds East 1365.62' to a stone
2 - South 82 degrees 41 minutes 21 seconds West 1539.62' to a point
3 - South 82 degrees 35 minutes 49 seconds West 1350.72' to a spike marking a corner of this and set in the title line of Pennsylvania Route 841, leading in a northerly direction to Pennsylvania Route 896 and a southerly direction to Lewisville; thence leaving said spike and by the title line of said Pennsylvania Route 841 the following four courses and distances to wit:

1 - North 08 degrees 35 minutes 11 seconds West 438.86' to a spike
2 - North 19 degrees 38 minutes 41 seconds West 418.53' to a spike
3 - North 18 degrees 54 minutes 38 seconds West 251.55' to a spike
4 - North 06 degrees 48 minutes 13 seconds East 426.30' to a spike set for a northwesterly corner of this and a corner of lands of L. T. Steele, Jr.; thence by said lands of Steele and also along the southerly side of the water rights right of way conveyed to Springlawn Corporation the following 14 courses and distances to wit:

1 - North 81 degrees 34 minutes 21 seconds East 321.87' to an iron pin
2 - North 42 degrees 27 minutes 26 seconds East 150.43' to an iron pin
3 - North 43 degrees 51 minutes 26 seconds East 242.61' to an iron pin
4 - North 57 degrees 31 minutes 26 seconds East 102.93' to an iron pin
5 - North 40 degrees 11 minutes 26 seconds East 155.16' to an iron pin
6 - North 47 degrees 49 minutes 26 seconds East 187.97' to an iron pin
7 - North 50 degrees 15 minutes 26 seconds East 90.78' to an iron pin
8 - North 38 degrees 02 minutes 26 seconds East 125.30' to an iron pin
9 - North 39 degrees 24 minutes 26 seconds East 214.76' to an iron pin
10 - North 46 degrees 15 minutes 26 seconds East 189.98' to an iron pin
11 - North 44 degrees 09 minutes 26 seconds East 227.40' to an iron pin
12 - North 33 degrees 04 minutes 26 seconds East 360.43' to an iron pin
13 - North 42 degrees 03 minutes 26 seconds East 228.73' to an iron pin
14 - North 55 degrees 03 minutes 26 seconds East 209.01' to an iron pin; thence crossing township line dividing Elk Township, Franklin Township, and partly by lands of aforementioned L. T. Steele, Jr. and lands of J. R. Frederick North 46 degrees 35 minutes 26 seconds East 858.48' to an iron pin marking a corner of this and a corner of lands of J. R. Frederick;

B 64 176

Addendum A

thence by lands of Frederick North 60 degrees 21 minutes 26 seconds East 382.33' to an iron pin; thence still by Frederick and partly by the water rights right of way granted to Springtown Corporation by Frederick North 51 degrees 47 minutes 26 seconds East 302.81' to a street thence still by lands of Frederick and the southerly side of said right of way North 84 degrees 32 minutes 26 seconds East 294.20' to an iron pin marking a corner of Francis Hill; thence by said lands of Hill the following four courses and distances to wit:

1 - North 68 degrees 29 minutes 26 seconds East 231.01' to an iron pin
2 - North 51 degrees 01 minute 26 seconds East 187.61' to an iron pin
3 - North 68 degrees 42 minutes 26 seconds East 231.82' to an iron pin
4 - North 83 degrees 35 minutes 35 seconds East 1586.08' to an old iron pin marking a corner of J. Rowe; thence partly by lands of Rowe and partly by lands of T. Davis North 81 degrees 06 minutes 55 seconds East 729.23' to a point marking a northwesterly corner of lands of R. Riale; thence by said lands of Riale the following two courses and distances to wit:

1 - South 05 degrees 13 minutes 30 seconds West 334.81' to a point
2 - South 01 degrees 09 minutes 30 seconds west 215.13' to a point; thence still partly by lands of Riale and partly by lands of C. Thomas South 09 degrees 10 minutes 30 seconds West 196.00' to a point marking a corner of lands of Thomas; thence by said lands of Thomas South 04 degrees 58 minutes 30 seconds West 455.15' to an old iron pin marking a corner of said lands of Thomas; thence still partly by lands of Thomas and partly by lands of Riale South 87 degrees 56 minutes 30 seconds East 626.36' to an iron pin; thence by lands of Riale South 87 degrees 22 minutes 30 seconds East 580.03' to an old iron pin; thence passing through the title line of Public Road T-303 known as Mt. Olivet Road said road leading in a northerly direction to Peacedale Road and an easterly direction to Pennsylvania Route 856 South 88 degrees 03 minutes 00 seconds East 1201.27' to an iron pin marking a corner of Mt. Olivet School; thence by said lands of Mt. Olivet School the following five courses and distances to wit:

1 - South 00 degrees 06 minutes 57 seconds West 80.89' to an iron pin
2 - North 88 degrees 55 minutes 57 seconds East 230.00' to an iron pin
3 - North 26 degrees 32 minutes 33 seconds West 76.30' to a stone
4 - North 36 degrees 21 minutes 33 seconds West 94.89' to a stump
5 - North 88 degrees 32 minutes 03 seconds West 112.37' to a point set in the title line of aforementioned Public Road T-303; thence by said title line the following three courses and distances to wit:

1 - North 47 degrees 24 minutes 27 seconds East 131.16' to a point
2 - North 39 degrees 45 minutes 27 seconds East 93.81' to a point
3 - South 82 degrees 22 minutes 33 seconds East 56.76' to an iron pin; thence leaving said title line and by lands of D. Johnson the following three courses and distances to wit:

1 - South 32 degrees 09 minutes 33 seconds East 459.65' to an iron pin
2 - South 08 degrees 52 minutes 27 seconds West 1043.47' to an iron pin marking a corner of this and a corner of lands of said Johnson; thence partly by said lands of Johnson and partly by lands of A. Del Duca South 06 degrees 44 minutes 00 seconds East 2116.95' to a spike set in the title line of aforementioned Public Road LR-15016; thence by said title line the following four courses and distances to wit:

1 - South 78 degrees 28 minutes 13 seconds East 112.21' to a point
2 - South 72 degrees 59 minutes 13 seconds East 273.31' to a point
3 - South 89 degrees 33 minutes 13 seconds East 137.50' to a point
4 - North 80 degrees 50 minutes 32 seconds East 59.42' to a spike marking a corner of this and a corner of lands of T. A. Crossan; thence by said lands of Crossan South 41 degrees 03 minutes 14 seconds East 614.04' to an iron pin; thence partly by said lands of Crossan and partly by lands of aforementioned Vannoy North 22 degrees 34 minutes 16 seconds East 4020.63' to a spike being the first mentioned point and place of beginning.

CONTAINING 1,684,938 Acres be the same more or less.

TOGETHER with the water rights right of way as granted to Springtown Corporation by L. T. Steele, Jr. situate in Elk Township and New London Township, Chester County, Pennsylvania described as follows.

BEGINNING at a spike set for a northwesterly corner of lands of Springtown Corporation said spike being set in the title line of Pennsylvania Route 841 said road leading in a southerly direction to Lewisville and a northerly direction to Pennsylvania Route 856; thence leaving said point of beginning and by the title line of Pennsylvania Route 841 North 07 degrees 45 minutes 22 seconds East 256.93' to a point; thence leaving said title line and passing through lands of L. T. Steele, Jr. the following three courses and distances to wit:

1 - North 42 degrees 08 minutes 47 seconds East 3135.88' to a point
2 - North 45 degrees 05 minutes 56 seconds East 340.01' to a point
3 - North 45 degrees 24 minutes 26 seconds East 580.00' to a point set in line of lands of J. R. Frederick also set on Township Line dividing Franklin Township from New London Township; thence by lands of Frederick South 78 degrees 13 minutes 04 seconds East 295.95' to a point set in line of lands of Springtown Corporation. Thence by said lands the following 15 courses and distances to wit:

B 64 177

1 - South 46 degrees 25 minutes 26 seconds West 67.79' to a point
2 - South 55 degrees 03 minutes 26 seconds West 209.01' to an iron pin
3 - South 43 degrees 03 minutes 26 seconds West 288.73' to an iron pin
4 - South 39 degrees 04 minutes 26 seconds West 360.43' to an iron pin
5 - South 44 degrees 09 minutes 26 seconds West 232.49' to an iron pin
6 - South 46 degrees 15 minutes 26 seconds West 189.98' to an iron pin
7 - South 39 degrees 24 minutes 26 seconds West 214.76' to an iron pin
8 - South 38 degrees 02 minutes 26 seconds West 125.30' to an iron pin
9 - South 50 degrees 15 minutes 26 seconds West 59.78' to an iron pin
10 - South 47 degrees 49 minutes 26 seconds West 183.97' to an iron pin
11 - South 40 degrees 11 minutes 26 seconds West 155.16' to an iron pin
12 - South 37 degrees 51 minutes 26 seconds West 102.98' to an iron pin
13 - South 43 degrees 51 minutes 26 seconds West 242.61' to an iron pin
14 - South 42 degrees 27 minutes 26 seconds West 150.43' to an iron pin
15 - South 81 degrees 34 minutes 31 seconds West 321.83' to point and place of beginning.

CONTAINING 18.451 acres be the same more or less.

ALSO TOGETHER with the use of water rights right of way as granted to Springtown Corporation by J. R. Frederick situate in Franklin Township described as follows.

BEGINNING at a point set in line of lands of Springtown Corporation said point being set South 84 degrees 32 minutes 26 seconds West from an iron pin marking a corner of J. A. Frederick, Francis Hill, and Springtown Corporation 49.12'; thence leaving said point of beginning and by lands of Springtown Corporation the following two courses and distances to wit:

1 - South 84 degrees 32 minutes 26 seconds West 245.55' to a tree
2 - South 51 degrees 47 minutes 26 seconds West 135.05' to a point thence leaving said lands of Springtown Corporation and passing through lands of J. R. Frederick the following five courses and distances to wit:

1 - North 44 degrees 25 minutes 26 seconds West 311.42' to a point
2 - North 73 degrees 27 minutes 56 seconds West 265.84' to a point
3 - North 17 degrees 21 minutes 26 seconds West 343.93' to a point
4 - North 13 degrees 13 minutes 34 seconds East 248.22' to a point
5 - North 20 degrees 01 minutes 26 seconds West 506.28' to a point set in the title line Pennsylvania Route 841 said road leading in an easterly direction to Pennsylvania Route 896 and a Westerly direction to Lewisville thence by the title line of said road north 26 degrees 00 minutes 34 seconds East 45.00' to a point set for a northeasterly corner of this; thence leaving said title line passing through lands of J. R. Frederick the following five courses and distances to wit:

1 - South 19 degrees 02 minutes 26 seconds East 583.01' to a point
2 - South 50 degrees 53 minutes 56 seconds East 383.69' to a point
3 - South 63 degrees 03 minutes 26 seconds East 346.11' to a point
4 - South 45 degrees 30 minutes 26 seconds East 124.22' to a point
5 - South 23 degrees 51 minutes 26 seconds East 193.10' to the point and place of beginning.

CONTAINING 8.260 acres be the same more or less.

EXCEPTING AND RESERVING thereout and therefrom 4.283 acres as granted and conveyed onto R. Reckus in Deed Book U-30 page 471, S. Greene in Deed Book L-35 page 595, and K. Wells in Deed Book R-52 page 537, situate in Franklin Township, Chester County, Pennsylvania, bounded and described as follows to wit:

BEGINNING at a post set in the intersection of Public Road LR 15016 known as Strickerville Lewisville Road with Public Road T-355 known as Mt. Olivet Road said road leading in a northerly direction to Valker Road, said point being set the following eight courses and distances to wit from a spike set for a southeasterly corner of A. Del Duca and a corner of Springtown Corporation said point being set in the title line of LR 15016.

1 - North 28 degrees 28 minutes 13 seconds West 520.54' to a point
2 - North 81 degrees 59 minutes 45 seconds West 470.28' to a point
3 - North 84 degrees 03 minutes 22 seconds West 115.76' to an old spike
4 - South 59 degrees 12 minutes 22 seconds West 118.24' to an old spike
5 - South 74 degrees 56 minutes 22 seconds West 83.82' to a point
6 - South 40 degrees 34 minutes 21 seconds West 9.31' to a point

7 - South 81 degrees 05 minutes 26 seconds West 38.32' to a point
8 - South 56 degrees 49 minutes 44 seconds West 22.86' to said post of beginning; thence leaving said post of beginning and by the title line of aforementioned Public Road LR 15016 the following five courses and distances to wit:

B 64 178

Addendum A

1 - South 44 degrees 42 minutes 36 seconds East 61.00' to a point
2 - South 49 degrees 15 minutes 58 seconds West 149.50' to a point
3 - South 45 degrees 10 minutes 10 seconds West 300.23' to a point
4 - South 73 degrees 49 minutes 54 seconds West 270.00' to a spike
5 - South 67 degrees 35 minutes 37 seconds West 264.69' to a point set in the centerline of a retel bridge; thence leaving said title line and by lands of Springlawn Corporation the following 11 courses and distances to wit:

1 - North 53 degrees 36 minutes 02 seconds East 46.00' to a point
2 - North 32 degrees 31 minutes 02 seconds East 45.00' to a point
3 - North 00 degrees 41 minutes 02 seconds East 30.00' to a point
4 - North 18 degrees 51 minutes 02 seconds East 15.00' to a point
5 - North 33 degrees 21 minutes 02 seconds East 25.00' to a point
6 - North 15 degrees 45 minutes 02 seconds East 52.00' to a point
7 - North 03 degrees 18 minutes 13 seconds West 48.20' to a point
8 - North 22 degrees 54 minutes 53 seconds East 131.82' to a point
9 - North 34 degrees 32 minutes 28 seconds East 90.60' to a post
10 - North 80 degrees 47 minutes 08 seconds East 88.03' to a point
11 - North 81 degrees 12 minutes 24 seconds East 583.35' to a post being the first mentioned point and place of beginning.

CONTAINING 4.283 acres be the same more or less.

ALSO EXCEPTING AND RESERVING thereout and therefrom 4.324 acres granted and conveyed to P. Rowland in Deed Book R-36 page 393, W. North in Deed Book W-23 page 336 and A. Joyce in Deed Book Y-37 page 298 situate in Franklin Township, Chester County, Pennsylvania.

BEGINNING at a point set for a corner of this and set in the title line of Public Road LR-15016 known as Strickerville Lewisville Road said road leading in an easterly direction to Public Road LR-15020 and a westerly direction to Lewisville, said point of beginning being set the following two courses and distances from a spike set for a southwesterly corner of A. Del Duco to wit:

1 - North 28 degrees 28 minutes 33 seconds west 510.54' to a point
2 - North 82 degrees 59 minutes 43 seconds West 420.28' to said point of beginning; thence leaving said point of beginning and by lands of Springlawn Corporation the following four courses and distances to wit:

1 - South 7 degrees 31 minutes 13 seconds West 188.93' to an iron pin
2 - North 82 degrees 56 minutes 28 seconds West 221.17' to an iron pin
3 - North 52 degrees 17 minutes 38 seconds West 92.76' to an iron pin
4 - North 01 degrees 13 minutes 38 seconds West 82.65' to a point set in the title line of aforementioned Public Road LR-15016; thence by said title line South 81 degrees 00 minutes 26 seconds West 38.37' to a point set in the title line of Public Road T-356 known as Mt. Olivet Road, said road leading in a northerly direction to Public Road T-303; thence by the title line of Public Road T-356 North 03 degrees 21 minutes 04 seconds West 426.15' to a point set for a northwesterly corner of this and a corner of Springlawn Corporation thence by said lands of Springlawn Corporation the following two courses and distances to wit:

1 - South 25 degrees 33 minutes 04 seconds East 437.50' to an old iron pin
2 - South 02 degrees 06 minutes 56 seconds West 291.69' to the point and place of beginning.

CONTAINING 4.324 acres be the same more or less.

ALSO EXCEPTING AND RESERVING thereout and therefrom 5.005 acres granted and conveyed onto W. North in Deed Book R-39 page 565, and W. North in Deed Book U-35 page 576 situate in Elk Township, Chester County, Pennsylvania.

BEGINNING at a spike set for a northwesterly corner of this and a corner of Springlawn Corporation, said point being set in the title line of Public Road LR 15016 known as Lewisville Strickerville Road, said point being set north 73 degrees 49 minutes 15 seconds East from an iron pin marking the northeasterly corner of lands of R. M. Thompson 1213.73' to said point of beginning; thence leaving said point of beginning and by the title line the aforementioned Public Road LR 15016 the following two courses and distances to wit:

1 - North 77 degrees 38 minutes 22 seconds East 381.00' to a spike
2 - North 26 degrees 08 minutes 02 seconds East 271.12' to a spike marking a northeasterly corner of this and a corner of Springlawn Corporation; thence by said lands of Springlawn Corporation the following three courses and distances to wit:

1 - South 12 degrees 21 minutes 38 seconds East 514.32' to a point
2 - South 73 degrees 08 minutes 22 seconds West 654.03' to a post
3 - North 12 degrees 21 minutes 38 seconds West 358.50' to the point and place of beginning.

CONTAINING 5.005 acres be the same more or less.

B 64 179

Addendum A

PREMISES "B"

BEGINNING at a spike set in the title line of Public Road T-301 known as Elbow Lane leading in an westerly direction to Public Road SR-15020 and a easterly direction to Pennsylvania Route 896 said spikes marking a westerly corner of this about to be described tract; thence leaving spike of beginning and by the title line of Public Road T-301 the following eight courses and distances to wit:

1 - North 76 degrees 09 minutes 24 seconds East 826.50' to a spike
2 - North 75 degrees 56 minutes 09 seconds East 750.61' to a spike
3 - North 76 degrees 45 minutes 00 seconds East passing over the township line dividing London Britain and Franklin Township 350.17' to a spike.
4 - South 85 degrees 05 minutes 09 seconds East 300.21' to a spike
5 - South 54 degrees 53 minutes 30 seconds East 143.03' to a spike
6 - South 48 degrees 25 minutes 00 seconds East 455.85' to a spike
7 - South 86 degrees 36 minutes 30 seconds East 318.43' to a spike
8 - South 69 degrees 56 minutes 30 seconds East 414.60' to a spike marking an easterly corner of this; thence leaving said title line due south 15.61' to a milestone set on the line dividing the State of Pennsylvania from the State of Maryland; thence by said state line due west crossing over the township line dividing London Britain Township from Franklin Township 3453.74' to a spike being the first mentioned point and place of beginning.

CONTAINING 16.906 acres be the same more or less.

AS TO PREMISES "A"
BEING as to part the same premises which John P. F. Blackstone, Singleman by Deed dated April 17, 1918 and recorded in Chester County in Deed Book Q-24 page 101 conveyed unto Springlawn Corporation, (Pa. Corp.).

BEING as to another part the same premises which Richard T. Swan and Anne M. Swan, by Deed dated July 7, 1959 and recorded in Chester County in Deed Book O-31 page 354 conveyed unto Springlawn Corporation (Pa. Corp.).

AND BEING as to the remaining part, of the same premises which Center Square, Inc. by Deed dated December 27, 1956 and recorded in Chester County in Deed Book G-22 page 231 conveyed unto Springlawn Corporation, (Pa. Corp.).

AS TO PREMISES "B"
BEING part of the same premises which Center Square, Inc. by Deed dated December 27, 1956 and recorded in Chester County in Deed Book G-22 page 231 conveyed unto Springlawn Corporation, (Pa. Corp.).

UNDER AND SUBJECT to certain Reservations, Rights, Covenants, as of record.

BEING as to Premises A, Premises B, and the flooding rights as aforesaid the same premises which Springlawn Corporation, a Pennsylvania Corporation, conveyed unto George Strawbridge Jr., Individually, and Girard Bank, George Strawbridge, Sr., and Charles H. Norris, Jr., Trustees Under the Deed of Trust of George Strawbridge, Jr., Dated January 20, 1971; by Indenture dated the eighteenth day of October, 1978 and recorded in Chester County Deed Book W53 page 573.

AND BEING as to the flooding rights aforesaid the same premises which Delaware Trust Company, Jean Ellen duPont McConnell and William S. Potter, Trustees Under the Will of William duPont Jr., deceased, conveyed unto George Strawbridge Jr., Individually and Girard Bank, George Strawbridge, Sr., and Charles H. Norris, Jr., Trustees under the Deed of Trust of George Strawbridge Jr., dated January 20, 1971; by Indenture dated the twentieth of November, 1978 and recorded in Chester County Deed Book E54 page 291.

Rec. in Chester Co. Pa.
in Deeds Bk # B64
Pg 175
Elaine S. Weil
Recorder of Deeds

RECORDER'S OFFICE CHESTER COUNTY, PA.

B 64 180

Addendum A

B 075-176 C

REV-183 PO (7-80)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF REVENUE
BUREAU OF FIELD OPERATIONS

REALTY TRANSFER TAX
AFFIDAVIT OF VALUE

FOR RECORDER'S USE ONLY
BOOK NUMBER 1394
PAGE NUMBER 176
DATE RECORDED 8/22/84

COMPLETE APPLICABLE SECTIONS IN FULL AND FILE IN DUPLICATE WITH RECORDER OF DEEDS WHEN (1) THE FULL CONSIDERATION IS NOT SET FORTH IN THE DEED, (2) THE TRANSFER IS WITHOUT CONSIDERATION OR A GIFT, OR (3) A TAX EXEMPTION IS CLAIMED. (REFER SECT. 8, RTT ACT OF DEC. 27, 1951, P.L. 1743 AS AMENDED)

SECTION I
(COMPLETE FOR ALL TRANSACTIONS)

Girard Bank, George Strawbridge, Sr. Trustees u/d 1/20/71 — GRANTOR(S)
Broad & Chestnut Streets, Phila., PA 19101 — ADDRESS / ZIP CODE

Delaware Trust Co., George Strawbridge, Sr. & William C. Lickle, Trustees u/d 1/20/71 — GRANTEE(S)
Market Street Mall, Wilmington, DE 19801 — ADDRESS / ZIP CODE

LOCATION OF LAND, TENEMENTS AND HEREDITAMENTS:

302 Interest 1688 acres — P.O. STREET & NUMBER OR OTHER DESCRIPTION
London, Britain, Franklin & Elk — NAME OF LOCAL GOVERNMENTAL UNIT
Chester County — COUNTY

FULL CONSIDERATION $ -0- HIGHEST ASSESSED VALUE $ 158140.00

FAIR MARKET VALUE $ 825,000.00 REALTY TRANSFER TAX PAID $

TAX EXEMPT TRANSACTIONS: IF TRANSFER IS PARTIALLY OR WHOLLY EXEMPT, SHOW AMOUNT EXEMPT, REASON (S) AND CITE PORTION OF LAW. This is a transfer by law from one set of trustees to new trustees under same deed of trust.

IF THIS IS A TRANSFER FROM A STRAW, AGENT OR TRUST AGREEMENT, COMPLETE THE REVERSE SIDE.

SECTION II
(COMPLETE ONLY IF PROPERTY WAS SUBJECT TO LIEN OR MORTGAGE AT THE TIME OF TRANSFER)

EXISTING MORTGAGE: $ 510,000.00 DISPOSITION

Delaware Trust Co., Trustee — MORTGAGEE
Market Street Mall, Wilmington, DE 19801 — ADDRESS

EXISTING MORTGAGE: $ DISPOSITION

MORTGAGEE / ADDRESS

EXISTING LIEN OR OBLIGATION: $ DISPOSITION

LIENHOLDER / ADDRESS

EXISTING LIEN OR OBLIGATION: $ DISPOSITION

LIENHOLDER / ADDRESS

SECTION III
(COMPLETE ONLY IF TRANSFER IS RESULT OF JUDICIAL SALE)

OFFICIAL CONDUCTING SALE — NAME / ADDRESS / TITLE

SUCCESSFUL BIDDER — NAME / ADDRESS / TITLE

	JUDGEMENT PLUS PRIOR LIENS	BID PRICE	HIGHEST ASSESSED VALUE
HIGHEST ASSESSED VALUE			$
JUDGEMENT PLUS INTEREST	$		
BID PRICE		$	
PRIOR RECORDED LIEN	$	$	
PRIOR RECORDED MORTGAGE	$	$	
PRIOR RECORDED MORTGAGE	$	$	
UNPAID REAL ESTATE TAXES	$	$	
WATER RENT DUE	$	$	
SEWAGE RENT DUE	$	$	
ATTORNEY FEES	$	$	
OTHER (COSTS, ETC.)	$	$	
TOTAL	$	$	$

NOTE: CALCULATIONS MUST BE SHOWN IN ALL COLUMNS.

SWORN AND SUBSCRIBED BEFORE ME THIS 15th DAY OF August 19 84

Nita Goodlow
NOTARY PUBLIC

NITA GOODLOW
Notary Public, Phila., Phila. Co.
My Commission Expires Sept. 17, 1987

MY COMMISSION EXPIRES

ALL OF THE INFORMATION ENTERED ON BOTH SIDES OF THIS AFFIDAVIT IS TRUE, FULL AND COMPLETE TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF.

Wm. T. Dunn

☐ GRANTEE ☒ AGENT FOR GRANTEE
☐ GRANTOR ☐ AGENT FOR GRANTOR
☐ STRAW ☐ TRUSTEE

B 64 181

Addendum A

11578385 B: 9653 P: 523 DEE
11/20/2017 10:55:47 AM Page 1 of 20
Rec Fees: $218.00 Local: $0.00 State: $0.00
Rick Loughery Recorder of Deeds, Chester County, PA

Prepared by and return to:

Fidelity National Title Insurance Company
1515 Market Street
Suite 1325
Philadelphia, PA 19102

File No: 170225PHI

State Tax: EXEMPT
Local Tax: EXEMPT
Consideration: $4,385,000.00

Tax Parcel Nos.: 70-5-6; 70-5-7 ; 71-4-32.3;
72-6-1; 72-6-10

This Indenture dated 11-9-17 and made effective this 17th day of November, 2017;

Between

GEORGE STRAWBRIDGE, JR., individually

and

BNY MELLON, N.A. (f/k/a Mellon Bank, N.A.), R. STEWART STRAWBRIDGE and GEORGE J. BAXTER, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971

(hereinafter called the Grantors), of the one part, and

THE CONSERVATION FUND, a Non-Profit Corporation

(hereinafter called the Grantee), of the other part,

WHEREAS, the said, George Strawbridge, Jr. executed a written, irrevocable Agreement (Deed) of Trust Dated January 20, 1971, and wherein and whereby he appointed George Strawbridge, Sr., David G. Forman and Girard Trust Bank as trustees and authorized and empowered his said Trustees:

> "To sell at public or private sale, to exchange or to lease for any period of time, any real or personal property, and to give options for sales or leases;" and

WHEREAS, on July 19, 1977 David G. Forman appointed Charles H. Norris, Jr., as his successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, Springlawn Corporation, by indenture dated October 18, 1978 and recorded October 20, 1978 in the office of the recorder of deeds in and for the County of Chester in Deed Book W-53 page 573,

Unofficial Copy

granted and conveyed unto George Strawbridge, Jr., individually (as to an undivided 70% interest) and Girard Bank (f/k/a Girard Trust Bank), George Strawbridge, Sr. and Charles H. Norris, trustees under Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 (as to an undivided 30% interest), in fee, certain premises more particularly described in said indenture, and a portion of the premises therein conveyed is part of the premises hereinafter more particularly described as Premises A, B, and E; and

WHEREAS, on July 21, 1981 George Strawbridge, Sr., removed Girard Bank (f/k/a Girard Trust Bank) and appointed Delaware Trust Company as the successor corporate trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, in 1981 Charles H. Norris, Jr., appointed William C. Lickle as his successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 and the said William C. Lickle accepted said appointment as trustee on July 28, 1981; and

WHEREAS, an Adjudication filed in Montgomery County Orphans' Court Division of Court of Common Pleas No. 84664 in re: Trust Inter Vivos: George Strawbridge, Jr., Settlor, and excerpt of Schedule of Distribution recorded August 23, 1984 in Chester County in Deed Book B-64 page 175 awarded the undivided 30% interest in Real Estate unto Delaware Trust Company, George Strawbridge and William C. Lickle, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, by Decree of Orphans' Court Division of Court of Common Pleas of Montgomery County, Pennsylvania, dated March 13, 1985, the trustees under Trust under Deed of George Strawbridge, Jr. dated January 20, 1971, were changed to Delaware Trust Company, Dorrance H. Hamilton and George J. Baxter; and

WHEREAS, by Removal Of Corporate Co-Trustee and Appointment of Successor Corporate Co-Trustee, by Dorrance H. Hamilton and George J. Baxter, trustees, dated December 16, 1998, the First Union National Bank (f/k/a Delaware Trust Company) was replaced as Corporate Co-Trustee of the Trust under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971 by Mellon Bank, N.A.; and

WHEREAS, on July 8, 2005 Dorrance H. Hamilton appointed R. Stewart Strawbridge as her successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 and the said R. Stewart Strawbridge accepted said appointment as trustee on August 1, 2005;

WHEREAS, on July 1, 2008, Mellon Bank, N.A. changed its name to BNY Mellon, N.A.; and

WHEREAS, Jane F. Trimble by indenture dated March 31, 1997 and recorded April 2, 1997 in the Office of the Recorder of Deeds of Chester County in Record Book 4158, Page 1495, granted and conveyed unto George Strawbridge, Jr., in fee a certain premises more particularly described in said indenture, and the premises therein conveyed is more particularly described herein as Premises C and D; and

Unofficial Copy

WHEREAS, Grantor and Grantee have agreed that George Strawbridge, Jr., identified individually as one of Grantors named in this Deed will convey with special warranty his interest in the property described herein on Exhibit A (the "Property"); and BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, identified Grantors in their capacity as trustees in this Deed will convey with title warranties typically provided by trustees, as more fully set forth herein, the Property, as described on Exhibit A; and

NOW THEREFORE, for and in consideration of the sum of Four Million Three Hundred Eighty-Five Thousand and 00/100 Dollars ($4,385,000.00) payment by the Grantee and receipt by the Grantors in lawful money of the United States of America of which is hereby acknowledged , the Grantors hereby have granted and conveyed, bargained and sold, released and confirmed, and by these presents do grant and convey, bargain and sell, release and confirm unto the Grantee:

> All those certain tracts of land situate in the Townships of Elk and Franklin, County of Chester, Commonwealth of Pennsylvania, which are more particularly described on Exhibit A attached hereto and made a part hereof; and

TOGETHER WITH all and singular the buildings and improvements, ways, streets, alleys, passages, waters, water-courses, mineral, timber and other surface and subsurface rights, liberties, privileges, hereditaments and appurtenances, whatsoever belonging, or in anywise appertaining to the Property, and the reversions and remainders, rents, issues, and profits thereof; and all the estate, right, title, interest, claim and demand whatsoever pertaining to the Property at law or in equity.

TO HAVE AND TO HOLD the Property, with the buildings and improvements thereon erected, hereditaments and premises hereby granted, and the appurtenances, unto the said Grantee, its successors and assigns forever.

AND the said GEORGE STRAWBRIDGE, JR., for himself and his heirs and assigns, does covenants, promises and agrees to and with the said Grantee, its successors and assigns, as to the Property only as described on Exhibit A that he, the said George Strawbridge, Jr., and his heirs and assigns, all and singular the hereditaments and premises hereby granted or mentioned and intended so to be, with the appurtenances, unto the said Grantee, its successors and assigns, against him, the said George Strawbridge, Jr., and his heirs and assigns, and against all and every person and persons whosoever lawfully claiming or to claim the same or any part thereof, by, from or under, him, them or any of them, shall and will WARRANT and forever DEFEND.

AND the said BNY MELLON, N.A. (f/k/a Mellon Bank, N.A.), R. STEWART STRAWBRIDGE and GEORGE J. BAXTER, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971, do as to the Property as described on Exhibit A covenant, promise and agree to and with said Grantee, its heirs and assigns, that they, the said Trustees, have not done, committed, or knowingly or willingly suffered to be done or committed, any act, matter or thing whatsoever whereby the premises hereby granted, or any part thereof, is, are, shall or may be impeached, charged or encumbered, in title, charge, estate, or otherwise howsoever.

UNDER AND SUBJECT to the terms and conditions of that certain Declaration of Covenants, Conditions and Restrictions given by The Conservation Fund, a Non-Profit Corporation, a Maryland

Unofficial Document

corporation, to the County of Chester, a Pennsylvania county of the third class, of even date herewith, and intended to be recorded in the Chester County Recorder of Deeds Office immediately after this Indenture.

THIS PROPERTY was acquired with funds provided by the Pennsylvania Department of Conservation and Natural Resources ("Department"). The source of the funds is the Keystone Recreation, Park and Conservation Fund – LT. This Property may not be converted to purposes other than those authorized under the Act for property acquired with Department funds. No change of use and no transfer of ownership, control or interest in the Property may occur, and no encumbrance may be placed on this Property, without the written consent of the Department or its successor. The restriction in this paragraph applies to both the surface and subsurface of the Property. This restriction has the effect of a covenant running in perpetuity and the land is binding upon the owner(s) of the Property and upon all subsequent owners, successors and assigns. This restriction is enforceable by the Department and its successors.

This Indenture may be signed in two or more counterparts (or with counterpart signature pages) which taken together, shall constitute a full executed indenture and shall be considered a single document. The parties intend that a fully executed Indenture containing the signatures of all of the parties shall be binding on the parties.

[SIGNATURES BEGIN ON THE FOLLOWING PAGE]

Unofficial Copy

In Witness Whereof, the said Grantors have caused these presents to be duly executed under seal dated the day and year first above written.

George Strawbridge, Jr. (SEAL)

STATE OF DELAWARE)
) ss.:
COUNTY OF NEW CASTLE)

On the 13th day of November in the year 2017, before me, the undersigned, personally appeared George Strawbridge, Jr., personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

DIANA S. SKOMORUCHA
NOTARY PUBLIC
STATE OF DELAWARE
MY COMMISSION EXPIRES AUG. 8 2020

Notary Public
Commission Expires: August 8, 2020

Unofficial Copy

BNY Mellon, N.A., (f/k/a Mellon Bank, N.A.), Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

By: _____ (SEAL)
Name: Frank Schickling
Title: Vice President

STATE OF Pennsylvania)
) ss.:
COUNTY OF Philadelphia)

On this, the 9th day of November 2017, before me, the undersigned officer, personally appeared Frank Schickling who acknowledged himself / herself to be the Vice President of BNY Mellon N.A., (f/k/a Mellon Bank N.A.), a national banking institution, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971 and that he / she as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the association in the capacity therein stated by himself/herself as such officer.

In Witness Whereof, I hereunto set my hand and official seal.

Sabrina Moore
Notary Public
Commission Expires:

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Sabrina Moore, Notary Public
City of Philadelphia, Philadelphia County
My Commission Expires April 30, 2019
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

Unofficial Copy

George Baxter (SEAL)
George Baxter, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

STATE OF Pennsylvania)
) ss.:
COUNTY OF Bucks)

On the 10 day of November in the year 2017, before me, the undersigned, personally appeared George Baxter, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Notary Public
Commission Expires: 10-21-2021

Commonwealth of Pennsylvania Notary Seal
KATHLEEN BRADFIELD, Notary Public
Bucks County
My Commission Expires October 31, 2021
Commission Number 1097214

Unofficial Copy

Addendum A

_____(SEAL)
R. Stewart Strawbridge, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

STATE OF Maine)
) ss.:
COUNTY OF Cumberland)

On the 10th day of November in the year 2017, before me, the undersigned, personally appeared R. Stewart Strawbridge, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Kim Paquette
Notary Public
Commission Expires: 12/2/23

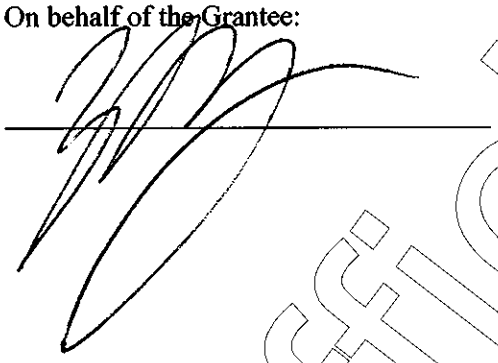
Unofficial Copy

File No: 170225PHI
Tax Parcel Nos. 70-5-6
70-5-7
71-4-32.3
72-6-1
72-6-10
Chesterville Road (A), Elk Township, Chester County, PA
Elk, Chester County, PA
New London, Chester County, PA

The complete address of the above named Grantee, The Conservation Fund, a Non-Profit Corporation is:

The Conservation Fund
1655 North Fort Myer Drive, Suite 1300
Arlington, Virginia 22209

On behalf of the Grantee:



Unofficial Copy

EXHIBIT "A"
Legal Description of the Property

Description of five premises to be conveyed to The Conservation Fund known as Strawbridge Phase II, as shown on the ALTA/NSPS Land Title Survey prepared by Transition Engineering Surveying dated September 26, 2017, project number 294.02.01.

Situated in Elk Township, New London Township, and Franklin Township, Chester County, Pennsylvania.

Premises A – Phase 1 (U.P.I. 70-5-6), known as #1001 Chesterville Road (Source of Title: Deed Record B, Volume 64, Page 175).

BEGINNING at a point (spike set call) in the bed and title line of Chesterville Road Pennsylvania Route No. 841 at 33' wide, said point being a common corner for the premises herein being described and lands known as #985 Chesterville Road now or formerly of N. Philip Dougherty and Marie A. Dougherty his wife, and others, and further located along the bed and centerline of said Chesterville Road, the thirteen (13) following described courses and distances from the intersection formed by the said centerline of Chesterville Road with the centerline of Strickersville Road at 33' wide:

1. N 09° 34' 12" E, 36.50' to a point;
2. N 04° 30' 16" E, 51.95' to a point;
3. N 04° 13' 24" E, 51.60' to a point;
4. N 04° 21' 37" E, 231.05' to a point;
5. Along the arc of a circle curving to the left (radius = 756.48') (chord = 231.41', chord bearing = N 05° 37' 36" W), an arc distance of 232.32' to a point;
6. N 14° 25' 29" W, 31.67' to a point;
7. N 14° 41' 12" W, 155.83' to a point;
8. N 15° 18' 38" W, 216.99' to a point;
9. Along the arc of a circle curving to the right (radius = 1950.54') (chord = 193.39', chord bearing = N 10° 49' 03" W), an arc distance of 193.47' to a point;
10. N 07° 58' 34" W, 77.87' to a point;
11. N 05° 59' 57" W, 278.48' to a point;
12. N 07° 49' 48" W, 253.42' to a point; and
13. N 09° 28' 35" W, 220.39'.

THENCE from the said point of beginning, along the title line of said Chesterville Road the four (4) following described courses and distances:

1. N 09° 50' 40" W, 498.86' to a point (spike set call);
2. N 20° 54' 10" W, 418.51' to a point (spike set call);
3. N 18° 10' 07" W, 251.55' to a point (spike set call); and
4. N 05° 32' 50" E, 467.25' to a point, a corner for Premises B;

THENCE by the same, the twelve (12) following described courses and distances:

1. N 86° 55' 18" E, 220.91' to a point;
2. Along the arc of a circle curving to the left (radius = 263.00') (chord = 204.44', chord bearing = N 64° 03' 00" E), an arc distance of 209.97' to a point;
3. N 41° 10' 42" E, 227.72' to a point;
4. N 51° 17' 58" E, 193.36' to a point;
5. N 40° 53' 01" E, 174.72' to a point;

Unofficial Copy

6. N 47° 22' 34" E, 221.77' to a point;
7. N 37° 28' 20" E, 334.01' to a point;
8. N 45° 17' 00" E, 314.29' to a point;
9. N 38° 35' 57" E, 259.33' to a point;
10. N 41° 05' 26" E, 200.80' to a point;
11. Along the arc of a circle curving to the right (radius = 180.00') (chord = 303.92', chord bearing = S 81° 19' 17" E), an arc distance of 361.84' to a point; and
12. S 23° 44' 01" E, 127.53' to a point, a corner for Phase 3 lands known as #633 Strickersville Road, now or formerly of Delaware Trust Company and George Strawbridge and others (Deed Record B, Volume 64, Page 175) (U.P.I 70-5-8);

THENCE by the same, the ten (10) following described courses and distances:

1. S 07° 24' 24" W, 192.19' to a point;
2. S 25° 52' 31" W, 296.59' to a point;
3. S 08° 28' 56" W, 281.55' to a point;
4. S 13° 43' 33" E, 367.71' to a point;
5. S 07° 50' 14" E, 297.19' to a point;
6. S 13° 44' 47" W, 271.14' to a point;
7. S 05° 57' 22" E, 258.81' to a point;
8. S 03° 22' 21" W, 233.11' to a point;
9. S 31° 51' 37" W, 412.83' to a point; and
10. S 15° 41' 21" W, 376.60' to a point, said point being a common corner for the premises herein being described, said lands known as #633 Strickersville Road, lands known as #112 Schoolhouse Road now or formerly of Christ S. King and Anna M. King his wife (Deed Book 9034, Page 527), (U.P.I. 70-5-9), and the aforesaid lands known as #985 Chesterville Road;

THENCE along said lands known as #985 Chesterville Road, S 86° 21' 20" W, 1350.72' to a point in the aforesaid bed of Chesterville Road, the first mentioned point and place of beginning.

CONTAINING within said described metes and bounds 94.9239 acres of land, be the same more or less.

Premises B – Phase 1 (U.P.I. 70-5-7), known as #1 Springlawn Road (Source of Title: Deed Record B, Volume 64, Page 175).

BEGINNING at a point (spike set call) in the bed and title line of Chesterville Road Pennsylvania Route No. 841 at 33' wide, said point being a common corner for the premises herein being described as Premises A, and further located along the bed and title line of said Chesterville Road, the seventeen (17) following described courses and distances from the intersection formed by the said centerline of Chesterville Road with the centerline of Strickersville Road at 33' wide:

1. N 09° 34' 12" E, 36.50' to a point;
2. N 04° 30' 16" E, 51.95' to a point;
3. N 04° 13' 24" E, 51.60' to a point;
4. N 04° 21' 37" E, 231.05' to a point;
5. Along the arc of a circle curving to the left (radius = 756.48') (chord = 231.41', chord bearing = N 05° 37' 36" W), an arc distance of 232.32' to a point;

Unofficial Copy

6. N 14° 25' 29" W, 31.67' to a point;
7. N 14° 41' 12" W, 155.83' to a point;
8. N 15° 18' 38" W, 216.99' to a point;
9. Along the arc of a circle curving to the right (radius = 1950.54') (chord = 193.39', chord bearing = N 10° 49' 03" W), an arc distance of 193.47' to a point;
10. N 07° 58' 34" W, 77.87' to a point;
11. N 05° 59' 57" W, 278.48' to a point;
12. N 07° 49' 48" W, 270.82' to a point;
13. N 09° 37' 02" W, 203.00'.
14. N 09° 50' 40" W, 498.86' to a point (spike set call);
15. N 20° 54' 10" W, 418.51' to a point (spike set call);
16. N 18° 10' 07" W, 251.55' to a point (spike set call); and
17. N 05° 32' 50" E, 467.25'.

THENCE from the said point of beginning along the title line of said Chesterville Road, N 05° 32' 50" E, 8.95' to a point (spike set call), a corner for lands known as #1075 Chesterville Road now or formerly of David Cooper and Sharon Cooper his wife (Deed Record U, Volume 50, Page 144) (U.P.I. 71-5-2), said point also being the southwest corner of a water rights right of way easement.

THENCE along said lands known as #1075 Chesterville Road and along the southeasterly side of said water rights right of way easement, the fifteen (15) following described courses and distances:

1. N 80° 18' 52" E, 321.87' to a point (iron pin call);
2. N 46° 11' 57" E, 150.43' to a point (iron pin call);
3. N 42° 35' 57" E, 242.61' to a point (iron pin call);
4. N 56° 15' 57" E, 102.98' to a point (iron pin call);
5. N 38° 55' 57" E, 155.16' to a point (iron pin call);
6. N 46° 33' 57" E, 187.97' to a point (iron pin call);
7. N 48° 59' 57" E, 90.78' to a point (iron pin call);
8. N 36° 46' 57" E, 125.30' to a point (iron pin call);
9. N 38° 08' 57" E, 214.76' to a point (iron pin call);
10. N 44° 59' 57" E, 189.98' to a point (iron pin call);
11. N 42° 53' 57" E, 227.40' to a point (iron pin call);
12. N 37° 48' 57" E, 360.43' to a point (iron pin call);
13. N 40° 47' 57" E, 288.73' to a point (iron pin call);
14. N 53° 47' 57" E, 209.01' to a point (iron pin call); and
15. N 45° 09' 57" E, 67.71' to a point, said point being a common corner for the premises herein being described said lands known as #1075 Chesterville Road and said easement Premises D, now or formerly of George Strawbridge Jr. (Deed Book 4158, Page 1495) (U.P.I. 72-6-1), and Phase 2 lands known as #99 Bullock Road now or formerly of Delaware Trust Company and trustee for Strawbridge (Deed Record B, Volume 64, Page 175) (U.P.I. 72-6-4);

THENCE along said lands known as #99 Bullock Road, and along new title (tie) lines of Big Elk Creek, the forty-four (44) following described courses and distances:

1. S 67° 47' 50" E, 63.22' to a point;
2. S 28° 51' 08" E, 347.66' to a point;
3. S 14° 26' 10" E, 397.54' to a point;
4. S 23° 53' 55" E, 460.54' to a point;

Unofficial Copy

5. S 40° 43' 49" E, 141.24' to a point;
6. S 62° 40' 24" E, 160.48' to a point;
7. N 72° 51' 22" E, 177.80' to a point;
8. N 89° 14' 08" E, 115.53' to a point;
9. N 64° 53' 11" E, 130.54' to a point;
10. N 36° 17' 09" E, 217.50' to a point;
11. N 17° 11' 40" E, 99.01' to a point;
12. N 13° 53' 09" W, 194.74' to a point;
13. N 06° 34' 29" W, 666.92' to a point;
14. N 23° 26' 54" W, 139.08' to a point;
15. N 24° 31' 14" E, 114.90' to a point;
16. N 54° 58' 01" E, 237.29' to a point;
17. N 84° 25' 34" E, 146.37' to a point;
18. S 69° 20' 47" E, 132.00' to a point;
19. S 34° 00' 01" E, 128.70' to a point;
20. S 81° 36' 22" E, 210.89' to a point;
21. S 83° 58' 21" E, 228.35' to a point;
22. S 32° 20' 03" E, 167.44' to a point;
23. S 84° 17' 05" E, 150.48' to a point;
24. S 74° 32' 54" E, 170.50' to a point;
25. S 77° 38' 15" E, 250.88' to a point;
26. N 78° 03' 10" E, 111.54' to a point;
27. S 41° 46' 56" E, 369.15' to a point;
28. S 74° 20' 31" E, 302.37' to a point;
29. S 43° 19' 31" E, 235.57' to a point;
30. S 13° 01' 47" E, 138.20' to a point;
31. S 15° 10' 32" E, 87.18' to a point;
32. S 04° 11' 42" W, 534.08' to a point;
33. S 15° 45' 23" W, 362.93' to a point;
34. S 14° 13' 18" E, 363.08' to a point;
35. S 18° 10' 41" E, 316.20' to a point;
36. S 51° 04' 59" E, 86.98' to a point;
37. S 21° 56' 11" E, 208.51' to a point;
38. S 78° 05' 35" E, 494.00' to a point;
39. S 69° 58' 20" E, 722.25' to a point;
40. S 53° 42' 31" E, 450.90' to a point;
41. S 68° 35' 19" E, 225.52' to a point;
42. S 32° 08' 25" E, 141.01' to a point;
43. S 20° 15' 51" W, 124.86' to a point; and
44. S 35° 00' 10" W, 49.64' to a point in the bed and title line of Strickersville Road at 33' wide;

THENCE along the bed and title line of Strickersville Road, S 69° 30' 51" W, 474.02' to a point, a corner for Phase 3 lands known as #633 Strickersville Road now or formerly of Delaware Trust Company and George Strawbridge and others (Deed Record B, Volume 64, Page 175) (U.P.I. 70-5-8), said point being in the centerline of Springlawn Road T-354 vacated, said point being in the terminus of a public trail easement at 33' wide;

Unofficial copy

THENCE along said Phase 3 lands known as #633 Strickersville Road, along the title lines of said easement and said vacated road, the forty-two (42) following described courses and distances:

1. N 06° 43' 32" W, 177.09' to a point;
2. Along the arc of a circle curving to the left (radius = 545.00') (chord = 176.07', chord bearing = N 16° 01' 17" W), an arc distance of 176.84' to a point;
3. N 25° 19' 02" W, 200.01' to a point;
4. Along the arc of a circle curving to the left (radius = 475.00') (chord = 233.25', chord bearing = N 39° 31' 49" W), an arc distance of 235.66' to a point;
5. N 53° 44' 36" W, 114.99' to a point;
6. Along the arc of a circle curving to the left (radius = 425.00') (chord = 127.82', chord bearing = N 62° 23' 32" W), an arc distance of 128.30' to a point;
7. N 71° 02' 26" W, 182.93' to a point;
8. N 64° 57' 51" W, 204.61' to a point;
9. Along the arc of a circle curving to the left (radius = 350.00') (chord = 168.68', chord bearing = N 78° 54' 28" W), an arc distance of 170.35' to a point;
10. S 87° 08' 55" W, 85.18' to a point;
11. Along the arc of a circle curving to the right (radius = 225.00') (chord = 105.31', chord bearing = N 79° 19' 04" W), an arc distance of 106.29' to a point;
12. N 65° 47' 03" W, 243.43' to a point;
13. Along the arc of a circle curving to the right (radius = 245.00') (chord = 237.24', chord bearing = N 36° 49' 33" W), an arc distance of 247.65' to a point;
14. N 07° 52' 03" W, 351.37' to a point;
15. N 05° 11' 35" W, 147.17' to a point;
16. N 11° 39' 14" W, 109.67' to a point;
17. Along the arc of a circle curving to the left (radius = 425.00') (chord = 311.84', chord bearing = N 33° 10' 37" W), an arc distance of 319.30' to a point;
18. N 54° 42' 00" W, 37.68' to a point;
19. N 10° 26' 17" W, 252.23' to a point;
20. N 37° 36' 37" W, 248.38' to a point;
21. Along the arc of a circle curving to the right (radius = 830.00') (chord = 129.16', chord bearing = N 33° 08' 52" W), an arc distance of 129.29' to a point;
22. N 28° 41' 07" W, 356.00' to a point;
23. Along the arc of a circle curving to the left (radius = 350.00') (chord = 130.71', chord bearing = N 39° 26' 49" W), an arc distance of 131.48' to a point;
24. N 50° 12' 32" W, 246.80' to a point;
25. N 63° 56' 17" W, 108.82' to a point;
26. Along the arc of a circle curving to the left (radius = 150.00') (chord = 67.45', chord bearing = N 76° 55' 54" W), an arc distance of 68.03' to a point;
27. N 89° 55' 31" W, 535.10' to a point;
28. N 89° 58' 22" W, 221.46' to a point;
29. Along the arc of a circle curving to the left (radius = 235.00') (chord = 275.93', chord bearing = S 54° 04' 35" W), an arc distance of 294.91' to a point;
30. S 18° 07' 31" W, 185.56' to a point;
31. Along the arc of a circle curving to the left (radius = 336.81') (chord = 172.60', chord bearing = S 03° 16' 44" W), an arc distance of 174.55' to a point;
32. Along the arc of a circle curving to the right (radius = 215.00') (chord = 250.02', chord bearing = S 23° 59' 07" W), an arc distance of 266.82' to a point;
33. S 59° 32' 16" W, 225.93' to a point;
34. S 69° 30' 06" W, 325.39' to a point;

Unofficial Copy

35. S 42° 55' 32" W, 126.26' to a point;
36. Along the arc of a circle curving to the right (radius = 100.00') (chord = 77.14', chord bearing = S 65° 36' 41" W), an arc distance of 79.19' to a point;
37. S 88° 17' 51" W, 110.71' to a point;
38. Along the arc of a circle curving to the right (radius = 180.00') (chord = 168.56', chord bearing = N 63° 47' 02" W), an arc distance of 175.42' to a point;
39. N 35° 51' 55" W, 160.89' to a point;
40. N 28° 20' 22" W, 260.11' to a point;
41. N 16° 28' 43" W, 327.85' to a point;
42. N 23° 44' 01" W, 182.64' to a point, a corner for the aforesaid lands known as Premises A;

THENCE still along the title lines of said easement and said vacated road, the twelve (12) following described courses and distances:

1. N 23° 44' 01" W, 127.53' to a point;
2. Along the arc of a circle curving to the left (radius = 180.00') (chord = 303.92', chord bearing = N 81° 19' 17" W), an arc distance of 361.84' to a point;
3. S 41° 05' 26" W, 200.80' to a point;
4. S 38° 35' 57" W, 259.33' to a point;
5. S 45° 17' 00" W, 314.29' to a point;
6. S 37° 28' 20" W, 334.01' to a point;
7. S 47° 22' 34" W, 221.77' to a point;
8. S 40° 53' 01" W, 174.72' to a point;
9. S 51° 17' 58" W, 193.36' to a point;
10. S 41° 10' 42" W, 227.72' to a point;
11. Along the arc of a circle curving to the right (radius = 263.00') (chord = 204.44', chord bearing = S 64° 03' 00" W), an arc distance of 209.97' to a point;
12. S 86° 55' 18" W, 220.91' to a point in the bed of said Chesterville Road, the first mentioned point and place of beginning;

CONTAINING within said described metes and bounds 66.8385 acres of land, be the same more or less.

Premises C – Phase 1 (U.P.I. 71-4-32.3) and Premises D - Phase 1 (U.P.I. 72-6-1), known as #2057 Chesterville Road (Source of Title: Deed Book 4158, Page 1495).

BEGINNNG at a point in the bed and title line of Chesterville Road Pennsylvania Route No. 841 at 33' wide, said point being a common corner for the premises herein being described and lands known as #2003 Chesterville Road now or formerly of Rosemary Pushkarewicz (Deed Book 8728, Page 1624) (U.P.I. 71-4-32), said point being further located along the title lines of said Chesterville Road the three (3) following described courses and distances from the point of intersection formed by the title line of said Chesterville Road with the title line of another section of Chesterville Road at 33' wide, at the southerly terminus of the title line of Lewisville Road at 33' wide:

1. N 78° 03' 12" E, 185.07' to a point;
2. N 53° 47' 12" E, 366.29' to a point; and
3. N 71° 09' 12" E, 340.81.

Unofficial Copy

THENCE from the said point of beginning along the title line of said Chesterville Road, N 71° 09' 12" E, 265.91' to a point, a corner for lands known as #2097 Chesterville Road, now or formerly of Michael E. Chaga and Doris J. Chaga his wife (Deed Book 3781, Page 1752) (U.P.I. 71-4-32.2 and U.P.I. 72-6-1.2);

THENCE by the same, S 33° 27' 48" E, 1605.87' to a point (iron pin call), a corner for Phase 2 lands known as #99 Bullock Road, now or formerly of Delaware Trust Company and trustee for Strawbridge (Deed Record B, Volume 64, Page 175) (U.P.I. 72-6-4);

THENCE by the same, S 44° 44' 34" W, 782.85' to a point, said point being a common corner for the premises herein being described, said lands known as #99 Bullock Road, Premises B, and lands known as #1075 Chesterville Road, now or formerly of David Cooper and Sharon S. Cooper his wife (Deed Record U, Volume 50, Page 144) (U.P.I. 71-5-2);

THENCE along said lands known as #1075 Chesterville Road, N 79° 28' 33" W, 810.16' to a point, a corner for lands known as #2001 Chesterville Road, now or formerly of Charles G. Woods and Lois A. Woods his wife (Deed Record Q, Volume 40, Page 991) (U.P.I. 71-4-31);

THENCE by the same, N 06° 18' 48" W, 652.55' to a point, a corner for said lands known as #2003 Chesterville Road;

THENCE by the same, the two (2) following described courses and distances:

1. N 71° 51' 12" E, 476.33' to a point; and
2. N 11° 08' 48" W, 881.53' to a point in the bed of said Chesterville Road, the first mentioned point and place of beginning;

CONTAINING within said described metes and bounds 33.6346 acres of land, be the same more or less.

Premises E – Phase 1 (U.P.I. 72-6-10), known as #401 Strickersville Road (Source of Title: Deed Record B, Volume 64, Page 175).

BEGINNING at a point in the bed and title line of Strickersville Road at 33' wide, said point being a common corner for the premises herein being described and the subdivision of Mt. Olivet Farms (extended) (Microfilm No. 1408) said point being further located the three (3) following described courses and distances from the westerly end of a 25.00' radius junction curve joining the northerly side of said Strickersville Road with the westerly side of Peter Christopher Drive at 50' wide:

1. S 10° 34' 49" W, 13.58' to a point in the title line of said Strickersville Road;
2. THENCE by the same, N 79° 25' 11" W, 87.91' to an angle point; and
3. Along another title line of Strickersville Road, N 79° 54' 11" W, 112.74'.

THENCE from the said point of beginning, continuing along the bed and title lines of Strickersville Road the two (2) following described courses and distances:

1. N 80° 18' 01" W, 519.80' to a point; and
2. N 84° 49' 31" W, 470.28' to a point, a corner for lands known as #421 Strickersville Road now or formerly of Ronald M. Basara (Deed Book 5135, Page 319) (U.P.I. 72-6-11);

Unofficial Copy

THENCE by the same, N 05° 33' 36" E, 294.47' to a point;

THENCE still by the same and along lands known as #423 Strickersville Road now or formerly of James E. Nowland (Deed Book 5113, Page 741) (U.P.I. 72-6-12), N 77° 06' 45" W, 437.88' to a point, a corner for Phase 2 lands known as #99 Bullock Road, now or formerly of Delaware Trust Company and trustee for George Strawbridge (Deed Record B, Volume 64, Page 175) (U.P.I. 72-6-4);

THENCE by the same (along new title lines for Mt. Olivet Road, at 33' wide), the eight (8) following described courses and distances:

1. N 10° 22' 42" W, 454.24' to a point;
2. N 10° 44' 27" E, 481.21' to a point;
3. N 28° 03' 06" E, 1020.62' to a point;
4. N 22° 22' 46" E, 237.42' to a point;
5. N 08° 55' 54" E, 159.65' to a point;
6. N 14° 01' 33" E, 607.00' to a point;
7. N 14° 47' 21" W, 384.05' to a point; and
8. N 36° 03' 37" W, 230.03' to a point in the bed of Walker Road at 33' wide;

THENCE along the title line of said Walker Road, S 85° 18' 09" E, 56.76' to a point (iron pin call), a corner for lands known as #2 Johnson Lane now or formerly of John R. Griffith and Ann P. Griffith his wife (Deed Record P, Volume 65, Page 386) (U.P.I. 72-6-8.44);

THENCE by the same, S 40° 05' 09" E, 439.64' to a point (iron pin call);

THENCE still by the same, and along lands known as #10 Ways Run now or formerly Jeffrey D. Bennett and Juanita S. Bennett his wife (Deed Record Z, Volume 63, Page 521) (U.P.I. 72-6-8.57), S 05° 56' 51" W, 1054.09' to a point (iron pin call);

THENCE still along said lands known as #10 Ways Run, S 42° 57' 35" E, 473.49' to a point (iron pin call);

THENCE still along said lands known as #10 Ways Run and along said subdivision of Mt. Olivet Farms, S 08° 16' 00" E, 2150.90' to a point in the said bed of Strickersville Road, the first mentioned point and place of beginning;

CONTAINING within said described metes and bounds 59.0579 acres of land, be the same more or less.

As to Premises A, B and E

Being part of the same premises which Springlawn Corporation, a Pennsylvania corporation by Deed dated 10-18-1978 and recorded 10-21-1978 in Chester County in Deed Book W 53 Page 573 conveyed unto George Strawbridge, Jr., Individually, an undivided seventy (70%) percent interest and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Jr., Trustees under Deed of Trust of George Strawbridge, Jr., dated 1-20-1971, the remaining thirty (30%) percent interest as a tenancy in common as to the whole thereof, in fee.

Also being part of the same premises which vested in Delaware Trust Company, George Strawbridge and William C. Lickle, Trustees under Deed of George Strawbridge, Jr. dated

Unofficial Copy

January 20, 1971, thirty percent interest, by Certificate of Award of Real Estate, Trust Inter Vivos: George Strawbridge, Jr., Settlor No. 84664 by the Orphans' Court Division of the Court of Common Pleas for the County of Montgomery dated 8-7-1984 and recorded 8-23-1984 in Deed Book B 64 page 175.

As to Premises C and D

Being the same premises which Jane F. Trimble by Deed dated 3-31-1977 and recorded 4-2-1997 in Chester County in Record Book 4158 Page 1495 conveyed unto George Strawbridge, Jr., in fee.

Unofficial Copy

REV-183 EX (2-15)

pennsylvania
DEPARTMENT OF REVENUE
Bureau of Individual Taxes
PO BOX 280603
Harrisburg, PA 17128-0603

REALTY TRANSFER TAX STATEMENT OF VALUE

See reverse for instructions.

RECORDER'S USE ONLY
State Tax Paid
Book Number
Page Number
Date Recorded

Complete each section and file in duplicate with Recorder of Deeds when (1) the full value/consideration is not set forth in the deed, (2) the deed is without consideration or by gift, or (3) a tax exemption is claimed. If more space is needed, please attach additional sheets. A Statement of Value (SOV) is not required if the transfer is wholly exempt from tax based on family relationship or public utility easement. However, it is recommended that a SOV accompany all documents filed for recording.

A. CORRESPONDENT – All inquiries may be directed to the following person:

Name			Telephone Number:
Jodi R. O'Day, Vice President and Regional Counsel, The Conservation Fund			(443) 482-2826
Mailing Address	**City**	**State**	**ZIP Code**
410 Severn Avenue, Suite 204	Annapolis	MD	21403

B. TRANSFER DATA

Date of Acceptance of Document			
11/17/17			
Grantor(s)/Lessor(s)	**Telephone Number:**	**Grantee(s)/Lessee(s)**	**Telephone Number:**
George Strawbridge, Jr. and Trustees		The Conservation Fund	
Mailing Address		**Mailing Address**	
Greenville Center, Building B-100		1655 North Fort Myer Drive, Suite 1300	
City / **State** / **ZIP Code**		**City** / **State** / **ZIP Code**	
Greenville / DE / 19807		Arlington / VA / 22209	

C. REAL ESTATE LOCATION

Street Address	City, Township, Borough	
Various Properties (see attached)	Elk, Franklin, New London Townships	
County	**School District**	**Tax Parcel Number**
Chester	Oxford Area, Avon Grove	See Attached

D. VALUATION DATA

Was transaction part of an assignment or relocation? ☐ Y ☐ N

1. Actual Cash Consideration	2. Other Consideration	3. Total Consideration
4,385,000.00	+0.00	= 4,385,000.00
4. County Assessed Value	**5. Common Level Ratio Factor**	**6. Computed Value**
1,287,870.00	x 1.89	= 2,434,074.30

E. EXEMPTION DATA - Refer to instructions for exemption status.

1a. Amount of Exemption Claimed	1b. Percentage of Grantor's Interest in Real Estate	1c. Percentage of Grantor's Interest Conveyed
$ 4,385,000.00	100.00 %	100.00 %

2. Check Appropriate Box Below for Exemption Claimed.

- ☐ Will or intestate succession. _____ (Name of Decedent) _____ (Estate File Number)
- ☐ Transfer to a trust. (Attach complete copy of trust agreement identifying all beneficiaries.)
- ☐ Transfer from a trust. Date of transfer into the trust _____
  If trust was amended attach a copy of original and amended trust.
- ☐ Transfer between principal and agent/straw party. (Attach complete copy of agency/straw party agreement.)
- ☐ Transfers to the commonwealth, the U.S. and instrumentalities by gift, dedication, condemnation or in lieu of condemnation. (If condemnation or in lieu of condemnation, attach copy of resolution.)
- ☐ Transfer from mortgagor to a holder of a mortgage in default. (Attach copy of mortgage and note/assignment.)
- ☐ Corrective or confirmatory deed. (Attach complete copy of the deed to be corrected or confirmed.)
- ☐ Statutory corporate consolidation, merger or division. (Attach copy of articles.)
- ☒ Other (Please explain exemption claimed.) Exempt pursuant to 72 P.S. Sec 8102-C.3-18

Under penalties of law, I declare that I have examined this statement, including accompanying information, and to the best of my knowledge and belief, it is true, correct and complete.

Signature of Correspondent or Responsible Party	Date
The Conservation Fund By: Jodi R. O'Day, Vice President	11/17/17

FAILURE TO COMPLETE THIS FORM PROPERLY OR ATTACH REQUESTED DOCUMENTATION MAY RESULT IN THE RECORDER'S REFUSAL TO RECORD THE DEED.

Unofficial Copy

EXHIBIT TO TRANSFER TAX STATEMENT OF VALUE

Grantors: George Strawbridge, Jr. and the trustees of George Strawbridge Jr. Trust
Grantee: The Conservation Fund, a Non-Profit Corporation

Tax Parcel Number	Assessed Value	Township
70-5-6	$222,130.00	Elk
70-5-7	$151,410.00	Elk
71-4-32.3	$487,710.00	New London
72-6-1	$85,870.00	Franklin
72-6-10	$340,750.00	Franklin
Total Assessed Value:	$1,287,870.00	

Unofficial Copy

11640407 B: 9847 P: 280 DEE
11/21/2018 09:40:47 AM Page 1 of 19
Rec Fees: $154.75 Local: $0.00 State: $0.00
Rick Loughery Recorder of Deeds, Chester County, PA

Prepared by and return to:

Fidelity National Title Insurance Company
1515 Market Street
Suite 1325
Philadelphia, PA 19102

State Tax: EXEMPT
Local Tax: EXEMPT
Consideration: $6,105,000.00

File No: 180155PHI

Tax Parcel Nos.: 72-6-4

This Indenture

executed as of this 9th day of November, 2018, to be made effective this 15th day of November, 2018;

Between

GEORGE STRAWBRIDGE, JR., individually

and

BNY MELLON, N.A. (f/k/a Mellon Bank, N.A.), R. STEWART STRAWBRIDGE and GEORGE J. BAXTER, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971

(hereinafter called the Grantors), of the one part, and

THE CONSERVATION FUND, a Non-Profit Corporation

(hereinafter called the Grantee), of the other part,

WHEREAS, the said, George Strawbridge, Jr. executed a written, irrevocable Agreement (Deed) of Trust Dated January 20, 1971, and wherein and whereby he appointed George Strawbridge, Sr., David G. Forman and Girard Trust Bank as trustees and authorized and empowered his said Trustees:

"To sell at public or private sale, to exchange or to lease for any period of time, any real or personal property, and to give options for sales or leases;" and

Unofficial Copy

WHEREAS, on July 19, 1977 David G. Forman appointed Charles H. Norris, Jr., as his successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, Springlawn Corporation, by indenture dated October 18, 1978 and recorded October 20, 1978 in the office of the recorder of deeds in and for the County of Chester in Deed Book W-53 page 573, granted and conveyed unto George Strawbridge, Jr., individually (as to an undivided 70% interest) and Girard Bank (f/k/a Girard Trust Bank), George Strawbridge, Sr. and Charles H. Norris, trustees under Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 (as to an undivided 30% interest), in fee, certain premises more particularly described in said indenture, and a portion of the premises therein conveyed is part of the premises hereinafter more particularly described as Premises A, B, and E; and

WHEREAS, on July 21, 1981 George Strawbridge, Sr., removed Girard Bank (f/k/a Girard Trust Bank) and appointed Delaware Trust Company as the successor corporate trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, in 1981 Charles H. Norris, Jr., appointed William C. Lickle as his successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 and the said William C. Lickle accepted said appointment as trustee on July 28, 1981; and

WHEREAS, an Adjudication filed in Montgomery County Orphans' Court Division of Court of Common Pleas No. 84664 in re: Trust Inter Vivos: George Strawbridge, Jr., Settlor, and excerpt of Schedule of Distribution recorded August 23, 1984 in Chester County in Deed Book B-64 page 175 awarded the undivided 30% interest in Real Estate unto Delaware Trust Company, George Strawbridge and William C. Lickle, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, by Decree of Orphans' Court Division of Court of Common Pleas of Montgomery County, Pennsylvania, dated March 13, 1985, the trustees under Trust under Deed of George Strawbridge, Jr. dated January 20, 1971, were changed to Delaware Trust Company, Dorrance H. Hamilton and George J. Baxter; and

WHEREAS, by Removal of Corporate Co-Trustee and Appointment of Successor Corporate Co-Trustee, by Dorrance H. Hamilton and George J. Baxter, trustees, dated December 16, 1998, the First Union National Bank (f/k/a Delaware Trust Company) was replaced as Corporate Co-Trustee of the Trust under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971 by Mellon Bank, N.A.; and

WHEREAS, on July 8, 2005 Dorrance H. Hamilton appointed R. Stewart Strawbridge as her successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 and the said R. Stewart Strawbridge accepted said appointment as trustee on August 1, 2005;

WHEREAS, on July 1, 2008, Mellon Bank, N.A. changed its name to BNY Mellon, N.A.; and

Unofficial Copy

WHEREAS, Jane F. Trimble by indenture dated March 31, 1997 and recorded April 2, 1997 in the Office of the Recorder of Deeds of Chester County in Record Book 4158, Page 1495, granted and conveyed unto George Strawbridge, Jr., in fee a certain premises more particularly described in said indenture, and the premises therein conveyed is more particularly described herein as Premises C and D; and

WHEREAS, Grantor and Grantee have agreed that George Strawbridge, Jr., identified individually as one of Grantors named in this Deed will convey with special warranty his interest in the property described herein on Exhibit A (the "Property"); and BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, identified Grantors in their capacity as trustees in this Deed will convey with title warranties typically provided by trustees, as more fully set forth herein, the Property, as described on Exhibit A; and

NOW THEREFORE, for and in consideration of the sum of Six Million One Hundred Five Thousand and 00/100 Dollars ($6,105,000.00) payment by the Grantee and receipt by the Grantors in lawful money of the United States of America of which is hereby acknowledged , the Grantors hereby have granted and conveyed, bargained and sold, released and confirmed, and by these presents do grant and convey, bargain and sell, release and confirm unto the Grantee:

> All those certain tracts of land situate in Elk Township, New London Township and Franklin Township, Chester County, Commonwealth of Pennsylvania, which are more particularly described on Exhibit A attached hereto and made a part hereof; and

TOGETHER WITH all and singular the buildings and improvements, ways, streets, alleys, passages, waters, water-courses, mineral, timber and other surface and subsurface rights, liberties, privileges, hereditaments and appurtenances, whatsoever belonging, or in anywise appertaining to the Property, and the reversions and remainders, rents, issues, and profits thereof; and all the estate, right, title, interest, claim and demand whatsoever pertaining to the Property at law or in equity.

TO HAVE AND TO HOLD the Property, with the buildings and improvements thereon erected, hereditaments and premises hereby granted, and the appurtenances, unto the said Grantee, its successors and assigns forever.

AND the said GEORGE STRAWBRIDGE, JR., for himself and his heirs and assigns, does covenants, promises and agrees to and with the said Grantee, its successors and assigns, as to the Property only as described on Exhibit A that he, the said George Strawbridge, Jr., and his heirs and assigns, all and singular the hereditaments and premises hereby granted or mentioned and intended so to be, with the appurtenances, unto the said Grantee, its successors and assigns, against him, the said George Strawbridge, Jr., and his heirs and assigns, and against all and every person and persons whosoever lawfully claiming or to claim the same or any part thereof, by, from or under, him, them or any of them, shall and will WARRANT and forever DEFEND.

UNOFFICIAL COPY

AND the said BNY MELLON, N.A. (f/k/a Mellon Bank, N.A.), R. STEWART STRAWBRIDGE and GEORGE J. BAXTER, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971, do as to the Property as described on Exhibit A covenant, promise and agree to and with said Grantee, its heirs and assigns, that they, the said Trustees, have not done, committed, or knowingly or willingly suffered to be done or committed, any act, matter or thing whatsoever whereby the premises hereby granted, or any part thereof, is, are, shall or may be impeached, charged or encumbered, in title, charge, estate, or otherwise howsoever.

UNDER AND SUBJECT to the terms and conditions of that certain Declaration of Covenants, Conditions and Restrictions given by The Conservation Fund, a Non-Profit Corporation, a Maryland corporation, to the County of Chester, a Pennsylvania county of the third class, of even date herewith, and intended to be recorded in the Chester County Recorder of Deeds Office immediately after this Indenture.

THIS PROPERTY was acquired with funds provided by the Pennsylvania Department of Conservation and Natural Resources ("Department"). The source of the funds is the Keystone Recreation, Park and Conservation Fund – LT. This Property may not be converted to purposes other than those authorized under the Act for property acquired with Department funds. No change of use and no transfer of ownership, control or interest in the Property may occur, and no encumbrance may be placed on this Property, without the written consent of the Department or its successor. The restriction in this paragraph applies to both the surface and subsurface of the Property. This restriction has the effect of a covenant running in perpetuity and the land is binding upon the owner(s) of the Property and upon all subsequent owners, successors and assigns. This restriction is enforceable by the Department and its successors.

This Indenture may be signed in two or more counterparts (or with counterpart signature pages) which taken together, shall constitute a full executed indenture and shall be considered a single document. The parties intend that a fully executed Indenture containing the signatures of all of the parties shall be binding on the parties.

[SIGNATURES BEGIN ON THE FOLLOWING PAGE]

Unofficial Copy

In Witness Whereof, the said Grantors have caused these presents to be duly executed under seal dated the day and year first above written.

George Strawbridge, Jr. (SEAL)

STATE OF DELAWARE)
) ss.:
COUNTY OF NEW CASTLE)

On the 12th day of NOVEMBER in the year 2018, before me, the undersigned, personally appeared George Strawbridge, Jr., personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Notary Public
Commission Expires: AUG. 8, 2020

DIANA S. SKOMORUCHA
NOTARY PUBLIC
STATE OF DELAWARE
MY COMMISSION EXPIRES AUG. 8, 2020

Unofficial Copy

BNY Mellon, N.A., (f/k/a Mellon Bank, N.A.), Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

By: _____ (SEAL)
Name: Maritza Ramos-Morcado
Title: VP

STATE OF New Jersey)
) ss.:
COUNTY OF Passaic)

On this, the 13th day of November, 2018, before me, the undersigned officer, personally appeared Maritza Ramos, who acknowledged himself / herself to be the VP of BNY Mellon N.A., (f/k/a Mellon Bank N.A.), a national banking institution, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971 and that he / she as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the association in the capacity therein stated by himself/herself as such officer.

In Witness Whereof, I hereunto set my hand and official seal.

_____
Notary Public
Commission Expires:

HEATHER GOLDSTEIN
NOTARY PUBLIC OF NEW JERSEY
Comm. # 2438133
My Commission Expires 9/6/2023

Unofficial Copy

George Baxter (SEAL)
George Baxter, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

STATE OF Pennsylvania)
) ss.:
COUNTY OF Bucks)

On the 9 day of November in the year 2018, before me, the undersigned, personally appeared George Baxter, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Notary Public
Commission Expires: 10-31-2021

Commonwealth of Pennsylvania - Notary Seal
KATHLEEN BRADFIELD, Notary Public
Bucks County
My Commission Expires October 31, 2021
Commission Number 1097214

Unofficial Copy

(SEAL)
R. Stewart Strawbridge, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

STATE OF DELAWARE)
) ss.:
COUNTY OF NEW CASTLE)

On the 13th day of NOVEMBER in the year 2018, before me, the undersigned, personally appeared R. Stewart Strawbridge, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

DIANA S. SKOMORA MY COMMISSION EXPIRES AUG. 8 2020 NOTARY PUBLIC STATE OF DELAWARE

Notary Public
Commission Expires: AUGUST 8, 2020

Unofficial Copy

File No: 180155PHI
Tax Parcel No. 72-6-4
Chesterville Road (A), Elk Township, Chester County, PA
Elk, Chester County, PA
New London, Chester County, PA

The complete address of the above named Grantee, The Conservation Fund, a Non-Profit Corporation is:

The Conservation Fund
1655 North Fort Myer Drive, Suite 1300
Arlington, Virginia 22209

On behalf of the Grantee:

Joan R. O'Day

Unofficial Copy

EXHIBIT "A"
LEGAL DESCRIPTION OF THE PROPERTY

That certain tract of land situate in Elk Township, New London Township and Franklin Township, Chester County, Commonwealth of Pennsylvania, identified as Uniform Parcel Identifier No. 72.6.4 and known as #99 Bullock Road, as more particularly described below, shown September 26, 2017, prepared by Transition Engineering Surveying for The Conservation Fund, known as Strawbridge Phase II, Project No 294.02.01.

(Source of Title: Deed Record B, Volume 64, Page 175).

BEGINNING at a point in the bed and title line of Strickersville Road at 33' wide, said point being a common corner for the phase herein being described and Premises B, known as #1 Springlawn Road, now or formerly of Delaware Trust Co. and George Strawbridge, et al. (Deed Record B, Volume 64, Page 175) (U.P.I. 70-5-7), said point being in the bridge over Big Elk Creek, and further located by the title line of said Strickersville Road, N 69° 30' 51" E, 474.02' from its point of intersection formed with the title centerline of Springlawn Road T-354 vacated, said point being in the southerly terminus of a public trail easement at 33' wide.

THENCE from the said point of beginning, along said Premises B and along new title (tie) lines of Big Elk Creek, the forty-four (44) following described courses and distances:

1. N 35° 00' 10" E, 49.64' to a point;
2. N 20° 15' 51" E, 124.86' to a point;
3. N 32° 08' 25" W, 141.01' to a point;
4. N 68° 35' 19" W, 225.52' to a point;
5. N 53° 42' 31" W, 450.90' to a point;
6. N 69° 58' 20" W, 722.25' to a point;
7. N 78° 05' 35" W, 494.00' to a point;
8. N 21° 56' 11" W, 208.51' to a point;
9. N 51° 04' 59" W, 86.98' to a point;
10. N 18° 10' 41" W, 316.20' to a point;
11. N 14° 13' 18" W, 363.08' to a point;
12. N 15° 45' 23" E, 362.93' to a point;
13. N 04° 11' 42" E, 534.08' to a point;
14. N 15° 10' 32" W, 87.18' to a point;
15. N 13° 01' 47" W, 138.20' to a point;
16. N 43° 19' 31" W, 235.57' to a point;
17. N 74° 20' 31" W, 302.37' to a point;
18. N 41° 46' 56" W, 369.15' to a point;
19. S 78° 03' 10" W, 111.54' to a point;
20. N 77° 38' 15" W, 250.88' to a point;

Unofficial Copy

21.N 74° 32' 54" W, 170.50' to a point;
22.N 84° 17' 05" W, 150.48' to a point;
23.N 32° 20' 03" W, 167.44' to a point;
24.N 83° 58' 21" W, 228.35' to a point;
25.N 81° 36' 22" W, 210.89' to a point;
26.N 34° 00' 01" W, 128.70' to a point;
27.N 69° 20' 47" W, 132.00' to a point;
28.S 84° 25' 34" W, 146.37' to a point;
29.S 54° 58' 01" W, 237.29' to a point;
30.S 24° 31' 14" W, 114.90' to a point;
31.S 23° 26' 54" E, 139.08' to a point;
32.S 06° 34' 29" E, 666.92' to a point;
33.S 13° 53' 09" E, 194.74' to a point;
34.S 17° 11' 40" W, 99.01' to a point;
35.S 36° 17' 09" W, 217.50' to a point;
36.S 64° 53' 11" W, 130.54' to a point;
37.S 89° 14' 08" W, 115.53' to a point;
38.S 72° 51' 22" W, 177.80' to a point;
39.N 62° 40' 24" W, 160.48' to a point;
40.N 40° 43' 49" W, 141.24' to a point;
41.N 23° 53' 55" W, 460.54' to a point;
42.N 14° 26' 10" W, 397.54' to a point;
43.N 28° 51' 08" W, 347.66' to a point in the centerline of said Big Elk Creek; and
44.N 67° 47' 50" W, 63.22' to a point, said point being a common corner for the phase herein being described said Premises B lands known as #1075 Chesterville Road, now or formerly of David Cooper and Sharon S. Cooper his wife (Deed Record U, Volume 50, Page 144) (U.P.I. 71-5-2), and Premises D;

THENCE along said Premises D, N 44° 44' 34" E, 782.85' to a point (iron pin call), a corner for lands known as #770 Chesterville Road, now or formerly of Michael E. Chaga and Doris J. Chaga his wife (Deed Book 3781, Page 1752) (U.P.I. 72-6-1.2);

THENCE by the same the three (3) following described courses and distances:

1. N 59° 40' 06" E, 387.37' to a point (iron pin call);
2. N 50° 54' 34" E, 301.81' to a point (tree call); and
3. N 83° 16' 22" E, 293.86' to a point (iron pin call), a corner for Lot No. 18 of Southview Estates (Microfilm No. 8357);

THENCE along the rear lot lines of said Lot No. 18, the three (3) following described courses and distances:

1. N 46° 57' 13" E, 284.39' to a point (iron pin call);
2. N 50° 29' 03" E, 187.62' to a point (iron pin call); and

Unofficial Copy

3. N 67° 15' 23" E, 231.82' to a point (iron pin call), a rear corner for Lot No. 17 of said Southview Estates;

THENCE along the rear lot line of said Lot No. 17, and along the rear lot lines of Lot Nos. 16, 10, 9, and 8, N 82° 03' 32" E, 1584.08' to a point (concrete monument call), a rear corner for Lot No. 4 of the subdivision of Newline Homes (Microfilm No. 17347);

THENCE along the rear lot lines of said Lot No. 4 and Lot No. 5 of said Newline Homes, N 79° 29' 02" E, 449.98' to a point (concrete monument call), a rear corner for Lot No. 13 of Hunters Crossing (Microfilm No. 8668);

THENCE along the rear lot line of said Lot No. 13, in part, N 80° 07' 32" E, 326.16' to a point (iron pin call), a corner for Lot Nos. 12, 13, and 14 of the Raymond L. Riale Subdivision (Microfilm No. 690) known as #20 Bullock Road;

THENCE by the same S 03° 48' 32" W, 334.84' to a point (iron pin call);

THENCE still along said lands known as #20 Bullock Road and along Lot No. 15 of the said Raymond L. Riale Subdivision, known as #17 Bullock Road, S 00° 19' 28" E, 225.12' to a point (iron pin call);

THENCE still along said lands known as #17 Bullock Road, the two (2) following described courses and distances:

1. S 07° 41' 32" W, 196.00' to a point (iron pin call); and
2. S 03° 29' 32" W, 455.18' to a point (iron pin call);

THENCE still along lands known as #17 Bullock Road, and along Lot No. 6 known as #7 Bullock Road, in part, S 89° 25' 28" E, 626.16' to a point (iron pin call);

THENCE still along said lands known as #7 Bullock Road, in part, and along Lot No. 5 of the said Raymond L. Riale Subdivision, S 88° 51' 28" E, 580.03' to a point (iron pin call), a corner for lands known as #224 Walker Road, now or formerly of Alan R. Bow (Deed Book 3826, Page 1539) (U.P.I. 72-6-7.1);

THENCE along said lands known as #224 Walker Road, and along lands known as #240 and #208 Walker Road, now or formerly of Christopher Davalos and Laura Davalos his wife (Deed Book 8009, Page 347) (U.P.I. 72-6-7 and U.P.I. 72-6-7.2), S 89° 05' 32" E, 1201.80' to a point, a corner for lands known as #207 Walker Road, now or formerly of Mt. Olivet Church (U.P.I. 72-6-3);

THENCE by the same, the seven (7) following described courses and distances:

1. S 02° 48' 39" E, 83.52' to a point;
2. N 86° 00' 21" E, 270.00' to a point;
3. N 29° 28' 09" W, 76.20' to a point;

Unofficial Copy

4. N 39° 17' 09" W, 94.89' to a point;
5. S 88° 32' 21" W, 112.37' to a point;
6. N 44° 28' 51" E, 131.16' to a point; and
7. N 76° 49' 51" E, 93.81' to a point, a corner for Premises E known as #401 Strickersville Road, now or formerly of Delaware Trust Co. and trustee for George Strawbridge (Deed Record B, Volume 64, Page 175) (U.P.I. 72-6-10);

THENCE by the same (along the bed and new title lines for Mt. Olivet Road, at 33' wide), the nine (9) following described courses and distances:

1. S 36° 03' 37" E, 230.03' to a point;
2. S 14° 47' 21" E, 384.05' to a point;
3. S 14° 01' 33" W, 607.00' to a point;
4. S 08° 55' 54" W, 159.65' to a point;
5. S 22° 22' 46" W, 237.42' to a point;
6. S 28° 03' 06" W, 1020.62' to a point;
7. S 10° 44' 27" W, 481.21' to a point;
8. S 10° 22' 42" E, 454.24' to a point; and
9. S 05° 05' 28" E, 425.74' to a point near or in the bed of Strickersville Road;

THENCE near or in the bed of Strickersville Road, S 55° 23' 18" W, 22.86' to a point (1" pipe call) a corner for lands known as #511 Strickersville Road, now or formerly of Zachary Wilson and Amy R. Wilson his wife (Deed Book 726, Page 1567) (U.P.I. 72-6-6.1);

THENCE by the same, the eleven (11) following described courses and distances:

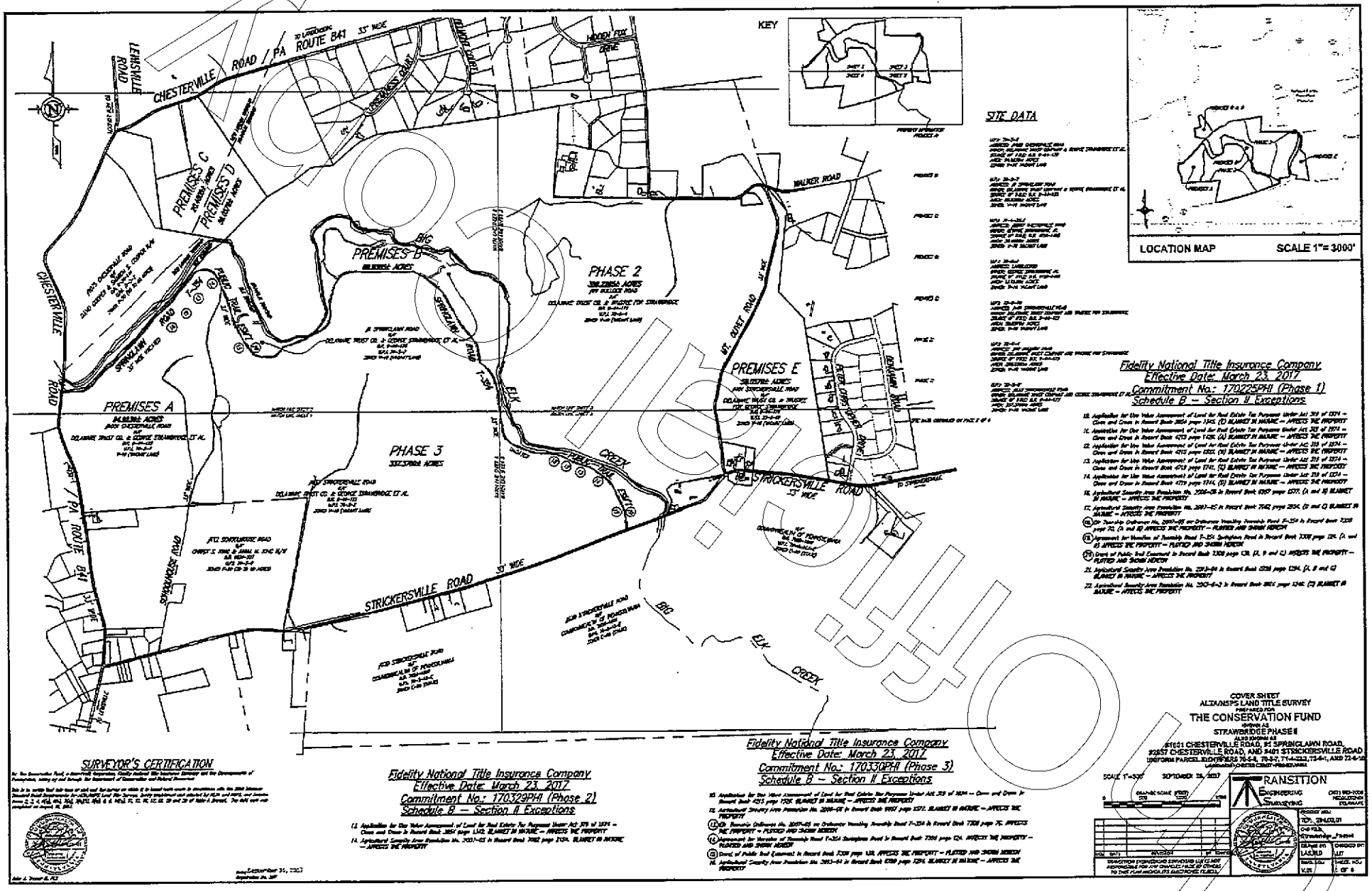
1. S 79° 45' 58" W, 588.35' to a point;
2. S 79° 20' 42" W, 88.07' to a point;
3. S 43° 06' 02" W, 90.80' to a point;
4. S 24° 21' 19" E, 131.82' to a point;
5. S 04° 44' 39" E, 48.70' to a point;
6. S 18° 19' 41" W, 52.00' to a point;
7. S 31° 54' 41" W, 25.00' to a point;
8. S 17° 24' 41" W, 15.00' to a point;
9. S 00° 45' 19" E, 30.00' to a point;
10. S 36° 04' 41" W, 43.00' to a point; and
11. S 52° 21' 11" W, 43.94' to a point in the title centerline of Strickersville Road;

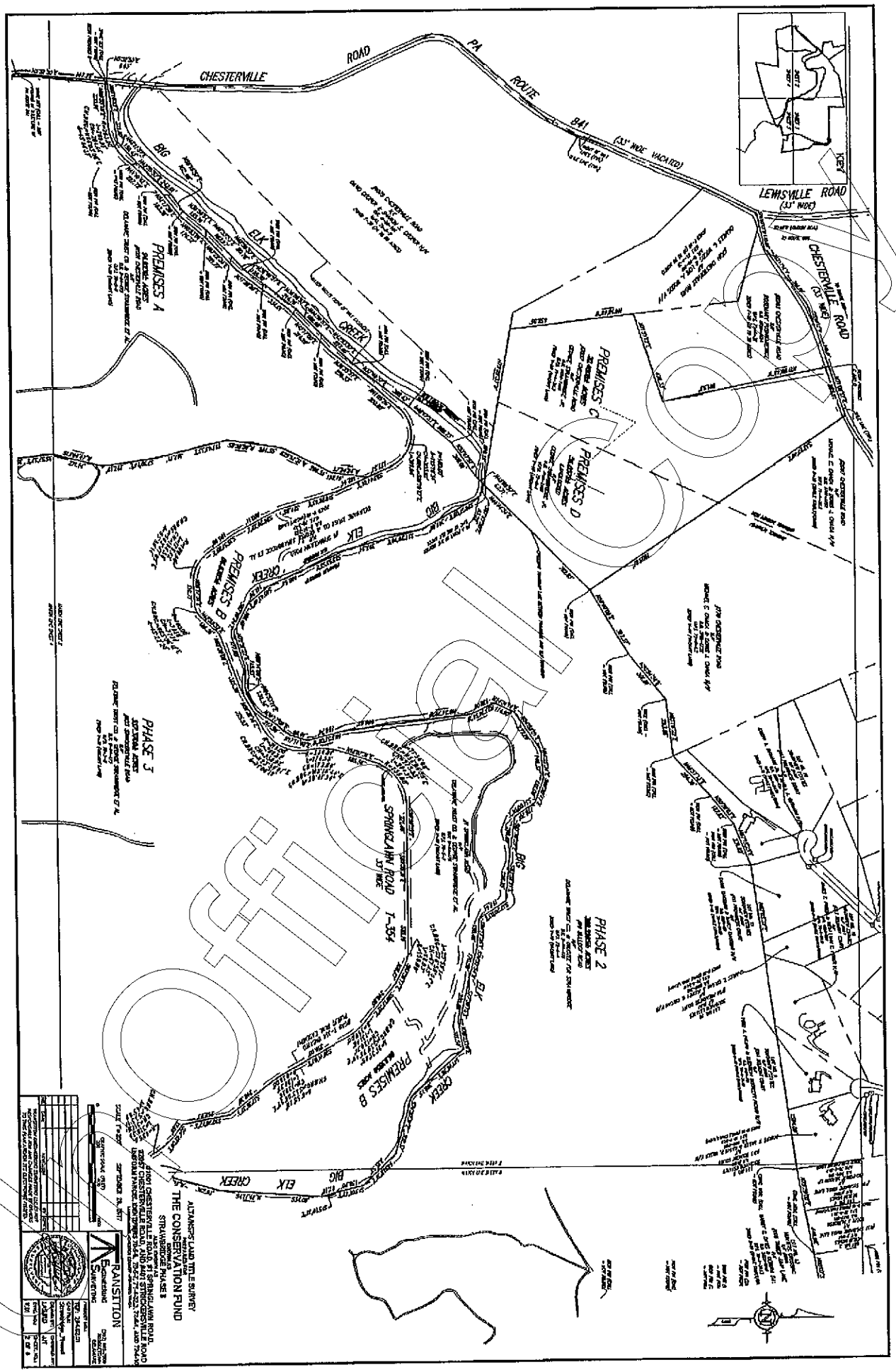
THENCE by the same, S 69° 30' 51" W, 38.10' to a point, a corner for said Premises B, the first mentioned point and place of beginning.

The Strawbridge II – Parcel 1 and Parcel 2 CONTAINING with said described metes and bounds 386.2285 acres of land, be the same more or less.

Unofficial Copy

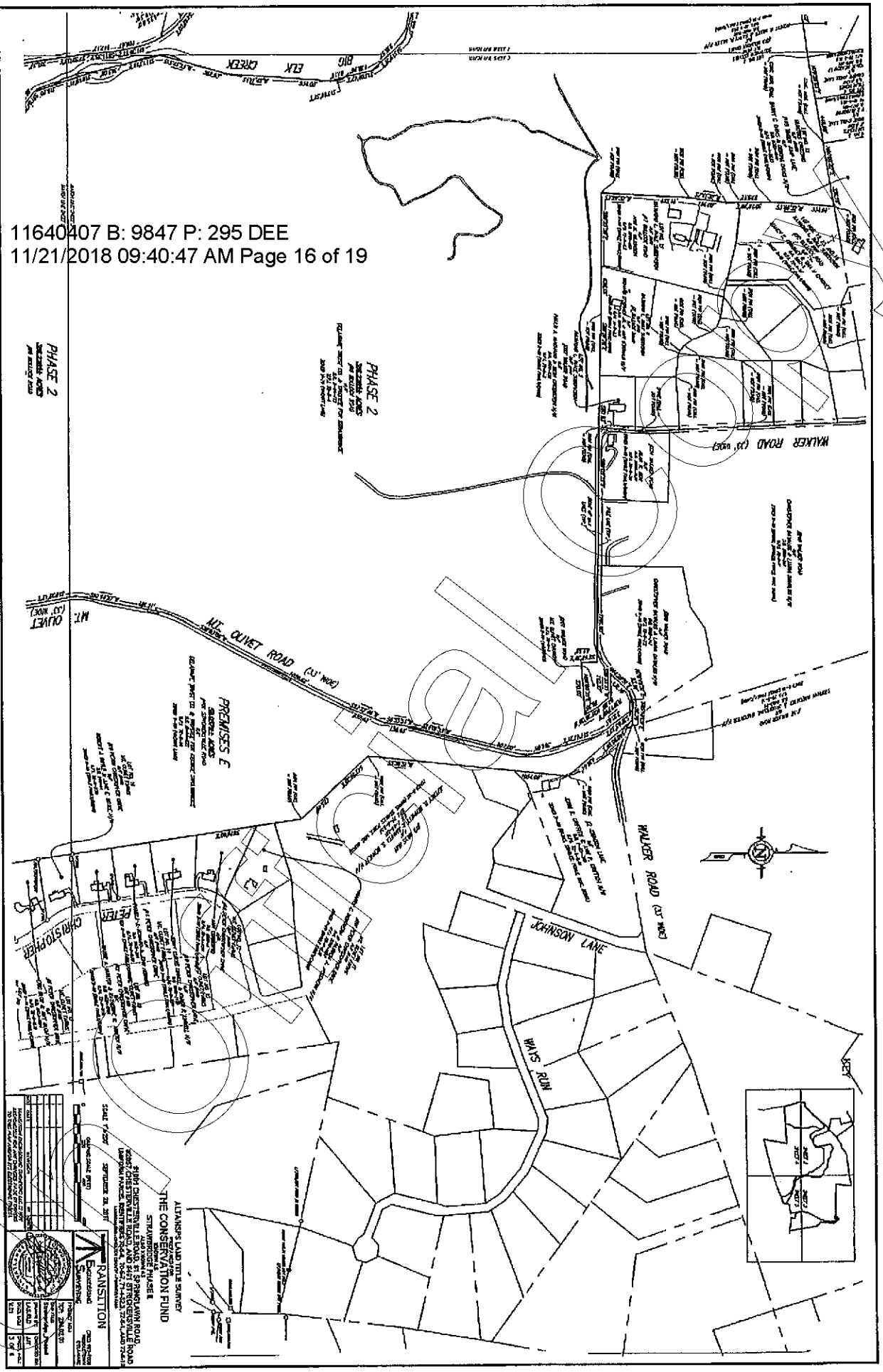
11640407 B: 9847 P: 293 DEE
11/21/2018 09:40:47 AM Page 14 of 19



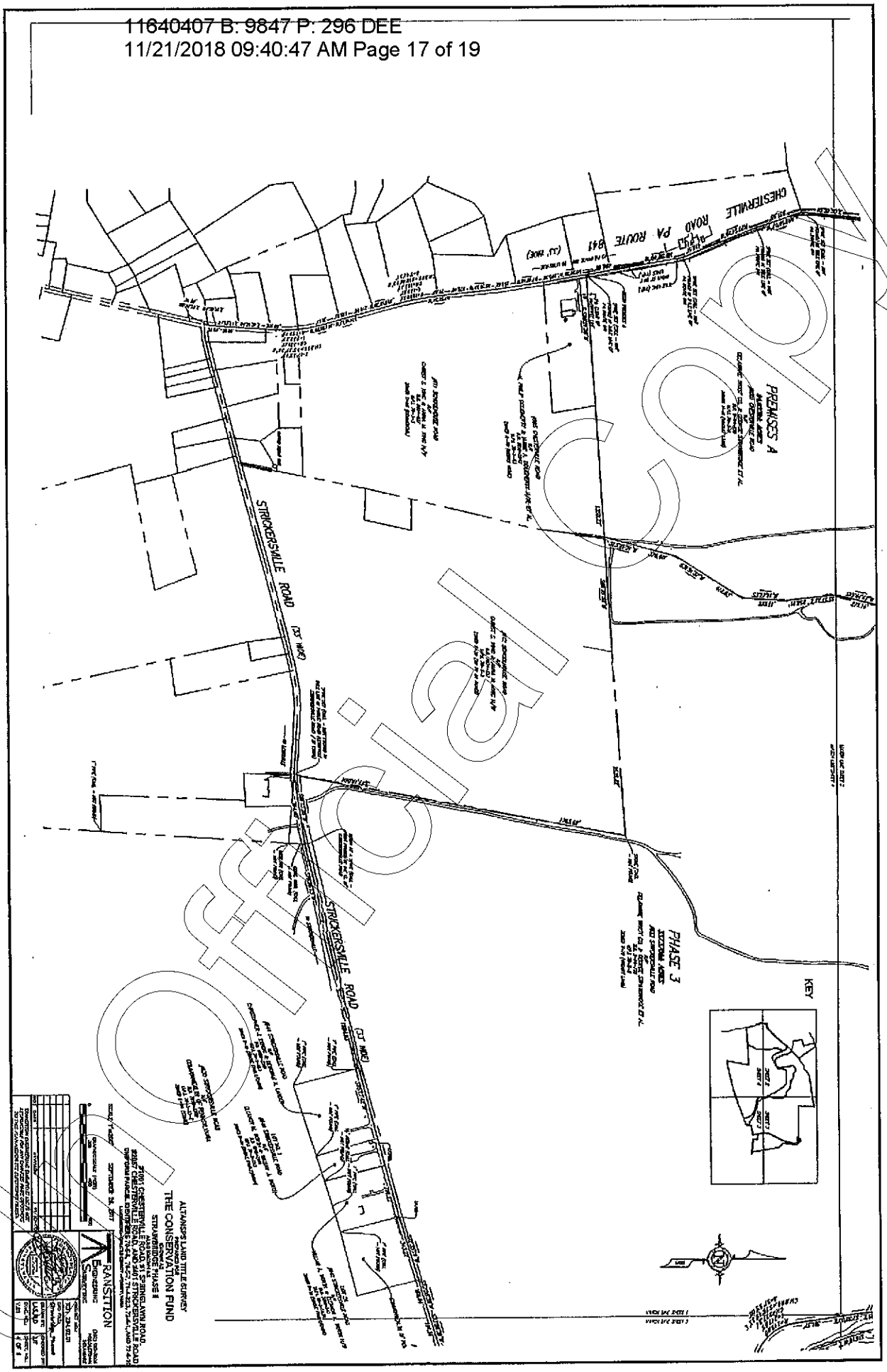


Unofficial Document

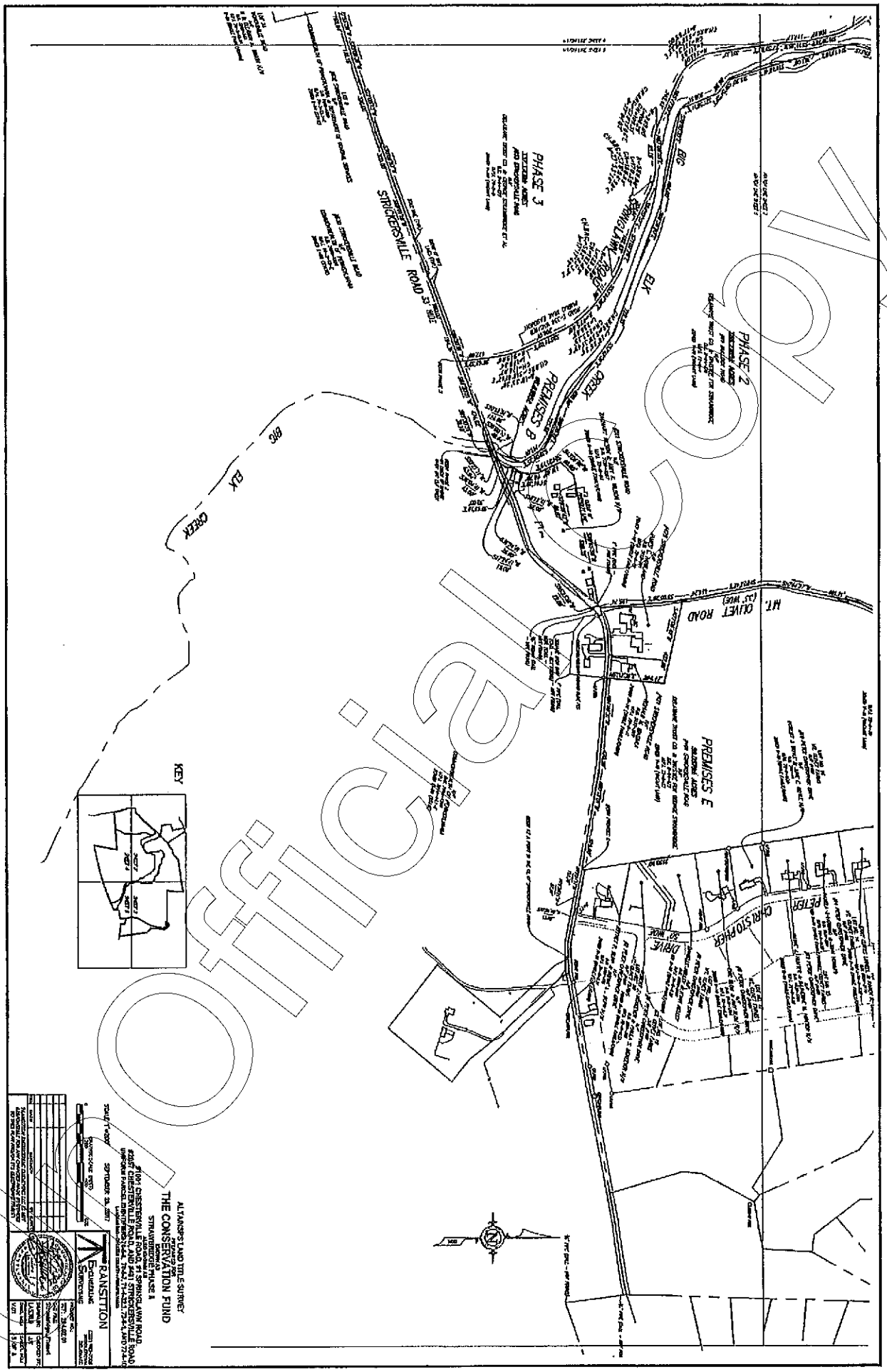
Addendum A


BIG ELK CREEK
PHASE 2
PHASE 2
PHASE 2
WALKER ROAD (33' WIDE)
MT. OLIVET ROAD (33' WIDE)
MT. OLIVET (33' WIDE)
PREMISES E
CHRISTOPHER
PETER
WALKER ROAD (33' WIDE)
JOHNSON LANE
WAYS RUN
ALTA/NSPS LAND TITLE SURVEY
THE CONSERVATION FUND
STRAWBRIDGE PHASE II
SEPTEMBER 28, 2017
RANSITION
Surveying
Engineering

Addendum A



Unofficial Copy



Unofficial Copy

Addendum A

REV-183 EX (2-15)

pennsylvania
DEPARTMENT OF REVENUE
Bureau of Individual Taxes
PO BOX 280603
Harrisburg, PA 17128-0603

REALTY TRANSFER TAX STATEMENT OF VALUE

See reverse for instructions.

RECORDER'S USE ONLY
State Tax Paid
Book Number
Page Number
Date Recorded

Complete each section and file in duplicate with Recorder of Deeds when (1) the full value/consideration is not set forth in the deed, (2) the deed is without consideration or by gift, or (3) a tax exemption is claimed. If more space is needed, please attach additional sheets. A Statement of Value (SOV) is not required if the transfer is wholly exempt from tax based on family relationship or public utility easement. However, it is recommended that a SOV accompany all documents filed for recording.

A. CORRESPONDENT - All inquiries may be directed to the following person:

Name	Telephone Number:
Jodi R. O'Day, VP - The Conservation Fund	(443) 482-2826

Mailing Address	City	State	ZIP Code
410 Severn Avenue, Suite 204	Annapolis	MD	21403

B. TRANSFER DATA

Date of Acceptance of Document / /

Grantor(s)/Lessor(s)	Telephone Number:	Grantee(s)/Lessee(s)	Telephone Number:
George Strawbridge, Jr. and Trustees		The Conservation Fund	703 525-6300

Mailing Address	Mailing Address
Greenville Center, Building B-100	1655 North Fort Myer Drive, Suite 1300

City	State	ZIP Code	City	State	ZIP Code
Greenville	DE	19807	Arlington	VA	22209

C. REAL ESTATE LOCATION

Street Address	City, Township, Borough
Phase 2, #99 Bullock Road	Franklin Township, Chester County, PA

County	School District	Tax Parcel Number
Chester	Avon Grove SD	72-6-4

D. VALUATION DATA

Was transaction part of an assignment or relocation? ☐ Y ☐ N

1. Actual Cash Consideration	2. Other Consideration	3. Total Consideration
6,105,000.00	+0.00	= 6,105,000.00
4. County Assessed Value	**5. Common Level Ratio Factor**	**6. Computed Value**
1,804,530.00	x 1.89	= 3,410,561.70

E. EXEMPTION DATA - Refer to instructions for exemption status.

1a. Amount of Exemption Claimed	1b. Percentage of Grantor's Interest in Real Estate	1c. Percentage of Grantor's Interest Conveyed
$ 6,105,000.00	100.00 %	100.00 %

2. Check Appropriate Box Below for Exemption Claimed.

- ☐ Will or intestate succession. _____ (Name of Decedent) _____ (Estate File Number)
- ☐ Transfer to a trust. (Attach complete copy of trust agreement identifying all beneficiaries.)
- ☐ Transfer from a trust. Date of transfer into the trust _____
  If trust was amended attach a copy of original and amended trust.
- ☐ Transfer between principal and agent/straw party. (Attach complete copy of agency/straw party agreement.)
- ☐ Transfers to the commonwealth, the U.S. and instrumentalities by gift, dedication, condemnation or in lieu of condemnation. (If condemnation or in lieu of condemnation, attach copy of resolution.)
- ☐ Transfer from mortgagor to a holder of a mortgage in default. (Attach copy of mortgage and note/assignment.)
- ☐ Corrective or confirmatory deed. (Attach complete copy of the deed to be corrected or confirmed.)
- ☐ Statutory corporate consolidation, merger or division. (Attach copy of articles.)
- ☒ Other (Please explain exemption claimed.) Exempt pursuant to 72 P.S. Section 8102-C.3(18)

Under penalties of law, I declare that I have examined this statement, including accompanying information, and to the best of my knowledge and belief, it is true, correct and complete.

Signature of Correspondent or Responsible Party	Date
By: Jodi R O'D The Conservation Fund	11/15/18

FAILURE TO COMPLETE THIS FORM PROPERLY OR ATTACH REQUESTED DOCUMENTATION MAY RESULT IN THE RECORDER'S REFUSAL TO RECORD THE DEED.

Unofficial Copy

Fidelity National Title Insurance Company

FIDELITY NATIONAL TITLE INSURANCE COMPANY
COMMITMENT FOR TITLE INSURANCE

Schedule A

1. Effective Date: March 23, 2017 **Commitment No.:** 170225PHI (Phase 1)

2. Policy or Policies to be issued:

ALTA Owner's Policy - 6/17/06

Proposed Insured: The Conservation Fund, a Non-Profit Corporation and The Commonwealth of Pennsylvania, acting by and through The Department of Conservation and Natural Resources, as their respective interests appear

Amount: $4,385,000.00

ALTA Loan Policy - 6/17/06

Proposed Insured: NONE

Amount: N/A

3. The estate or interest in the land described or referred to in the Commitment covered herein is:

Fee Simple

4. Title to the estate or interest in the land is vested in:

George Strawbridge, Jr., individually and BNY Mellon, NA, George Baxter and R. Stewart Strawbridge, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971

5. The land referred to in this Commitment is described as follows:

See Exhibit "A" attached hereto.

FOR INFORMATIONAL PURPOSES ONLY:
Chesterville Road (A), Elk Township, Chester County, PA
Elk, Chester County, PA
New London, Chester County, PA

Insurance Fraud Warning
Any person who, with intent to defraud or knowing that he is facilitating a fraud against an insurer, submits an application or files a claim containing false or deceptive statement is guilty of insurance fraud.

This Title Insurance Commitment (the "Commitment") is issued pursuant to the Agreement to Issue Policy contained on the American Title Association (2006) front cover form ("The Form") and is subject to the Conditions and Stipulations stated therein, all of which are incorporated herein. If this copy of the Commitment is not accompanied by the Form, a copy may be obtained from this Company upon request.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS

The following are the requirements to be complied with:

1. Instrument(s) satisfactory to us, creating the estate or interest to be insured must be executed, delivered and filed for record.

   A. DEED FROM: George Strawbridge, Jr., individually and BNY Mellon, NA, George Baxter and R. Stewart Strawbridge, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971
   TO: The Conservation Fund, a Non-Profit Corporation
   DATED: _____
   RECORDED: _____

2. Payment of full consideration to or for the account of the grantors or mortgagors.

3. Payment of the premiums, fees and charges for the policy.

4. Possible unfiled mechanics liens and municipal claims.

5. Terms of any unrecorded lease or rights of parties in possession.

6. Proof that all natural persons in this transaction are of full age and legally competent.

7. Proof of identity of parties as set forth in Recital.

8. POWERS OF ATTORNEY: If any party to the settlement intends to use a Power of Attorney at settlement, a copy of such Power of Attorney must be submitted for review in advance of settlement. Failure to comply with this requirement may result in the postponement of the settlement. Acceptability of the Power of Attorney for purposes of completion of settlement is within the discretion of the insurer.

9. Proof to be provided that any individuals holding record title have not, subsequent to acquisition of title, been a party to any divorce proceedings, whether currently ongoing or completed prior to the transaction that is the subject of this report/commitment. In the event such divorce proceedings have occurred, same to be examined and possible additional exceptions and requirements to be added. This requirement applies only to individuals and is not applicable if record owner is an LLC, LP, Corporation or other business entity.

10. Prior to settlement, search of statewide support lien system (http://www.childsupport.state.pa.us) to be performed to determine the existence of support arrearages, if any. Company or its Agent to be provided with social security numbers of all natural persons that are a party to the transaction so that this search can be performed by the closing officer no more than 30 days in advance of closing.

11. Proof that no parties to this transaction are involved in bankruptcy proceedings; if bankruptcy has been filed, same to be examined; possible additional requirements/exceptions to be added.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS
(Continued)

12. Satisfactory evidence should be provided that improvements and/or repairs or alterations thereto are completed; that contractor, sub-contractors, labor and materialmen are all paid; and have released of record all liens or notice of intent to perfect a lien for labor material.

13. TAXES:
    Receipts for Township, County and School Taxes for the three prior years to be produced.
    Township, County and School Taxes for the current year 2017
    Assessment $13,170.00 (A), $9,800.00 (B), $12,990.00 (C), $2,360.00 (D) and $8,760.00 (E)
    Tax ID / Parcel No. 70-5-6 (A) 70-5-7 (B) 71-4-32.3 (C) 72-6-1 (D) 72-6-10 (E)

14. WATER AND SEWER RENTS:
    Receipts for Water and Sewer Rents for the three prior years to be produced.
    Water and Sewer Rents for the current year 2017.

15. MECHANICS AND MUNICIPAL CLAIMS: NONE

16. MORTGAGES:

    A. Amount: $2,250,000.00
    Mortgagor: George Strawbridge, Jr. individually and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971
    Mortgagee: Springlawn Corporation
    Dated: 10-11-1978 and Recorded 10-20-1978 in Record Book Mortgage Book E 57 Page 575.

    Assigned to Delaware Trust Company 3-27-1979 in Mortgage Book M 58 page 89.
    Assigned to Northern Trust Company of Chicago 9-21-1989 in Record Book 1706 page 34.

    (A,B and E) (covers additional property)

17. JUDGMENTS: NONE

18. Names of all relevant parties to the within real estate transaction to be searched prior to closing to verify that they are not Specially Designated Nationals subject to the provisions of President's Executive Order Targeting Terrorist Assets.

19. Possible additional Company approvals, which approvals depend on liability amount as shown on Schedule A, currently designated as TBD.

20. Trust Instrument to be examined, additional exceptions, if any, to be certified.

21. Proof that the trusts are still subsisting.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS
(Continued)

22. Description hereon for temporary use only -Survey must be produced and the premises described in accordance therewith. Possible additional requirements and exceptions to be added.

23. Divorce Action: Nina S. Strawbridge vs. George Strawbridge, Jr. #2009-00851-DI entered 1-28-2009. (No Final Decree)

    Property settlement agreement and any amendments thereto between Nina S. Strawbridge and George Strawbridge, Jr. to be produced and examined prior to settlement.

    Proof that no award has been made of subject premises under divorce proceedings #2009-00851-DI.

24. Right of First Offer Agreement by and between George Strawbridge, Jr., BNY Mellon, N.A. (f/k/a Mellon Bank, N.A.), George Baxter and Redmond Stewart Strawbridge, as Co-Trustees of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 (Seller) and The Conservation Fund, a Non-Profit Corporation dated 12-15-2009 and recorded 12-29-2009 in Record Book 7837 page 446.

25. Last Insured Not Available.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 2
EXCEPTIONS

In the event that one or more of the Exceptions listed below references covenants, conditions and/or restrictions, please note that the Exception(s) specifically exclude any covenants or restrictions, if any, based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, or source of income, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law.

The Policy or Policies to be issued will contain exception to the following unless the same are disposed of to the satisfaction of the Company.

1. Intentionally omitted.

2. Intentionally omitted.

3. Intentionally omitted.

4. Easements, encroachments, overlaps, shortages of area, boundary line disputes and other matters affecting title that an accurate and complete survey would disclose.

5. Real estate taxes for the current and future tax years which are hereafter assessed and are not yet due and payable.

6. Rights of the public and others entitled thereto in and to the use only of that portion of the premises within the bounds of Chesterville Road, Rt 841, School House Road, T-350, Strickersville Road, LR 15016, Mount Olivet Road, T-356, and Walker Road.

7. Stream of water flows through premises hereon, subject to rights of other riparian owners abutting stream.

8. Intentionally omitted.

9. Intentionally omitted.

10. Application for Use Value Assessment of Land for Real Estate Tax Purposes Under Act 319 of 1974 - Clean and Green in Record Book 3854 page 1345. (E)

11. Application for Use Value Assessment of Land for Real Estate Tax Purposes Under Act 319 of 1974 - Clean and Green in Record Book 4215 page 1429. (A)

12. Application for Use Value Assessment of Land for Real Estate Tax Purposes Under Act 319 of 1974 - Clean and Green in Record Book 4215 page 1525. (B)

13. Application for Use Value Assessment of Land for Real Estate Tax Purposes Under Act 319 of 1974 - Clean and Green in Record Book 4719 page 1741. (C)

14. Application for Use Value Assessment of Land for Real Estate Tax Purposes Under Act 319 of 1974 - Clean and Green in Record Book 4719 page 1744. (D)

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 2
EXCEPTIONS
(Continued)

15. Intentionally omitted.

16. Agricultural Security Area Resolution No. 2006-06 in Record Book 6957 page 1577. (A and B)

17. Agricultural Security Area Resolution No. 2007-05 in Record Book 7082 page 2154. (D and E)

18. Elk Township Ordinance No. 2007-05 an Ordinance Vacating Township Road T-354 in Record Book 7308 page 70. (A and B)

19. Agreement for Vacation of Township Road T-354 Springlawn Road in Record Book 7308 page 124. (A and B)

20. Grant of Public Trail Easement in Record Book 7308 page 139. (A, B and G)

21. Agricultural Security Area Resolution No. 2013-04 in Record Book 8799 page 1294. (A, B and G)

22. Agricultural Security Area Resolution No. 2013-6-2 in Record Book 8816 page 1246. (C)

NOTE: The Policy(s) of insurance may contain a clause permitting arbitration of claims at the request of either the Insured or the Company. Upon request, the Company will provide a copy of this clause and the accompanying arbitration rules prior to the closing of the transaction.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

EXHIBIT A

Description hereon for temporary use only -Survey must be produced and the premises described in accordance therewith. Possible additional requirements and exceptions to be added.

Premises: A and B

All that certain parcel of land situate in the Township of Elk, County of Chester, and Commonwealth of Pennsylvania being known as:

UPI #70-5-6 containing 96.7 acres, more or less and

UPI #70-5-7 containing 71.9 acres, more or less

Premises: C and D

Note: The last two courses in the legal narrative set forth in Record Book 4158 page 1495 are incorrect.

ALL that certain tract of ground, situate in New London and Franklin Townships, Chester County, State of Pennsylvania, and being more particularly bounded and described in accordance with a Plan prepared by George E. Regester, Jr. & Sons, Inc., dated September 1, 1982, as follows, to-wit:

BEGINNING at a point in the bed of Public Road TR841 known as Lewisville-Chesterville Road, said road leading in an Easterly direction to Chesterville and in a Southerly direction to Lewisville, said point of Beginning marking a corner of this about to be described tract and a corner of other lands of J. Robert Frederick, being Parcel A on said Plan, said point of Beginning being the following three (3) described courses and distances to wit along the Lewisville-Chesterville Road from a point marking a corner of said Parcel A and a corner of lands now or formerly of Charles G. Woods: (1) North 80 degrees 12 minutes 00 seconds East, 129.48 feet to a point; (2) North 55 degrees 56 minutes 00 seconds East, 366.29 feet to a point; and (3) North 73 degrees 18 minutes 00 seconds East, 340.81 feet to said point of Beginning; thence leaving said point of Beginning and continuing along said Lewisville-Chesterville Road, North 73 degrees 18 minutes 00 seconds East, 265.91 feet to a point marking a corner of this and a corner of other lands now or formerly of J. Robert Frederick; thence leaving said Lewisville-Chesterville Road and along said other lands now or formerly of J. Robert Frederick, South 31 degrees 19 minutes 00 seconds East, crossing the township line dividing New London Township from Franklin Township, 1605.87 feet to a point marking a corner of this and a corner of lands of George Strawbridge, Jr., thence along said lands now or formerly of George Strawbridge, Jr., South 47 degrees 01 minute 00 seconds West, 790.69 feet to a point in the bed of the Big Elk Creek marking a corner of this, a corner of said lands now or formerly of George Strawbridge, Jr., and a corner of lands now or formerly of Louis T. Staats, Jr.; thence along said lands now or formerly of Louis T. Staats, Jr., North 77 degrees 37 minutes 30 seconds West, recrossing the aforementioned township line dividing New London Township from Franklin Township, 804.30 feet to a point marking a corner of this and a corner of the aforementioned lands now or formerly of Charles G. Woods, North 04 degrees 10 minutes 00 seconds West, 667.00 feet to a point marking a corner of

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

EXHIBIT A
(Continued)

this and a corner of the aforementioned Parcel A; thence along said Parcel A, the following two (2) described courses and distances, to-wit: (1) South 74 degrees 00 minutes 00 seconds West, 476.33 feet to a point; and (2) South 09 degrees 00 minutes 00 seconds East, 881.53 feet to the first mentioned point and place of BEGINNING.

Be the contents thereof what they may.

EXCEPTING THEREOUT AND THEREFROM all that certain premises which J. Robert Frederick and Marion B. Frederick, his wife, by Deed dated October 3, 1984, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book Z-64, Page 132, did grant and convey unto Department of Transportation, in fee.

Being known as

UPI #71-4-32.3 containing 19.3 acres, more or less and

UPI #72-6-1 containing 14.4 acres, more or less

Premises: E

All that certain parcel of land situate in the Township of Franklin, County of Chester and Commonwealth of Pennsylvania, being known as:

UPI #72-6-10 containing 63.5 acres, more or less.

As to Premises A, B and E

Being part of the same premises which Springlawn Corporation, a Pennsylvania corporation by Deed dated 10-18-1978 and recorded 10-21-1978 in Chester County in Deed Book W 53 Page 573 conveyed unto George Strawbridge, Jr., Individually, an undivided seventy (70%) percent interest and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Jr., Trustees under Deed of Trust of George Strawbridge, Jr., dated 1-20-1971, the remaining thirty (30%) percent interest as a tenancy in common as to the whole thereof, in fee.

Also being part of the same premises which vested in Delaware Trust Company, George Strawbridge and William C. Lickle, Trustees under Deed of George Strawbridge, Jr. dated January 20, 1971, thirty percent interest, by Certificate of Award of Real Estate, Trust Inter Vivos: George Strawbridge, Jr., Settlor No. 84664 by the Orphans' Court Division of the Court of Common Pleas for the County of Montgomery dated 8-7-1984 and recorded 8-23-1984 in Deed Book B 64 page 175

.

As to Premises C and D

Being the same premises which Jane F. Trimble by Deed dated 3-31-1977 and recorded 4-2-1997 in Chester County in Record Book 4158 Page 1495 conveyed unto George Strawbridge, Jr., in fee.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

Fidelity National Title Insurance Company

FIDELITY NATIONAL TITLE INSURANCE COMPANY
COMMITMENT FOR TITLE INSURANCE

Schedule A

1. Effective Date: March 23, 2017 **Commitment No.:** 170329PHI (Phase 2)

2. Policy or Policies to be issued:

ALTA Owner's Policy - 6/17/06

Proposed Insured: The Conservation Fund, a Non-Profit Corporation and The Commonwealth of Pennsylvania, acting by and through The Department of Conservation and Natural Resources, as their respective interests appear

Amount: $6,105,000.00

ALTA Loan Policy - 6/17/06

Proposed Insured: NONE

Amount: N/A

3. The estate or interest in the land described or referred to in the Commitment covered herein is: Fee Simple

4. Title to the estate or interest in the land is vested in:

George Strawbridge, Jr., individually and BNY Mellon, NA, George Baxter and R. Stewart Strawbridge, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971

5. The land referred to in this Commitment is described as follows:

See Exhibit "A" attached hereto.

FOR INFORMATIONAL PURPOSES ONLY:
Franklin Township, Chester County, PA

Insurance Fraud Warning
Any person who, with intent to defraud or knowing that he is facilitating a fraud against an insurer, submits an application or files a claim containing false or deceptive statement is guilty of insurance fraud.

This Title Insurance Commitment (the "Commitment") is issued pursuant to the Agreement to Issue Policy contained on the American Title Association (2006) front cover form ("The Form") and is subject to the Conditions and Stipulations stated therein, all of which are incorporated herein. If this copy of the Commitment is not accompanied by the Form, a copy may be obtained from this Company upon request.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS

The following are the requirements to be complied with:

1. Instrument(s) satisfactory to us, creating the estate or interest to be insured must be executed, delivered and filed for record.

   A. DEED FROM: George Strawbridge, Jr., individually and BNY Mellon, NA, George Baxter and R. Stewart Strawbridge, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971
   TO: The Conservation Fund, a Non-Profit Corporation
   DATED: _____
   RECORDED: _____

2. Payment of full consideration to or for the account of the grantors or mortgagors.

3. Payment of the premiums, fees and charges for the policy.

4. Possible unfiled mechanics liens and municipal claims.

5. Terms of any unrecorded lease or rights of parties in possession.

6. Proof that all natural persons in this transaction are of full age and legally competent.

7. Proof of identity of parties as set forth in Recital.

8. POWERS OF ATTORNEY: If any party to the settlement intends to use a Power of Attorney at settlement, a copy of such Power of Attorney must be submitted for review in advance of settlement. Failure to comply with this requirement may result in the postponement of the settlement. Acceptability of the Power of Attorney for purposes of completion of settlement is within the discretion of the insurer.

9. Proof to be provided that any individuals holding record title have not, subsequent to acquisition of title, been a party to any divorce proceedings, whether currently ongoing or completed prior to the transaction that is the subject of this report/commitment. In the event such divorce proceedings have occurred, same to be examined and possible additional exceptions and requirements to be added. This requirement applies only to individuals and is not applicable if record owner is an LLC, LP, Corporation or other business entity.

10. Prior to settlement, search of statewide support lien system (http://www.childsupport.state.pa.us) to be performed to determine the existence of support arrearages, if any. Company or its Agent to be provided with social security numbers of all natural persons that are a party to the transaction so that this search can be performed by the closing officer no more than 30 days in advance of closing.

11. Proof that no parties to this transaction are involved in bankruptcy proceedings; if bankruptcy has been filed, same to be examined; possible additional requirements/exceptions to be added.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS
(Continued)

12. Satisfactory evidence should be provided that improvements and/or repairs or alterations thereto are completed; that contractor, sub-contractors, labor and materialmen are all paid; and have released of record all liens or notice of intent to perfect a lien for labor material.

13. TAXES:
    Receipts for Township, County and School Taxes for the three prior years to be produced.
    Township, County and School Taxes for the current year 2017
    Assessment $52,840.00
    Tax ID / Parcel No. 72-6-4

14. WATER AND SEWER RENTS:
    Receipts for Water and Sewer Rents for the three prior years to be produced.
    Water and Sewer Rents for the current year 2017.

15. MECHANICS AND MUNICIPAL CLAIMS: NONE

16. MORTGAGES:

    A. Amount: $2,250,000.00
    Mortgagor: George Strawbridge, Jr. individually and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971
    Mortgagee: Springlawn Corporation
    Dated: 10-11-1978 and Recorded 10-20-1978 in Record Book Mortgage Book E 57 Page 575.

    Assigned to Delaware Trust Company 3-27-1979 in Mortgage Book M 58 page 89.
    Assigned to Northern Trust Company of Chicago 9-21-1989 in Record Book 1706 page 34.

    (covers additional property)

17. JUDGMENTS: NONE

18. Names of all relevant parties to the within real estate transaction to be searched prior to closing to verify that they are not Specially Designated Nationals subject to the provisions of President's Executive Order Targeting Terrorist Assets.

19. Possible additional Company approvals, which approvals depend on liability amount as shown on Schedule A, currently designated as TBD.

20. Trust Instrument to be examined, additional exceptions, if any, to be certified.

21. Proof that the trusts are still subsisting.

22. Description hereon for temporary use only -Survey must be produced and the premises

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS
(Continued)

described in accordance therewith. Possible additional requirements and exceptions to be added.

23. Divorce Action: Nina S. Strawbridge vs. George Strawbridge, Jr. #2009-00851-DI entered 1-28-2009. (No Final Decree)

    Property settlement agreement and any amendments thereto between Nina S. Strawbridge and George Strawbridge, Jr. to be produced and examined prior to settlement.

    Proof that no award has been made of subject premises under divorce proceedings #2009-00851-DI.

24. Right of First Offer Agreement by and between George Strawbridge, Jr., BNY Mellon, N.A. (f/k/a Mellon Bank, N.A.), George Baxter and Redmond Stewart Strawbridge, as Co-Trustees of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 (Seller) and The Conservation Fund, a Non-Profit Corporation dated 12-15-2009 and recorded 12-29-2009 in Record Book 7837 page 446.

25. Last Insured Not Available.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 2
EXCEPTIONS

In the event that one or more of the Exceptions listed below references covenants, conditions and/or restrictions, please note that the Exception(s) specifically exclude any covenants or restrictions, if any, based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, or source of income, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law.

The Policy or Policies to be issued will contain exception to the following unless the same are disposed of to the satisfaction of the Company.

1. Intentionally omitted.

2. Intentionally omitted.

3. Intentionally omitted.

4. Easements, encroachments, overlaps, shortages of area, boundary line disputes and other matters affecting title that an accurate and complete survey would disclose.

5. Real estate taxes for the current and future tax years which are hereafter assessed and are not yet due and payable.

6. Rights of the public and others entitled thereto in and to the use only of that portion of the premises within the bounds of Mount Olivet Road, T-356, Walker Road, and Bullock Road.

7. Stream of water flows through premises hereon, subject to rights of other riparian owners abutting stream.

8. Rights and Conditions set out in Deed Book X 14 page 515.

9. Intentionally omitted.

10. Intentionally omitted.

11. Mill and Mill race rights and privileges in Deed Book G 23 page 264.

12. Mill and Mill race rights and privileges in Deed Book Q 35 page 568.

13. Application for Use Value Assessment of Land for Real Estate Tax Purposes Under Act 319 of 1974 - Clean and Green in Record Book 3854 page 1342.

14. Agricultural Security Area Resolution No. 2007-05 in Record Book 7082 page 2154.

NOTE: The Policy(s) of insurance may contain a clause permitting arbitration of claims at the request of either the Insured or the Company. Upon request, the Company will provide a copy of this clause and the accompanying arbitration rules prior to the closing of the transaction.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

EXHIBIT A

Description hereon for temporary use only -Survey must be produced and the premises described in accordance therewith. Possible additional requirements and exceptions to be added.

All that certain parcel of land situate in the Township of Franklin, County of Chester and Commonwealth of Pennsylvania, being known as:

UPI #72-6-4 containing 370.1 acres, more or less

TOGETHER WITH the rights and benefits as set forth in Deed Book X 14 page 515.

Being part of the same premises which Springlawn Corporation, a Pennsylvania corporation by Deed dated 10-18-1978 and recorded 10-21-1978 in Chester County in Deed Book W 53 Page 573 conveyed unto George Strawbridge, Jr., Individually, an undivided seventy (70%) percent interest and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Jr., Trustees under Deed of Trust of George Strawbridge, Jr., dated 1-20-1971, the remaining thirty (30%) percent interest as a tenancy in common as to the whole thereof, in fee.

Also being part of the same premises which vested in Delaware Trust Company, George Strawbridge and William C. Lickle, Trustees under Deed of George Strawbridge, Jr. dated January 20, 1971, thirty percent interest, by Certificate of Award of Real Estate, Trust Inter Vivos: George Strawbridge, Jr., Settlor No. 84664 by the Orphans' Court Division of the Court of Common Pleas for the County of Montgomery dated 8-7-1984 and recorded 8-23-1984 in Deed Book B 64 page 175.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

Fidelity National Title Insurance Company

FIDELITY NATIONAL TITLE INSURANCE COMPANY
COMMITMENT FOR TITLE INSURANCE

Schedule A

1. Effective Date: March 23, 2017 **Commitment No.:** 170330PHI (Phase 3)

2. Policy or Policies to be issued:

ALTA Owner's Policy - 6/17/06

Proposed Insured: The Conservation Fund, a Non-Profit Corporation and The Commonwealth of Pennsylvania, acting by and through The Department of Conservation and Natural Resources, as their respective interests appear

Amount: $5,725,000.00

ALTA Loan Policy - 6/17/06

Proposed Insured: NONE

Amount: N/A

3. The estate or interest in the land described or referred to in the Commitment covered herein is: Fee Simple

4. Title to the estate or interest in the land is vested in:

George Strawbridge, Jr., individually and BNY Mellon, NA, George Baxter and R. Stewart Strawbridge, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971

5. The land referred to in this Commitment is described as follows:

See Exhibit "A" attached hereto.

FOR INFORMATIONAL PURPOSES ONLY:
Elk Township, Chester County, PA

Insurance Fraud Warning
Any person who, with intent to defraud or knowing that he is facilitating a fraud against an insurer, submits an application or files a claim containing false or deceptive statement is guilty of insurance fraud.

This Title Insurance Commitment (the "Commitment") is issued pursuant to the Agreement to Issue Policy contained on the American Title Association (2006) front cover form ("The Form") and is subject to the Conditions and Stipulations stated therein, all of which are incorporated herein. If this copy of the Commitment is not accompanied by the Form, a copy may be obtained from this Company upon request.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS

The following are the requirements to be complied with:

1. Instrument(s) satisfactory to us, creating the estate or interest to be insured must be executed, delivered and filed for record.

   A. DEED FROM: George Strawbridge, Jr., individually and BNY Mellon, NA, George Baxter and R. Stewart Strawbridge, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971
   TO: The Conservation Fund, a Non-Profit Corporation
   DATED: _____
   RECORDED: _____

2. Payment of full consideration to or for the account of the grantors or mortgagors.

3. Payment of the premiums, fees and charges for the policy.

4. Possible unfiled mechanics liens and municipal claims.

5. Terms of any unrecorded lease or rights of parties in possession.

6. Proof that all natural persons in this transaction are of full age and legally competent.

7. Proof of identity of parties as set forth in Recital.

8. POWERS OF ATTORNEY: If any party to the settlement intends to use a Power of Attorney at settlement, a copy of such Power of Attorney must be submitted for review in advance of settlement. Failure to comply with this requirement may result in the postponement of the settlement. Acceptability of the Power of Attorney for purposes of completion of settlement is within the discretion of the insurer.

9. Proof to be provided that any individuals holding record title have not, subsequent to acquisition of title, been a party to any divorce proceedings, whether currently ongoing or completed prior to the transaction that is the subject of this report/commitment. In the event such divorce proceedings have occurred, same to be examined and possible additional exceptions and requirements to be added. This requirement applies only to individuals and is not applicable if record owner is an LLC, LP, Corporation or other business entity.

10. Prior to settlement, search of statewide support lien system (http://www.childsupport.state.pa.us) to be performed to determine the existence of support arrearages, if any. Company or its Agent to be provided with social security numbers of all natural persons that are a party to the transaction so that this search can be performed by the closing officer no more than 30 days in advance of closing.

11. Proof that no parties to this transaction are involved in bankruptcy proceedings; if bankruptcy has been filed, same to be examined; possible additional requirements/exceptions to be added.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS
(Continued)

12. Satisfactory evidence should be provided that improvements and/or repairs or alterations thereto are completed; that contractor, sub-contractors, labor and materialmen are all paid; and have released of record all liens or notice of intent to perfect a lien for labor material.

13. TAXES:
    Receipts for Township, County and School Taxes for the three prior years to be produced.
    Township, County and School Taxes for the current year 2017
    Assessment $47,200.00
    Tax ID / Parcel No. 70-5-8

14. WATER AND SEWER RENTS:
    Receipts for Water and Sewer Rents for the three prior years to be produced.
    Water and Sewer Rents for the current year 2017.

15. MECHANICS AND MUNICIPAL CLAIMS: NONE

16. MORTGAGES:

    A. Amount: $2,250,000.00
    Mortgagor: George Strawbridge, Jr. individually and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971
    Mortgagee: Springlawn Corporation
    Dated: 10-11-1978 and Recorded 10-20-1978 in Record Book Mortgage Book E 57 Page 575.

    Assigned to Delaware Trust Company 3-27-1979 in Mortgage Book M 58 page 89.
    Assigned to Northern Trust Company of Chicago 9-21-1989 in Record Book 1706 page 34.

    (covers additional property)

17. JUDGMENTS: NONE

18. Names of all relevant parties to the within real estate transaction to be searched prior to closing to verify that they are not Specially Designated Nationals subject to the provisions of President's Executive Order Targeting Terrorist Assets.

19. Possible additional Company approvals, which approvals depend on liability amount as shown on Schedule A, currently designated as TBD.

20. Trust Instrument to be examined, additional exceptions, if any, to be certified.

21. Proof that the trusts are still subsisting.

22. Description hereon for temporary use only -Survey must be produced and the premises

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 1
REQUIREMENTS
(Continued)

described in accordance therewith. Possible additional requirements and exceptions to be added.

23. Divorce Action: Nina S. Strawbridge vs. George Strawbridge, Jr. #2009-00851-DI entered 1-28-2009. (No Final Decree)

    Property settlement agreement and any amendments thereto between Nina S. Strawbridge and George Strawbridge, Jr. to be produced and examined prior to settlement.

    Proof that no award has been made of subject premises under divorce proceedings #2009-00851-DI.

24. Right of First Offer Agreement by and between George Strawbridge, Jr., BNY Mellon, N.A. (f/k/a Mellon Bank, N.A.), George Baxter and Redmond Stewart Strawbridge, as Co-Trustees of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 (Seller) and The Conservation Fund, a Non-Profit Corporation dated 12-15-2009 and recorded 12-29-2009 in Record Book 7837 page 446.

25. Last Insured Not Available.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 2
EXCEPTIONS

In the event that one or more of the Exceptions listed below references covenants, conditions and/or restrictions, please note that the Exception(s) specifically exclude any covenants or restrictions, if any, based upon race, color, religion, sex, sexual orientation, familial status, marital status, disability, handicap, national origin, ancestry, or source of income, as set forth in applicable state or federal laws, except to the extent that said covenant or restriction is permitted by applicable law.

The Policy or Policies to be issued will contain exception to the following unless the same are disposed of to the satisfaction of the Company.

1. Intentionally omitted.

2. Intentionally omitted.

3. Intentionally omitted.

4. Easements, encroachments, overlaps, shortages of area, boundary line disputes and other matters affecting title that an accurate and complete survey would disclose.

5. Real estate taxes for the current and future tax years which are hereafter assessed and are not yet due and payable.

6. Rights of the public and others entitled thereto in and to the use only of that portion of the premises within the bounds of School House Road, T-350 and Strickersville Road, LR 15016.

7. Stream of water flows through premises hereon, subject to rights of other riparian owners abutting stream.

8. Rights and Conditions set out in Deed Book X 14 page 515.

9. Mill and Mill race rights and privileges in Deed Book Q 35 page 568.

10. Application for Use Value Assessment of Land for Real Estate Tax Purposes Under Act 319 of 1974 - Clean and Green in Record Book 4215 page 1528.

11. Intentionally omitted.

12. Agricultural Security Area Resolution No. 2006-06 in Record Book 6957 page 1577.

13. Elk Township Ordinance No. 2007-05 an Ordinance Vacating Township Road T-354 in Record Book 7308 page 70.

14. Agreement for Vacation of Township Road T-354 Springlawn Road in Record Book 7308 page 124.

15. Grant of Public Trail Easement in Record Book 7308 page 139.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

SCHEDULE B - SECTION 2
EXCEPTIONS
(Continued)

16. Agricultural Security Area Resolution No. 2013-04 in Record Book 8799 page 1294.

NOTE: The Policy(s) of insurance may contain a clause permitting arbitration of claims at the request of either the Insured or the Company. Upon request, the Company will provide a copy of this clause and the accompanying arbitration rules prior to the closing of the transaction.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

EXHIBIT A

Description hereon for temporary use only -Survey must be produced and the premises described in accordance therewith. Possible additional requirements and exceptions to be added.

All that certain parcel of land situate in the Township of Elk, County of Chester and Commonwealth of Pennsylvania, being known as:

UPI #70-5-8 containing 346.7 acres, more or less.

TOGETHER WITH the rights and benefits as set forth in Deed Book X 14 page 515.

Being part of the same premises which Springlawn Corporation, a Pennsylvania corporation by Deed dated 10-18-1978 and recorded 10-21-1978 in Chester County in Deed Book W 53 Page 573 conveyed unto George Strawbridge, Jr., Individually, an undivided seventy (70%) percent interest and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Jr., Trustees under Deed of Trust of George Strawbridge, Jr., dated 1-20-1971, the remaining thirty (30%) percent interest as a tenancy in common as to the whole thereof, in fee.

Also being part of the same premises which vested in Delaware Trust Company, George Strawbridge and William C. Lickle, Trustees under Deed of George Strawbridge, Jr. dated January 20, 1971, thirty percent interest, by Certificate of Award of Real Estate, Trust Inter Vivos: George Strawbridge, Jr., Settlor No. 84664 by the Orphans' Court Division of the Court of Common Pleas for the County of Montgomery dated 8-7-1984 and recorded 8-23-1984 in Deed Book B 64 page 175.

Copyright American Land Title Association. All rights reserved. The use of this Form is restricted to ALTA licensees and ALTA members in good standing as of the date of use. All other uses are prohibited. Reprinted under license from the American Land Title Association

AGREEMENT OF SALE

Seller understands that Seller should not rely on any information (written or verbal) received from Purchaser as to property valuation, tax and legal matters associated with this transaction. Purchaser recommends that Seller consult with competent, independent professional appraisal, tax and legal advisors of Seller's own choosing regarding this transaction.

THIS AGREEMENT OF SALE (the "Agreement"), is made this 22nd day of March, 2017, by and between **GEORGE STRAWBRIDGE, JR.** (referred to as "Strawbridge"), **BNY MELLON, N.A.** (formerly known as Mellon Bank, N.A.), **GEORGE BAXTER AND R. STEWART STRAWBRDIGE, SUCCESSOR TRUSTEES OF THE TRUST UNDER DEED OF GEORGE STRAWBRIDGE, JR., DATED JANUARY 20, 1971** (collectively, the "Trustee Grantors"), and **THE CONSERVATION FUND, A Non-Profit Corporation** organized under the laws of the State of Maryland, having an address of 1655 North Fort Myer Drive, Suite 1300, Arlington, Virginia 22209 (referred to as "TCF" or the "Purchaser").

RECITALS

WHEREAS, Strawbridge is the owner of certain parcels of land located in Elk, Franklin and New London Townships in Chester County, Pennsylvania, as more particularly described on Exhibit A-3 attached hereto (the "Strawbridge Parcels"); and

WHEREAS, Strawbridge, as to a seventy percent (70%) undivided interest, and the Trustee Grantors, as to a thirty percent (30%) undivided interest, are the owners of certain parcels of land located in Elk, Franklin and New London Townships in Chester County, Pennsylvania, as more particularly described on Exhibit A-3 attached hereto (the "Jointly Owned Parcels"); and

WHEREAS, Strawbridge and the Trustee Grantors are hereinafter collectively referred to as "Seller", and the Strawbridge Parcels and the Jointly Owned Parcels are hereinafter collectively referred to as the "Land"; and

WHEREAS, Purchaser has offered to purchase and Seller has agreed to sell the Land together with related rights and appurtenances as more fully identified in Section 1 and Exhibit A of this Agreement as the "Property", in a phased transaction as more fully described below in Section 1 A.

NOW THEREFORE, for and in consideration of the mutual promises contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and intending to be legally bound, Seller agrees to sell and Purchaser agrees to purchase the Property, subject to and in accordance with the terms and conditions set forth in this Agreement.

Section 1. **The Property.** Seller agrees to sell and Purchaser agrees to purchase certain unimproved property containing approximately 983 +/- acres of land located in Chester County, Pennsylvania as more particularly described on **Exhibit A,** and a generally shown as parcels 4, 5, 6 and 7 on the map attached hereto as **Exhibit A-1** attached hereto, which is

improved with the improvements listed on **Exhibit A-2**, and includes without limitation any and all improvements and fixtures situated thereon, and any and all mineral, timber, water, grazing and other surface and subsurface rights, permits, hereditaments, easements, incidents and appurtenances belonging thereto (the "Property").

Section 1A. Phased Transaction. The Property shall be acquired by the Purchaser in a series of transactions described below.

(i) Definitions. The purchase and sale of the Property shall be accomplished through a series of phased and sequential transactions, involving not more than three (3) separate closings, hereinafter referred to individually as "Phase 1", "Phase 2" and "Phase 3", and collectively as the "Phases" or "Each Phase".

(ii) Identification of the portions of the Property to be included for Each Phase. A portion of the Property shall be conveyed by Seller to Purchaser in Each Phase as follows:

a. Phase 1 will include the purchase and sale of the following five tax parcels containing a total of 265.8 acres as identified on the Parcel Map attached hereto as **Exhibit A-1**:

1. Tax Parcel 72-6-10 containing 63.5 acres;
2. Tax Parcel 70-5-7 containing 71.9 acres;
3. Tax Parcel 71-4-32.3 containing 19.3 acres;
4. Tax Parcel 72-6-1 containing 14.4 acres; and
5. Tax Parcel 70-5-6 containing 96.7 acres.

b. Phase 2 will include the purchase and sale of Tax Parcel 72.6.4 as identified on the Parcel Map attached hereto as **Exhibit A-1**, containing 370.1 acres; and

c. Phase 3 will include the purchase and sale of Tax Parcel 70-5-8 as identified on the Parcel Map attached hereto as **Exhibit A-1**, containing 346.7 acres.

Section 2. Good Faith Deposit. Within five (5) business days after Purchaser's receipt of an original executed Agreement, Purchaser shall deliver a good faith deposit in the amount of One Hundred Thousand and 00/100 Dollars ($100,000.00) to be held in an interest bearing escrow account with Fidelity National Title Insurance Company, located at 1515 Market Street, Suite 1325, Philadelphia, PA 19102, attention: James Sindoni, phone: 215-241-6262, as escrow agent (the "Title Company"). The good faith deposit, and all interest earned thereon (the "Deposit") shall remain in escrow during Each Phase of the transaction, and shall be applied towards the payment of the Purchase Price for Phase 3, unless otherwise forfeited to Seller or returned to Purchaser in accordance with the terms of this Agreement. The Deposit shall be held in escrow in accordance with a written escrow agreement reasonably acceptable to Seller, Purchaser and the Title Company.

Section 3. Purchase Price. The total purchase price for the entire Property, including the Deposit, shall be Sixteen Million Two Hundred Fifteen Thousand and 00/100

Dollars ($16,215,000.00) (the "Purchase Price"). A portion of the Purchase Price shall be paid by Purchaser to Seller at the closing of Each Phase, in an amount approximately equivalent to the number of acres involved in Each Phase as follows:

a. The portion of the Purchase Price paid in Phase I shall equal $4,385,000;
b. The portion of the Purchase Price paid in Phase II shall equal $6,105,000; and
c. The portion of the Purchase Price paid in Phase III shall equal $5,725,000.

The allocable portion of the Purchase Price paid in Each Phase shall be in cash, certified funds, or by wire transfer of federal or other immediately available funds as elected by Seller.

Section 4. **Closing**. The closing of Each Phase of the transaction (generally referred to as the "Closing" or the "Closings", and specifically referred to as the "Phase 1 Closing", the "Phase 2 Closing" or the "Phase 3 Closing") shall be held at the office of the Title Company sixty (60) days following the termination of the Initial Inspection Period or applicable Interim Inspection Period, as defined below in Section 5 on the following dates:

A. The Phase 1 Closing shall occur sixty (60) days following the termination of the Initial Inspection Period under Section 5.

B. The Phase 2 Closing shall occur one year following the Phase 1 Closing.

C. The Phase 3 Closing shall occur one year following the Phase 2 Closing.

Section 5. **Due Diligence Review.** Purchaser's obligation to purchase the Property is subject to Purchaser satisfactorily completing its due diligence review of the Property, as more fully set forth herein.

5.1. **Inspection Period**.

A. Initial Inspection. The Purchaser shall have a period commencing upon the Effective Date of this Agreement and terminating one hundred eighty (180) days following the Effective Date, in which to obtain, secure, conduct, review and analyze any and all tests, studies, applications, analysis, reports and documents deemed necessary by the Purchaser, including but not limited to surveys, appraisals, title reports, title commitments, environmental assessments, budgets, and economic forecasts to satisfy itself as to the feasibility of proceeding with the acquisition of the Property (the "Initial Inspection Period"); provided, however, that no invasive testing of the Property shall be conducted without Seller's prior written consent.

B. Interim Due Diligence. Upon the completion of the Phase 1 Closing and again upon the completion of the Phase 2 Closing, if applicable, the Purchaser shall have additional inspection periods: the first additional inspection period commencing on the date of the Phase 1 Closing and terminating one hundred eighty (180) days following the Phase 1 Closing; and the second additional inspection period, if applicable, commencing upon the completion of the Phase 2 Closing and terminating

one hundred eighty (180) days following the date of the Phase 2 Closing (these additional inspection periods being referred to individually and collectively as the "Interim Inspection Period(s)". During the Interim Inspection Periods the Purchaser may obtain, at Purchaser's sole expense, an updated title commitment, survey and environmental assessment of the Property for the next Phase of the transaction to verify that no material changes have occurred in the title, legal status or physical condition of the Property since the expiration of the Initial Inspection Period (collectively, "Material Changes"). The purpose of the Interim Inspection Period(s) is solely to verify that no Material Changes have occurred since the expiration of the Initial Inspection Period.

5.2 **Documents; Evidence of Title**.

A. **Title Report**. Purchaser shall request that the Title Company complete a search of title to the Property, and within five (5) days of receipt of the title report (the "Title Report") and the Purchaser shall furnish to the Seller a copy thereof together with copies of any matters which are listed as exceptions on the Title Report. On or before the expiration of the Initial Inspection Period the Purchaser shall provide the Seller with written notification of any conditions, defects, liens, encumbrances or other items appearing as exceptions in the Title Report or shown on any survey which Purchaser may, but is not obligated to obtain, which are unsatisfactory to the Purchaser (hereinafter referred to as "Title and Survey Objections"). On or before the expiration of each Interim Inspection Period, if applicable, the Purchaser shall provide the Seller with written notification of any material changes that have occurred in the title, legal status or physical condition of the Property since the expiration of the Initial Inspection Period ("Changed Conditions"). Notwithstanding the foregoing, the Purchaser shall use reasonable efforts to provide the Seller with preliminary notice of any matters that may constitute Title and Survey Objections or Changed Conditions as such matters become evident to the Purchaser, as opposed to Purchaser delaying notice until the expiration of the Initial Inspection Period or applicable Interim Inspection Period, provided that such preliminary notice shall not be construed as a waiver of the Purchaser's right to continue to examine title throughout the duration of the Inspection Period. Within ten (10) days of Seller's receipt of notice or preliminary notice from Purchaser of Title and Survey Objections or Changed Conditions, Seller shall notify the Purchaser of which Title and Survey Objections or Changed Conditions, if any, that it is unable or refuses to correct or otherwise cause to be removed from the Title Report at Closing (the "Uncorrected Objections"). Notwithstanding the foregoing, at Closing, the Seller shall be unconditionally obligated to cure or remove the following title defects ("Liquidated Defects"): (a) liens securing a mortgage, deed of trust or trust deed evidencing an indebtedness of Seller; (b) tax liens for delinquent taxes; (c) broker's liens based upon the written agreement of Seller, its trustees, beneficiaries, agents or employees ("Seller Parties"); and (d) any mechanics liens that are based upon a written agreement between either (x) the claimant (a "Contract Claimant") and any or all of Seller and the Seller Parties, or (y) the Contract Claimant and any other contractor, supplier or materialman with which any or all of Seller and the Seller Parties has a written agreement. In lieu of removing any mechanics' lien or liens, Seller may, at its option, at Closing escrow with the Title Company an amount reasonably satisfactory to the Title Company in order for the Title Company to insure Purchaser's title to the Property without exception for any such mechanics' lien(s) which Seller is responsible to remove pursuant to this Section 5.2(A) and which will remain outstanding after Closing. Seller shall not be obligated to

cure or remove any lien securing a mortgage, deed of trust or trust deed evidencing an indebtedness of any party other than Seller or Seller Parties; however, Purchaser shall have no obligation to purchase the Property and consummate the transaction in the event any such lien affects the Property and is not paid off and/or released at Closing. Within ten (10) days after receipt of Seller's notice of the Uncorrected Objections, the Purchaser shall either (1) waive such Uncorrected Objections or (2) terminate this Agreement by giving written notice thereof to the Seller, in which event the Deposit shall be returned to the Purchaser, subject to Purchaser's obligation to restore the Property as provided in Section 5.3 hereof, and this Agreement shall be null and void, and neither of the parties shall have any further obligations or liability under this Agreement except those obligations that specifically survive the termination of this Agreement. In the event Seller elects to cure, remove or discharge Uncorrected Objections pursuant to the provisions of this paragraph, the Closing may be extended for such period as is necessary to permit Seller to effect such cure, removal or discharge.

B. **Status of Title**. The Property is to be conveyed free and clear of any liens, encumbrances, easements, restrictions and agreements, excepting only the Permitted Exceptions (hereinafter defined). With the exception of the Permitted Exceptions (defined below), title to the Property shall be good and marketable and such as will be insured by the Title Company at its regular rates for regular risks pursuant to the standard stipulations of an ALTA policy of owner's title insurance and free and clear of Liquidated Defects. "Permitted Exceptions" shall include (1) title exceptions appearing in the Title Report that are not raised as Title Objections or Changed Conditions in accordance with the provisions of Section 5.2 A. above; (2) title exceptions created or suffered by Purchaser; (3) such other title exceptions which Seller may cause the Title Company to omit from Purchaser's title policy or affirmatively insure, without additional premium (unless paid by Seller); and (4): (i) taxes, tax liens, water charges, sewer rents and assessments that are a lien, but not yet due and payable, (ii) zoning and land use laws and regulations and landmark or historic designations applicable to the Property, (iii) all liens, claims, encumbrances, restrictions, covenants, conditions, matters or exceptions to title (other than Liquidated Defects) that are set forth in the Title Report, but not objected to by Purchaser in its Title and Survey Objections or Changed Conditions.

C. **Inability to Convey Title**. If the Seller is unable in any Phase to convey title at Closing in accordance with the requirements of this Agreement, the Purchaser shall have the option:

(1) Of taking such title to the applicable portion of the Property as Seller is able to convey, without abatement of the Purchase Price; or

(2) Of terminating Purchaser's obligations under this Agreement by written notice to Seller and Escrow Agent, such termination shall be governed by the applicable provisions of Sections 5.3 and 5.4., in which case the Deposit and all interest earned thereon shall be returned to the Purchaser.

D. **Farm Leases**. Seller currently leases various portions of the Property to Scott Wilkinson (the "Farm Tenant") for use as crop land. The Purchaser agrees to allow the Farm Tenant to continue to grow crops on the Property, including those portions of the Property sold to Purchaser in Phase 1 and Phase 2 of this transaction, until at least the date that closing occurs on Phase 3 or the Phase 3 transaction is terminated in accordance with the terms

of this Agreement, provided the Farm Tenant agrees to execute on or before Closing on Phase 1 an Agriculture Lease with the Purchaser and Seller (as to Seller, with respect to any Phase that Purchaser has not yet then acquired pursuant to this Agreement), in a form reasonably satisfactory to the Purchaser and Seller, for a term commencing on the date of the Purchaser's acquisition of Phase 1 and terminating upon the closing or termination of Phase 3 of the transaction (the "Agricultural Lease"). The Agricultural Lease shall specify the rent to be apportioned between Seller and Purchaser, which apportionment shall take into account when Closing under any particular Phase occurs and the time period in which the Farm Tenant has planted and harvested his crop. Purchaser and Seller shall each be responsible for enforcing the Farm Tenant's obligation to pay rent to the appropriate party pursuant to the Agricultural Lease.

5.3 **Right of Entry onto the Property**. Purchaser and its employees, contractors and agents, shall have the right to enter upon the Property at reasonable times for appraising, surveying, inspecting the Property ("Purchaser's Investigation"), and for other reasonable purposes related to Purchaser's acquisition of the Property; provided, however, that no invasive testing of the Property shall be conducted without Seller's prior written consent. Purchaser shall promptly repair any damage to the Property for which Purchaser is responsible, and Purchaser shall restore the Property to substantially the same condition immediately preceding any exercise by or for Purchaser, its agents, employees and independent contractors, of Purchaser's right to entry and inspection pursuant to this paragraph. Purchaser agrees to defend (with counsel reasonably satisfactory to Seller), indemnify and hold harmless Seller and its respective partners, officers, trustees, beneficiaries, directors and shareholders from any liability, claims, damages or expenses for personal injury, property damage or liens (including, without limitation, mechanic's or construction liens and/or reasonable attorneys' fees) resulting from Purchaser's Investigation, including without limitation, any acts or omissions of Purchaser's employees, contractors and agents. If, however, any such injury, death or damage is caused solely by the act or omission (negligent or otherwise) of Seller or its tenant or occupant, the Purchaser shall not be liable therefor. As a condition to the exercise of Purchaser's rights under this Paragraph, Purchaser shall carry sufficient liability insurance to cover injury, loss or damage to persons or property resulting from Purchaser's activities hereunder, and upon Seller's written request, the Purchaser shall name Seller as an additional insured on a certificate of insurance to be provided by Purchaser to Seller prior to the exercise of Purchaser's rights under this Paragraph. The foregoing obligations of Purchaser will survive Closing or any earlier termination of this Agreement.

5.4. Election at the End of the Inspection Period. Should Purchaser determine, for any reason prior to the expiration of the Initial Inspection Period that it is not feasible for Purchaser to proceed with its acquisition of the Property, or should a Changed Condition unacceptable to Purchaser occur prior to the expiration of each applicable Interim Inspection Period, Purchaser shall notify Seller in writing on or before the expiration of the Inspection Period or applicable Interim Inspection Period of its dissatisfaction, at which time this Agreement shall be considered null and void and of no further force and effect and the Deposit shall be promptly returned to Purchaser; subject, however to the provisions of this Section 5.4. The foregoing notwithstanding, if Seller disputes Purchaser's determination of the occurrence of a Changed Condition, Purchaser shall not have the right to terminate this Agreement pursuant to this Section 5.4 if a court of competent jurisdiction determines that a Changed Condition has not in fact occurred. Upon such termination, the Purchaser shall provide to Seller, without representation or warranty, copies of any environmental reports, surveys, engineering studies,

subdivision and land development plans and title insurance commitments obtained by Purchaser or prepared on Purchaser's behalf with respect to Purchaser's investigation of the Property, to the extent legally allowed pursuant to the terms of contracts with third party vendors preparing such materials. Purchaser shall, at any time, have the right to waive its due diligence condition precedent, as described in Section 5, before the end of the Initial Inspection Period or applicable Interim Inspection and if Purchaser elects to waive this condition precedent or to terminate the Inspection Period, this Agreement will remain in full force and effect and the Deposit shall become non-refundable except as otherwise provided herein. Failure of Purchaser to notify Seller of its dissatisfaction prior to the expiration of the Initial Inspection Period or applicable Interim Inspection Period shall be deemed a waiver of this condition precedent, in which event this Agreement shall remain in full force and effect in accordance with its terms. If Purchaser notifies the Seller in writing of its election to terminate this Agreement, this Agreement shall, without any further action by the Purchaser or the Seller, become null and void, and all of the parties to this Agreement shall be released from any and all further obligation or liability hereunder, upon release to Purchaser of the Deposit by the Title Company, which Deposit shall not be returned to Purchaser until the Property shall be restored as provided in Section 5.3 hereof; subject, however, to Purchaser's continuing obligation to indemnify Seller for any loss or damage as a result of Purchaser's Investigation as provided in Section 5.3 hereof.

5.5. Condition of Property.

"As Is". "Where Is".

(A) Inspection. Purchaser acknowledges and agrees that (1) Purchaser has, or will have prior to the expiration of Purchaser's Inspection Period, independently examined, inspected, and investigated to the full satisfaction of Purchaser, the physical nature and condition of the Property, including, without limitation its environmental condition, or the potential income, operating expenses and carrying charges affecting the Property, (2) except as expressly set forth in this Agreement, neither Seller nor any agent, officer, employee, partner or representative of Seller has made any representation whatsoever regarding the subject matter of this Agreement or any part thereof, including (without limiting the generality of the foregoing) representations as to the physical nature or environmental condition of the Property, the existence or non-existence of petroleum, asbestos, lead paint, fungi, including mold, or other microbial contamination, hazardous substances or wastes, underground or above ground storage tanks or any other environmental hazards on, under or about the Property, the compliance of the Property or its operation with any laws, rules, ordinances or regulations of any applicable governmental or quasi-governmental authority or the habitability, merchantability, marketability, profitability or fitness of the Property for any purpose, and (3) except as expressly set forth in this Agreement, Purchaser, in executing, delivering and performing this Agreement, does not rely upon any statement, offering material, operating statement, historical budget, engineering structural report, any environmental reports, information, or representation to whomsoever made or given, whether to Purchaser or other, and whether directly or indirectly, orally or in writing, made by any person, firm or corporation, except for those representations, warranties and agreements expressly set forth herein, and Purchaser acknowledges that any such statement, information, offering material, operating statement, historical budget, report or representation, if any, does not represent or guarantee future performance of the Property. Without limiting the foregoing, but in addition thereto, Seller shall deliver, and Purchaser shall take, the Property in its "AS IS" "WHERE IS" condition and with all faults on the Closing Date (as hereinafter

defined). The provisions of Section 5.5 shall survive the Closing or the earlier termination of this Agreement.

(B) Release. Purchaser hereby waives, releases and forever discharges Seller, its affiliates, subsidiaries, officers, directors, shareholders, trustees, beneficiaries, employees, independent contractors, partners, representatives, agents, successors and assigns (collectively the "Released Parties"), and each of them, from any and all causes of action, claims, assessments, losses, damages (compensatory, punitive or other), liabilities, obligations, reimbursements, costs and expenses of any kind or nature, actual, contingent, present, future, known or unknown, suspected or unsuspected, including, without limitation, interest, penalties, fines, and attorneys' and experts' fees and expenses, whether caused by, arising from, or premised, in whole or in part, upon Seller's acts or omissions, and notwithstanding that such acts or omissions are negligent or intentional, or premised in whole or in part of any theory of strict or absolute liability, which Purchaser, its successors or assigns or any subsequent Purchaser of the Property may have or incur in any manner or way connected with, arising from, or related to the Property, including without limitation (a) the environmental condition of the Property, or (b) actual or alleged violations of environmental laws or regulations in connection with the Property and/or any property conditions. Purchaser agrees, represents and warrants that the matters released herein are not limited to matters which are known, disclosed, suspected or foreseeable, and Purchaser hereby waives any and all rights and benefits which it now has, or in the future may have, conferred upon Purchaser by virtue of the provisions of any law which would limit or detract from the foregoing general release of known and unknown claims. Notwithstanding the foregoing, this release of claims does not include a release of claims for: a) fraud or misrepresentation; b) breach of any express representation, warranty or agreement contained in this Agreement; c) third party tort or contract claims arising from events occurring on the Property prior to the Closing; or d) any statutory rights to contribution.

5.6. Seller's Delivery of Documents. Within seven (7) days of the Effective Date, Seller shall at its expense deliver or cause to be delivered to Purchaser for Purchaser's review in connection with Purchaser's Investigation the following documents or records relating to the Property, to the extent such documents exist and are in Seller's possession or reasonable control:

(a) true, complete and correct copies of all agricultural, residential or other leases or license documents and current and up-to-date security deposit and rent payment records, if any;
(b) most recent historic title insurance policy and deeds issued to Seller;
(c) tax bills and assessment records for the past two tax fiscal years, including but not limited to real estate taxes, school taxes, special assessments and personal property taxes;
(d) copies of all studies and reports which Seller possesses, including environmental assessments, property condition assessment reports, maps and surveys;
(e) copies of governmental licenses and permits pertaining to the Property; and
(f) copies of all maintenance agreements, vendor contracts and agreements with Property caretakers.

Section 6. **Intentionally Omitted.**

Section 7. **Seller's Representations and Warranties.** To induce Purchaser to enter into this Agreement, Seller makes the following representations and warranties as of the date of this Agreement (the "Representations and Warranties") for the benefit of Purchaser and its successors and assigns. These representations and warranties are continuing in nature and shall remain true, accurate and correct for a period of one hundred twenty (120) days after the Closing.

7.1 **Title to the Property**. Seller is the sole record fee simple owner of the Property.

7.2 **Authority.** Seller is duly authorized and has taken all necessary actions to execute and perform this Agreement and this Agreement is enforceable against Seller in accordance with its terms.

7.3. **Legal Proceedings**. To Seller's knowledge, there are no actions, suits, proceedings or investigations pending or, to Seller's knowledge threatened, against or affecting the Property, or arising out of Seller's conduct on the Property.

7.4 **Third Party Contracts**. To Seller's actual knowledge, Seller is not party to nor subject to or bound by any agreement, contract or lease of any kind relating to the Property, except as set forth on the Schedule of Third Party Agreements attached hereto as **Exhibit B** or such agreements, contracts or leases, if any, recorded in the land records.

7.5 **Intentionally Omitted**.

Section 8. **Purchaser's Authority**. Purchaser is duly authorized and has taken all necessary actions to execute and perform this Agreement and this Agreement is enforceable against Purchaser in accordance with its terms.

Section 9. **Possession.** Possession of the Property shall be given by special warranty deed, in form and substance reasonably acceptable to Seller and Purchaser, free and clear of all Liquidated Defects, but subject to the Permitted Exceptions.

Section 10. **Taxes.** Seller shall pay all general taxes and assessments for the Property for years prior to Closing, including, but not limited to, any and all so-called "Rollback" or "Recapture" taxes, if any, which may become due upon transfer of the Property to Purchaser. At Closing, real property taxes and all other assessments and taxes shall be prorated as of the date of Closing utilizing the customary tax cycle(s) in the taxing district in which the Property is situated, based on the most recent ascertainable tax bill.

Section 11. **Closing Costs and Fees.** All realty transfer taxes imposed by any governmental body or bodies shall be borne equally by Seller and Purchaser, to the extent assessed in this transaction. The premium for the title insurance policy described above shall be paid by Purchaser. All other Closing costs shall be borne by the parties in accordance with local custom.

Section 12. Preservation of the Property. Seller shall not mortgage, lease, encumber or otherwise dispose of the Property or any part thereof prior to Closing or the termination of this Agreement without first having obtained the prior written consent of Purchaser, which consent shall not be unreasonably withheld, conditioned or delayed provided such action does not materially adversely affect the fair market value of the Property; does not adversely impact the conservation values of the Property and terminates prior to the Closing. Seller agrees that Seller shall neither use nor consent to any use of the Property for any purpose or in any manner that is materially inconsistent with Purchaser's acquisition or intended use of the Property as a conservation area. This covenant expressly precludes any timber cutting on the Property. In the event that Seller shall use or consent to such use of the Property, Purchaser may, without liability, refuse to proceed with its acquisition of the Property, in which event, Purchaser may terminate this Agreement upon written notice to Seller, in which event the Deposit shall be promptly returned to the Purchaser, subject to Purchaser's obligation to restore the Property in accordance with Section 5.3; or, alternatively, Purchaser may elect to acquire title to the Property without any reduction in the Purchase Price.

Section 13. Remedies on Default.

13.1. Purchaser's Default. In the event that: a) all of the conditions to this Agreement for the benefit of Purchaser shall have been satisfied or waived by Purchaser; and b) Seller has or is willing to fully perform all of its obligations under this Agreement, but Purchaser is unable or unwilling to perform its obligations under this Agreement, then the entire amount of the Deposit shall be retained by Seller as liquidated damages under this Agreement, and Purchaser shall have no further liability to Seller. Purchaser and Seller hereby acknowledge and agree that Seller's damages would be difficult or impossible to determine and that the amount of the Deposit is the parties' best and most accurate estimate of the damages Seller would suffer in the event the transaction provided for in this Agreement fails to close, and is reasonable under the circumstances existing as of the date of this Agreement. Purchaser and Seller agree that Seller's right to retain the Deposit shall be the sole remedy of Seller in the event of a breach of this Agreement by Purchaser.

13.2. Seller's Default. In the event that: a) all of the conditions to this Agreement for the benefit of Seller shall have been satisfied or waived by Purchaser; and b) Purchaser has or is willing to fully perform all of its obligations under this Agreement, but Seller is unable or unwilling to perform its obligations under this Agreement, Purchaser may elect, at Purchaser's sole option to either: (i) terminate this Agreement and be released from its obligations hereunder, in which event the Deposit shall be returned to Purchaser; or (ii) proceed against Seller for specific performance of this Agreement.

Section 14. Notices. All notices required or permitted hereunder will be deemed to have been delivered when posted with the U.S. Postal Service, Federal Express, United Parcel Service, or sent by facsimile, telecopier or other such electronic device, directed as follows:

If to Seller: C/O GEORGE STRAWBRIDGE, JR.
3801 Kennett Pike, B-100
Greenville, DE 19807
Phone: 302-571-8322

With Copy To: Benjamin J. Berger, Esquire
Berger Harris LLP
1105 N. Market Street
11th floor
Wilmington, DE 19801
Phone: 302-655-1140/ Fax 302-655-1131

If to Purchaser: THE CONSERVATION FUND
410 Severn Avenue, Suite 204
Annapolis, Maryland 21403
Attention: Jodi R. O'Day, Esquire
Vice President and Regional Counsel
Phone: 443-482-2826 Fax: 443-482-2806

With Copy To: THE CONSERVATION FUND
1655 North Fort Myer Drive, Suite 1300
Arlington, Virginia 22209
Attention: General Counsel
Phone: 703-525-6300 Fax: 703-525-4610

Section 15. Miscellaneous.

15.1 Broker's Commission. Seller and Purchaser each represents to the other that they have not contracted with any broker or finder with regard to this transaction. Each agrees to indemnify, defend and hold harmless the other from and against any and all liability, claims, demands, damages and costs of any kind arising out of or in connection with any broker's or finder's fee, commission or charges claimed to be due any person in connection with such person's conduct respecting this transaction.

15.2 Certificate. At or prior to Closing, Seller shall furnish to Purchaser a duly executed Affidavit of Non-Foreign Status (the "Affidavit") in the form attached to this Agreement as Exhibit D. Seller hereby declares and represents to Purchaser that Seller is not a "foreign person" for purposes of withholding of federal tax as described in such Affidavit.

15.3 Assigns. Purchaser may not assign its rights and obligations under this Agreement without Seller's written consent (except an assignment pursuant to Section 16 below for which Seller's consent shall not be required), which consent shall not be unreasonably withheld. Purchaser shall pay all realty transfer taxes with respect to any assignment of this Agreement by Purchaser. The permitted assignee of any such assignment shall assume all of the obligations of Purchaser hereunder. Purchaser shall be relieved of all liability and obligations of Purchaser under this Agreement arising from and after the date of such assignment.

Notwithstanding the foregoing, the Purchaser may assign its rights under this Agreement or at Closing require the Seller to directly deed the Property to the Pennsylvania Department of Conservation and Natural Resources

In addition, the Purchaser may assign its rights and obligations under this Agreement to Sustainable Conservation, Inc., a supporting organization of The Conservation Fund under Internal Revenue Code Section 509(a)(3) ("SCI") or other subsidiary organization related to the Purchaser and organized for conservation purposes or to otherwise direct the Seller to convey title to SCI or other related subsidiary organization.

15.4 Binding Effect. The terms and conditions of this Agreement shall be binding upon Purchaser, its successors and assigns, and shall inure to the benefit of Seller and Seller's respective heirs, trustees, beneficiaries, executors, administrators, successors and assigns.

15.5 Exhibits. The exhibits attached hereto constitute an integral part of this Agreement and are hereby incorporated herein.

15.6 Counterparts. This Agreement may be executed in counterparts, all of which shall constitute one agreement which shall be binding on all of the parties, notwithstanding that all of the parties are not signatory to the original or the same counterpart.

15.7 Severability/Rules of Construction. If any provision of this Agreement shall be held invalid, the other provisions hereof shall not be affected thereby and shall remain in full force and effect. Each party has fully considered, negotiated and participated in the drafting of this Agreement. Accordingly, if any ambiguity or question of intent or interpretation arises after the Effective Date, then no presumption or burden of proof shall arise either favoring or disfavoring any party by virtue of the authorship of any provision of this Agreement.

15.8 Entire Agreement. This Agreement represents the entire agreement of the parties and may not be amended except by a writing signed by each party thereto.

15.9 Authority. Each party to this Agreement warrants to the other that the respective signatories have full right and authority to enter into and consummate this Agreement and all related documents.

15.10 Intentionally Omitted.

15.11 Further Assurances. Each party shall execute and deliver any instruments reasonably required to convey the Property to Purchaser and to vest in each party all rights, interests and benefits intended to be conferred by this Agreement.

15.12 Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Pennsylvania, without regard to conflicts or choice of law principles.

15.13 Offer. This Agreement will constitute an offer to Seller that can be accepted only by Seller signing and delivering an executed original of this Agreement to Purchaser on or before March 27, 2017. Purchaser may withdraw such offer in writing at any time prior to its execution of the same.

15.14 Owner's Title Affidavit. At each Closing the Seller shall execute the Deed, the settlement statement, an owner's title affidavit in form and substance reasonably acceptable to Seller and the Title Company, and any other documents reasonably required by the Title Company and reasonably acceptable to Seller.

15.15. Saturdays, Sunday and Holidays. If the final date of any time period of limitation set out in any provision of this Agreement falls on a Saturday, Sunday or a legal holiday under the laws of the state in which the Property is situated, then the time of such period shall be extended to the next day which is not a Saturday, Sunday or legal holiday.

15.16 Recitals. The recitals appearing at the beginning of this Agreement shall be deemed integral and binding provisions of this Agreement, as if fully set forth and restated in the body of this Agreement.

15.17 Effective Date. The Effective Date of this Agreement shall be the date on which the last party to this Agreement duly executed this Agreement.

15.18 1099 Reporting. The Title Company is designated as the party responsible for filing a Form 1099 with the Internal Revenue Service promptly after Closing, to the extent required by the Internal Revenue Code and Treasury Regulations.

Section 16. WAVERS OF APPLICATION OF TITLE 42 U.S.C.A. SECTION 4601 AND/OR JUST COMPENSATION UNDER APPLICABLE STATE STATUTES. Purchaser may assign this Agreement and its rights as Purchaser hereunder including the Deposit by written assignment to the Pennsylvania Department of Conservation and Natural Resources ("PADCNR"), wherein PADCNR assumes the obligations of Purchaser hereunder. Seller hereby waives any right to demand fair market value for the Property. In addition, recognizing that this Agreement is made in order to add lands to a PADCNR facility and that condemnation will not be used in any way as part of this transaction or in securing the Property, Seller hereby knowingly waives any potential right to receive compensation for the Property consistent with the requirements of either (i) Title II and Title III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Title 42 U.S.C.A. Section 4601, et seq. (Public Law 91-646, as amended) including those provisions relating to incidental expenses incurred by Seller; (ii) 49 Code of Federal Regulation Part 24; or (iii) applicable state statutes and regulations. Seller makes this waiver knowing that PADCNR will ultimately own the Property and/or that PADCNR may be an assignee of this Agreement.

Section 17. Compliance with Federal Law. Each party hereby represents and warrants to the other that (A) neither the party making the representation, nor any persons or entities holding any legal or beneficial interest whatsoever in the party making the representation, are (i) the target of any sanctions program that is established by Executive Order of the President or published by the Office of Foreign Assets Control, U.S. Department of the Treasury ("OFAC"); (ii) designated by the President or OFAC pursuant to the Trading with the Enemy Act, 50 U.S.C. App. § 5, the International Emergency Economic Powers Act, 50 U.S.C. §§ 1701-06, the Patriot Act, Public Law 107-56, Executive Order 13224 entitled "Blocking Property and Prohibiting Transactions with Persons Who Commit, Threaten to Commit, or Support Terrorism" (September 23, 2001) or any executive order of the President issued pursuant to such statutes; or (iii) persons or entities with whom U.S. persons or entities are restricted from doing business under regulations of

OFAC (including those named on OFAC's Specially Designated and Blocked Persons List) or under any statute, executive order (including Executive Order 13224) or other governmental action; and (B) the activities of the party making the representation do not violate the International Money Laundering Abatement and Financial Anti-Terrorism Act of 2001 or the regulations or orders promulgated thereunder. Each party further covenants and agrees to promptly deliver to the other any documentation that the other party, may reasonably request in order to confirm the accuracy of the representations and warranties made in this paragraph.

Section 18. **Trustee Grantors**. The Trustee Grantors, identified in the first paragraph of this Agreement as being BNY Mellon, N.A. (formerly known as Mellon Bank, N.A.), George Baxter and R. Stewart Strawbridge in their capacity as Successor Trustees of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 (the "Trust"), are acting in a fiduciary capacity in executing this Agreement on behalf of the Trust, and the Trustee Grantors shall be liable hereunder only in such fiduciary capacity and not in any other capacity.

The Trustee Grantors shall not be liable for the performance of Seller's obligations hereunder, or for any payment or other obligation required to be made or performed by Seller under this Agreement or any other document, instrument or certificate executed by or on behalf of Seller under this Agreement ("Ancillary Documents"), or for the performance of any of the covenants or warranties or obligations contained herein or in any Ancillary Documents, or subject to levy, execution or other enforcement procedure of the satisfaction of the rights or remedies of Purchaser hereunder or under any Ancillary Documents, except to the extent such actions or inactions by the Trustee Grantors constitute a breach of their fiduciary responsibilities as Successor Trustees under the above-referenced Trust.

[Signature Page Follows]

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first above written.

SELLER

_____ Date: _____
George Strawbridge, Jr.

BNY MELLON, N.A., Trustee

By: _____ Date: _____
Name: _____
Title: _____

_____ Date: _____
George Baxter, Trustee

_____ Date: 3/13/17
R. Stewart Strawbridge, Jr., Trustee

PURCHASER

THE CONSERVATION FUND,
a Non-Profit Corporation

By: _____ Date: 3/3/17
Jodi R. O'Day
Vice President and Regional Counsel

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date first above written.

SELLER

_____ Date:_____
George Strawbridge, Jr.

BNY MELLON, N.A., Trustee

By: Sara Burns Date: 3/22/17
Name: SARA BURNS
Title: ASSOCIATE

_____ Date:_____
George Baxter, Trustee

_____ Date:_____
R. Stewart Strawbridge, Jr., Trustee

PURCHASER

THE CONSERVATION FUND,
a Non-Profit Corporation

By: _____ Date:_____
Jodi R. O'Day
Vice President and Regional Counsel

Exhibit A
DESCRIPTION OF THE PROPERTY

ALL THAT CERTAIN LAND SITUATE AND LYING in Elk, Franklin and New London Townships in Chester County, Pennsylvania, containing approximately 983 acres of land being more fully described as follows:

BEING generally shown those seven parcels of land identified on the map attached hereto as Exhibit A-1 as Tax Parcel Numbers: 72-6-10;
70-5-7;
72-6-1;
71-4-32.3;
70-5-6;
72-6-4; and
70-5-8

AND BEING more fully described in the following deeds:

*Deed dated _____, from _____ to _____ and recorded in the Office of the Recorder of Deeds in Book ____, page____; and

*Deed dated _____, from _____ to _____ and recorded in the Office of the Recorder of Deeds in Book ____, page____; and

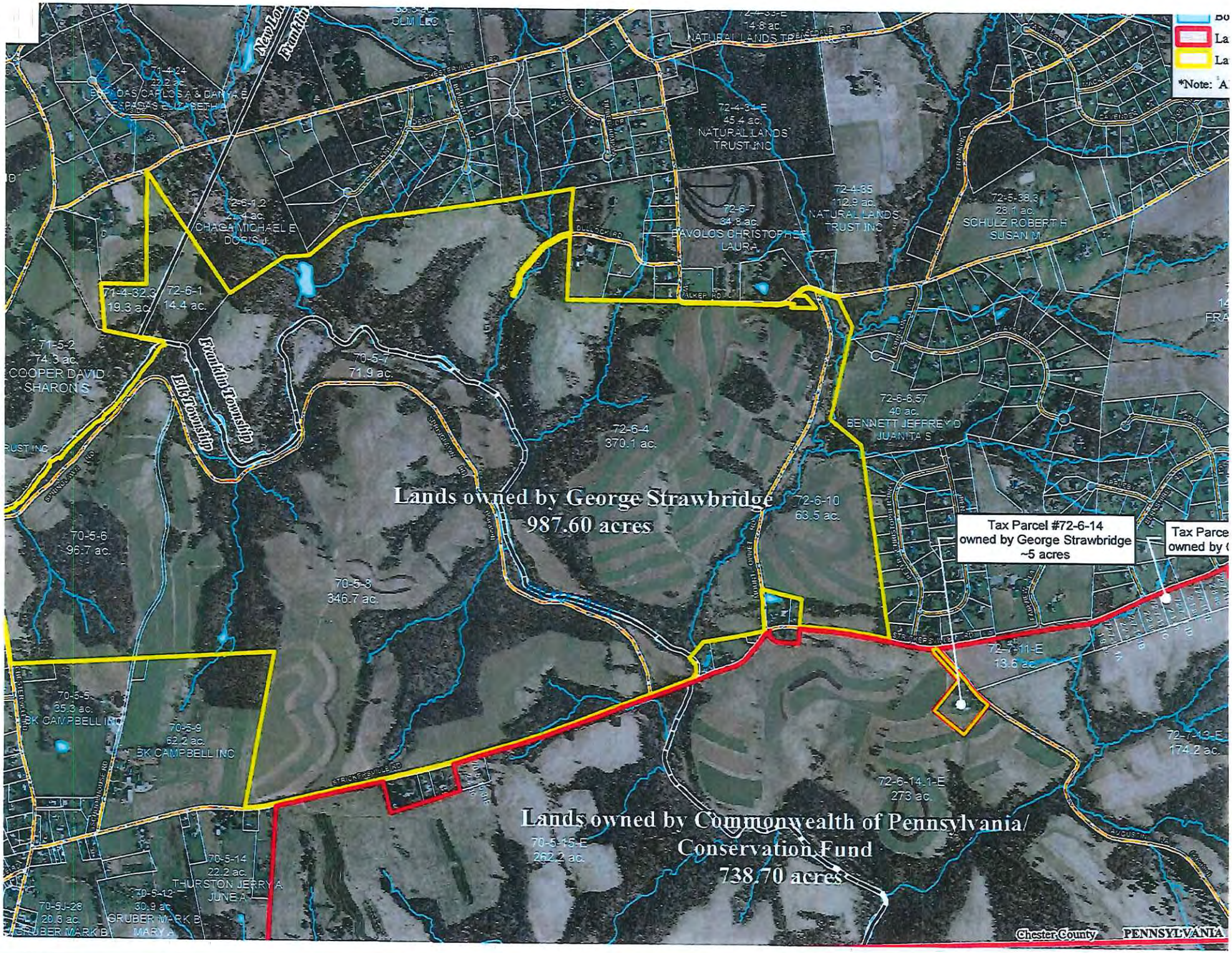
*To Be Provided Upon Receipt of Title Commitment

TOGETHER WTH those improvements identified on **Exhibit A-2.**

The final legal description of the Property to be included in the Deeds shall be subject to the prior review and approval of the Seller and the Purchaser.

Exhibit A-1

Map showing Parcels comprising the Property


Lands owned by George Strawbridge
987.60 acres
Lands owned by Commonwealth of Pennsylvania/
Conservation Fund
738.70 acres
Tax Parcel #72-6-14
owned by George Strawbridge
~5 acres
Tax Parce
owned by
72-6-4
370.1 ac.
70-5-7
71.9 ac.
70-5-8
346.7 ac.
70-5-6
96.7 ac.
71-5-2
74.3 ac.
COOPER DAVID
SHARON S
71-4-32.3
19.3 ac.
72-6-1
14.4 ac.
72-6-1.2
2.4 ac.
CHAGA MICHAEL E
DORIS J
72-6-7
34.8 ac.
PAVOLOS CHRISTOPHER
LAURA
72-4-34-E
45.4 ac.
NATURAL LANDS
TRUST INC
72-4-85
112.9 ac.
NATURAL LANDS
TRUST INC
72-5-38.3
28.1 ac.
SCHULZ ROBERT H
SUSAN M
72-6-6.57
40 ac.
BENNETT JEFFREY D
JUANITA S
72-6-10
63.5 ac.
72-7-11-E
13.6 ac.
72-7-13-E
174.2 ac.
72-6-14.1-E
273 ac.
70-5-15-E
262.2 ac.
70-5-5
85.3 ac.
BK CAMPBELL INC
70-5-9
62.2 ac.
BK CAMPBELL INC
70-5-14
22.2 ac.
THURSTON JERRY A
JUNE A
70-5-12
30.9 ac.
GRUBER MARK B
MARY A
70-5J-28
20.6 ac.
GRUBER MARK B
71-4-24
22.2 ac.
ESPADAS CARLOS A & DANYAE
ESPADAS ELIZABETH
OLM LLC
NATURAL LANDS TRUST INC
Franklin Township
Elk Township
New London
Chester County
PENNSYLVANIA
*Note: A

Addendum C

Exhibit A-2

List of Improvements on the Property

All structures, buildings and improvements located on the Land.

Addendum C

Exhibit A-3

List Designating the Strawbridge Parcels
and the Jointly Owned Parcels

Strawbridge Parcels:	71432.3	(19.3 acres)
	7261	(14.4 acres)
Jointly Owned Parcels:	7056	(96.7 acres)
	7057	(71.9 acres)
	7058	(346.7 acres)
	7264	(370.1 acres)
	72610	(63.5 acres)

Exhibit B
Schedule of Third Party Agreements

Verbal lease agreement between Seller and Farm Tenant.

Exhibit C
AFFIDAVIT OF NON-FOREIGN STATUS

Section 1445 and Section 6045 of the Internal Revenue Code provide that the Transferee of a real property interest must withhold tax if the Transferor is a foreign person and must provide certain sales related information to the Internal Revenue Service. To inform **THE CONSERVATION FUND, A Non-Profit Corporation** (the "Transferee") that withholding of tax is not required upon its disposition of a U.S. real property interest, more particularly described in the Contract for Sale of Real Estate annexed hereto _____ _____ (**collectively** the "Transferor"), hereby certifies that:

1. Transferor is not a non-resident alien for purposes of U.S. income taxation.

2. Transferor's tax identification/ social security number is: _____.

3. Transferor's principal address is: _____.

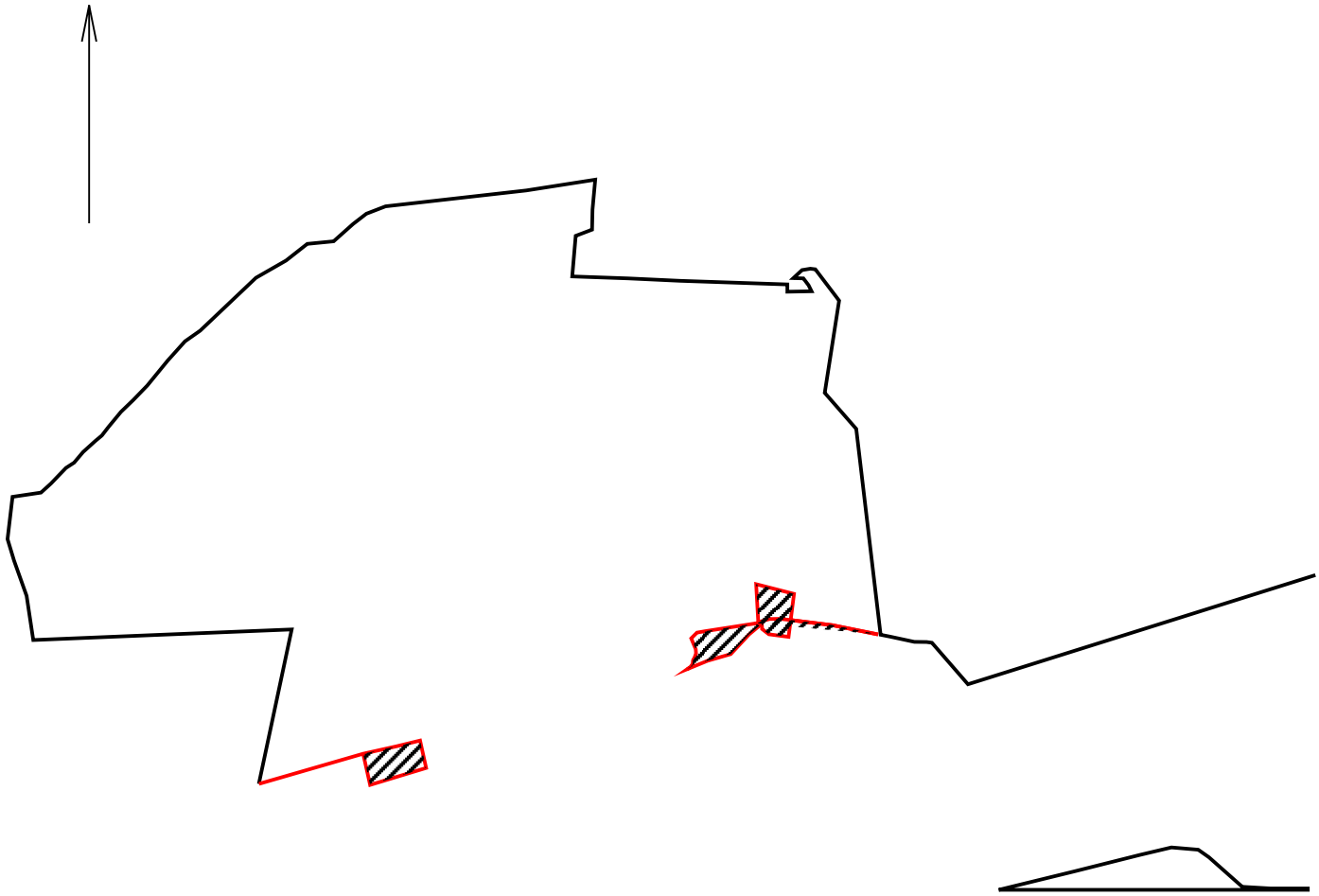
4. The gross sales price of this transfer is: _____.

Transferor understands that this affidavit and information contained herein will be disclosed to the Internal Revenue Service by the Transferee and that any false statement made herein by Transferor could be punished by fine, imprisonment, or both.

Under penalties of perjury, Transferor declares that Transferor has examined this certification and, to the best of Transferor's knowledge and belief, it is true, correct and complete.

TRANSFEROR:

BY:_____ Date: _____
Printed Name:_____
Title:_____



Trustees Under Deed of George Strawbridge Jr.	8/2/2018
Scale: 1 inch= 2031 feet	File: 2018-075 - Deed B64-175.ndp

+Tract 1: 147.4653 Acres, Closure: s78.4922w 12039.75 ft. (1/2), Perimeter=28230 ft.
--Tract 2: 1.6209 Acres (70604 Sq. Feet), Closure: s84.4433e 1364.00 ft. (1/3), Perimeter=3545 ft.
--Tract 3: 5.3607 Acres (233510 Sq. Feet), Closure: s80.3706e 990.05 ft. (1/3), Perimeter=2777 ft.
--Tract 4: 8.2289 Acres (358453 Sq. Feet), Closure: s73.4915w 1213.73 ft. (1/3), Perimeter=3193 ft.
+Tract 5: 16.9059 Acres, Closure: n00.0000e 0.00 ft. (1/999999), Perimeter=7134 ft.
Net Area= 149.1608 Acres, (6497443) Sq. Feet.

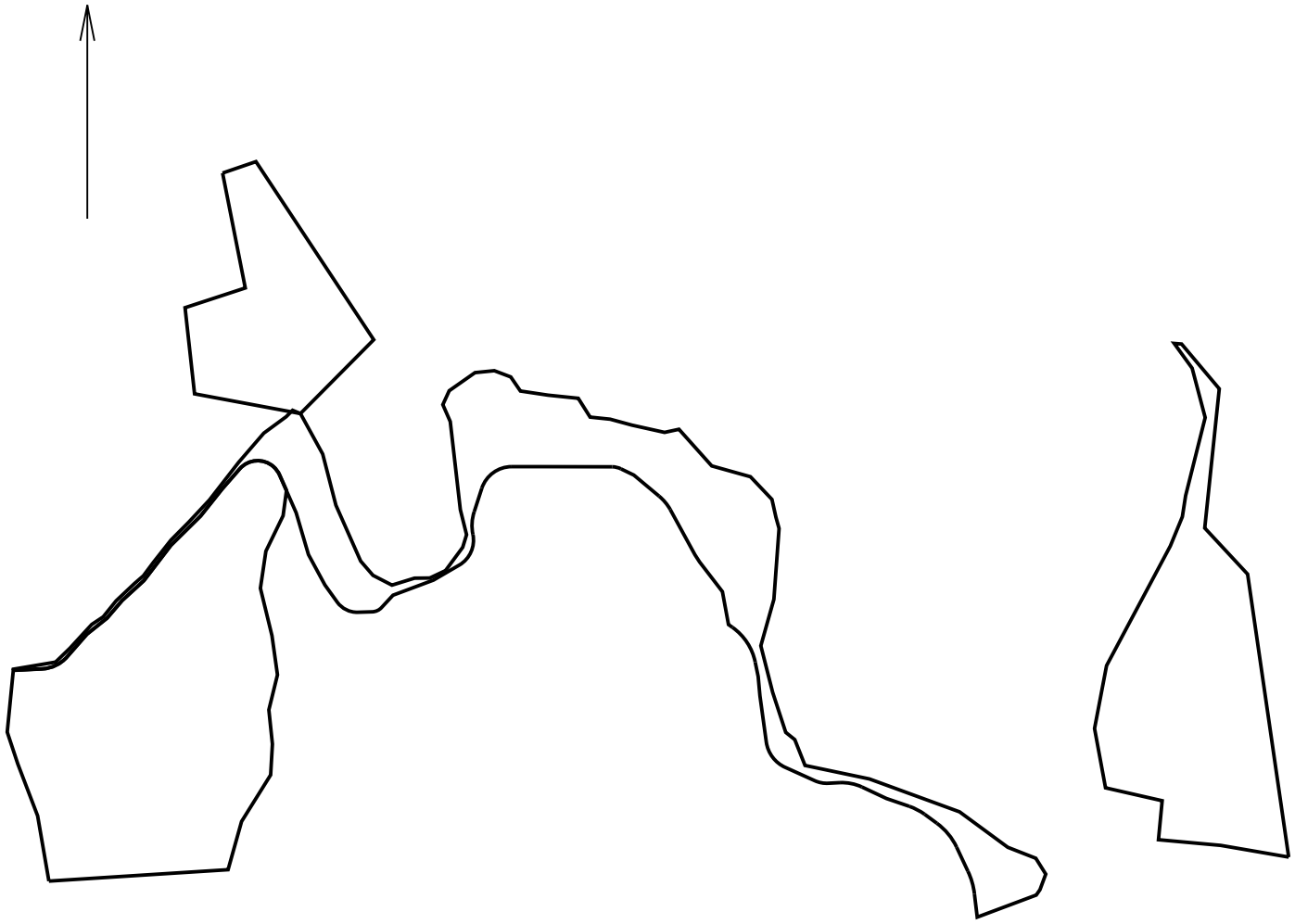
Tract Data and Deed Calls: File= 2018-075 - Deed B64-175.ndp

+Tract 01: 147.4653 Acres, Closure: s78.4922w 12039.75 ft. (1/2), Perimeter=28230 ft.
--Tract 02: 1.6209 Acres (70604 Sq. Feet), Closure: s84.4433e 1364.00 ft. (1/3), Perimeter=3545 ft.
--Tract 03: 5.3607 Acres (233510 Sq. Feet), Closure: s80.3706e 990.05 ft. (1/3), Perimeter=2777 ft.
--Tract 04: 8.2289 Acres (358453 Sq. Feet), Closure: s73.4915w 1213.73 ft. (1/3), Perimeter=3193 ft.
+Tract 05: 16.9059 Acres, Closure: n00.0000e 0.00 ft. (1/999999), Perimeter=7134 ft.
Net Area= 149.1608 Acres, (6497443) Sq. Feet.

1: e232.72 n380.81 (moved)
2: n11.5712e 1765.62
3: s87.4121w 1539.62
4: s87.3649w 1350.72
5: n08.3511w 498.86
6: n19.3841w 418.53
7: n16.5438w 251.55
8: n06.4819e 476.20
9: n81.3421e 321.87
10: n47.2726e 150.43
11: n43.5126e 242.61
12: n57.3126e 107.98
13: n40.1126e 155.16
14: n47.4926e 187.97
15: n50.1526e 90.78
16: n38.0226e 125.30
17: n39.2426e 214.76
18: n46.1526e 189.98
19: n44.0926e 227.40
20: n39.0426e 360.43
21: n42.0326e 288.73
22: n55.0326e 209.01
23: n46.2526e 858.48
24: n60.2126e 387.37
25: n51.4726e 302.81
26: n84.3226e 294.70
27: n48.2926e 291.01
28: n52.0126e 187.62
29: n68.4726e 231.82
30: n83.3535e 1584.08
31: n81.0658e 779.23
32: s05.1730w 334.84
33: s01.0930w 225.12
34: s69.1030w 196.00
35: s04.5830w 455.15
36: s87.5630e 626.16
37: s87.2230e 580.03
38: s88.0300e 1201.27
39: s00.0657w 80.89
40: n88.5557e 270.00
41: n26.3233w 76.20
42: n36.2133w 94.89
43: n88.3203w 112.37
44: n47.2427e 131.16
45: n79.4527e 93.81
46: s82.2233e 56.76
47: s37.0933e 439.64
48: s08.5227w 1043.47
49: s41.1437e 536.41
50: s06.4400e 2316.95
51: s78.2813e 112.74
52: s77.5913e 273.31
53: s89.3413e 137.50
54: s80.3032e 59.47
55: s41.0314e 614.04

Tract Data and Deed Calls: File= 2018-075 - Deed B64-175.ndp

56: n72.3416e 4070.69
57: @0 -
58: e7155.91 n2051.90 (moved)
59: n78.2813w 520.54
60: n82.5943w 470.28
61: n84.0322w 119.76
62: s89.1222w 118.24
63: s74.5622w 83.82
64: s40.5421w 9.31
65: s81.0026w 38.37
66: s56.4944w 22.86
67: s44.5736e 41
68: s49.4858w 149.5
69: s43.1010w 300.23
70: s73.4854w 270
71: s67.3637w 244.6
72: n53.3607e 44
73: n37.3107e 43
74: n00.4107e 30
75: n18.5107e 15
76: n33.2107e 25
77: n19.4607e 52
78: n03.1813w 48.7
79: n22.5453w 131.82
80: n44.3228e 90.80
81: n80.4708e 88.07
82: n81.1224e 588.35
83: @0 -
84: e7154.99 n2051.64 (moved)
85: n78.2813w 520.54
86: n82.5943w 470.28
87: s07.3113w 188.93
88: n82.5628w 221.17
89: n52.1738w 97.26
90: n02.1338w 82.65
91: s81.0026w 38.37
92: n03.2104w 426.15
93: s75.3304e 437.50
94: s07.0656w 294.48
95: @0 -
96: e233.03 n380.88 (moved)
97: n73.4915e 1213.73
98: n77.3822e 381.00
99: n76.0802e 271.17
100: s12.2138e 314.32
101: s73.0827w 654.09
102: n12.2138w 358.50
103: @0 +
104: e8504.81 n-803.94 (moved)
105: n76.0924e 876.50
106: n75.5600e 750.81
107: n76.4500e 360.17
108: s85.0500e 300.21
109: s54.5830e 147.03
110: s48.2500e 496.85
111: s86.3630e 318.43
112: s89.5630e 414.80
113: s00.00w 15.61
114: s90.00w 3453.74



The Conservation Fund	8/2/2018
Scale: 1 inch= 1339 feet	File: 2018-075 - Deed 9653-523.ndp

+Tract 1: 94.9239 Acres, Closure: n38.5548e 0.02 ft. (1/457229), Perimeter=8821 ft.
+Tract 2: 66.8396 Acres, Closure: n00.0000e 0.00 ft. (1/999999), Perimeter=25270 ft.
+Tract 3: 33.6346 Acres, Closure: n00.0000e 0.00 ft. (1/999999), Perimeter=5475 ft.
+Tract 4: 59.0579 Acres, Closure: n00.0000e 0.00 ft. (1/999999), Perimeter=9472 ft.
Net Area= 254.4561 Acres, (11084109) Sq. Feet.

Tract Data and Deed Calls: File= 2018-075 - Deed 9653-523.ndp

+Tract 01: 94.9239 Acres, Closure: n38.5548e 0.02 ft. (1/457229), Perimeter=8821 ft.
+Tract 02: 66.8396 Acres, Closure: n00.0000e 0.00 ft. (1/999999), Perimeter=25270 ft.
+Tract 03: 33.6346 Acres, Closure: n00.0000e 0.00 ft. (1/999999), Perimeter=5475 ft.
+Tract 04: 59.0579 Acres, Closure: n00.0000e 0.00 ft. (1/999999), Perimeter=9472 ft.
Net Area= 254.4561 Acres, (11084109) Sq. Feet.

1: e-96.17 n2468.56 (moved)
2: n09.5040w 498.86
3: n20.5410w 418.51
4: n18.1007w 251.55
5: n05.3250e 467.25
6: n86.5518e 220.91
7: curve left radius 263.00 arc 209.97 chord n64.0300e 204.44
8: n41.1042e 227.72
9: n51.1758e 193.36
10: n40.5301e 174.72
11: n47.2234e 221.77
12: n37.2820e 334.01
13: n45.1700e 314.29
14: n38.3557e 259.33
15: n41.0526e 200.80
16: curve right radius 180.00 arc 361.84 chord s81.1917e 303.92
17: s23.4401e 127.53
18: s07.2424w 192.19
19: s25.5231w 296.59
20: s08.2856w 281.55
21: s13.4333e 367.71
22: s07.5014e 297.19
23: s13.4447w 271.14
24: s05.5722e 258.81
25: s03.2221w 233.11
26: s31.5137w 412.83
27: s15.4121w 376.60
28: s86.2120w 1350.72
29: @0 +
30: e-364.58 n4054.17 (moved)
31: n05.3250e 8.95
32: n80.1852e 321.87
33: n46.1157e 150.43
34: n42.3557e 242.61
35: n56.1557e 102.98
36: n38.5557e 155.16
37: n46.3357e 187.97
38: n48.5957e 90.78
39: n36.4657e 125.30
40: n38.0857e 214.76
41: n44.5957e 189.98
42: n42.5357e 227.40
43: n37.4857e 360.43
44: n40.4757e 288.73
45: n53.4757e 209.01
46: n45.0957e 67.71
47: s67.4750e 63.22
48: s28.5108e 347.66
49: s14.2610e 397.54
50: s23.5355e 460.54
51: s40.4349e 141.24
52: s62.4024e 160.48
53: n72.5122e 177.80
54: n89.1408e 115.53
55: n64.5311e 130.54
56: n36.1709e 217.50

Tract Data and Deed Calls: File= 2018-075 - Deed 9653-523.ndp

57: n17.1140e 99.01
58: n13.5309w 194.74
59: n06.3429w 666.92
60: n23.2654w 139.08
61: n24.3114e 114.90
62: n54.5801e 237.29
63: n84.2534e 146.37
64: s69.2047e 132.00
65: s34.0001e 128.70
66: s81.3622e 210.89
67: s83.5821e 228.35
68: s32.2003e 167.44
69: s84.1705e 150.48
70: s74.3254e 170.50
71: s77.3815e 250.88
72: n78.0310e 111.54
73: s41.4656e 369.15
74: s74.2031e 302.37
75: s43.1931e 235.57
76: s13.0147e 138.20
77: s15.1032e 87.18
78: s04.1142w 534.08
79: s15.4523w 362.93
80: s14.1318e 363.08
81: s18.1041e 316.20
82: s51.0459e 86.98
83: s21.5611e 208.51
84: s78.0535e 494.00
85: s69.5820e 722.25
86: s53.4231e 450.90
87: s68.3519e 225.52
88: s32.0825e 141.01
89: s20.1551w 124.86
90: s35.0010w 49.64
91: s69.3051w 474.02
92: n06.4332w 177.09
93: curve left radius 545.00 arc 176.84 chord n16.0117w 176.07
94: n25.1902w 200.01
95: curve left radius 475.00 arc 235.66 chord n39.3149w 233.25
96: n53.4436w 114.99
97: curve left radius 425.00 arc 128.30 chord n62.2332w 127.82
98: n71.0226w 182.93
99: n64.5751w 204.61
100: curve left radius 350.00 arc 170.35 chord n78.5428w 168.68
101: s87.0855w 85.18
102: curve right radius 225.00 arc 106.29 chord n79.1904w 105.31
103: n65.4703w 243.43
104: curve right radius 245.00 arc 247.65 chord n36.4933w 237.24
105: n07.5203w 351.37
106: n05.1135w 147.17
107: n11.3914w 109.67
108: curve left radius 425.00 arc 319.30 chord n33.1037w 311.84
109: n54.4200w 37.68
110: n10.2617w 252.23
111: n37.3637w 248.38
112: curve right radius 830.00 arc 129.29 chord n33.0852w 129.16
113: n28.4107w 356.00
114: curve left radius 350.00 arc 131.48 chord n39.2649w 130.71
115: n50.1232w 246.80
116: n63.5617w 108.82
117: curve left radius 150.00 arc 68.03 chord n76.5554w 67.45

Tract Data and Deed Calls: File= 2018-075 - Deed 9653-523.ndp

118: n89.5531w 535.10
119: n89.5822w 221.46
120: curve left radius 235.00 arc 294.91 chord s54.0435w 275.93
121: s18.0731w 185.56
122: curve left radius 336.81 arc 174.55 chord s03.1644w 172.60
123: curve right radius 215.00 arc 266.82 chord s23.5907w 250.02
124: s59.3216w 225.93
125: s69.3006w 325.39
126: s42.5532w 126.26
127: curve right radius 100.00 arc 79.19 chord s65.3641w 77.14
128: s88.1751w 110.71
129: curve right radius 180.00 arc 175.42 chord n63.4702w 168.56
130: n35.5155w 160.89
131: n28.2022w 260.11
132: n16.2843w 327.85
133: n23.4401w 182.64
134: n23.4401w 127.53
135: curve left radius 180.00 arc 361.84 chord n81.1917w 303.92
136: s41.0526w 200.80
137: s38.3557w 259.33
138: s45.1700w 314.29
139: s37.2820w 334.01
140: s47.2234w 221.77
141: s40.5301w 174.72
142: s51.1758w 193.36
143: s41.1042w 227.72
144: curve right radius 263.00 arc 209.97 chord s64.0300w 204.44
145: s86.5518w 220.91
146: @0 +
147: e1210.22 n7796.86 (moved)
148: n71.0912e 265.91
149: s33.2748e 1605.87
150: s44.4434w 782.85
151: n79.2833w 810.16
152: n06.1848w 652.55
153: n71.5112e 476.33
154: n11.0848w 881.53
155: @0 +
156: e9231.54 n2650.09 (moved)
157: n80.1801w 519.80
158: n84.4931w 470.28
159: n05.3336e 294.47
160: n77.0645w 437.88
161: n10.2242w 454.24
162: n10.4427e 481.21
163: n28.0306e 1020.62
164: n22.2246e 237.42
165: n08.5554e 159.65
166: n14.0133e 607.00
167: n14.4721w 384.05
168: n36.0337w 230.03
169: s85.1809e 56.76
170: s40.0509e 439.64
171: s05.5651w 1054.09
172: s42.5735e 473.49
173: s08.1600e 2150.90

Current Parcel Details

UPI:	**70-5-6**	**PLAN NUMBER:**	
PIN:	7005 00060000	**LUC:**	V-10 VACANT LAND
Street Number:	1001	**Street Direction:**	
Street Name:	CHESTERVILLE	**Street Type:**	RD
Situs Address:	**1001 CHESTERVILLE RD**	**MAILING ADDRESS:**	**1655 N FORT MYER DR**
OWNER(S):	**CONSERVATION FUND**		**STE 1300**
			ARLINGTON VA
LOT LOCATION:	**ES OF CHESTERVILLE RD**	**ZIP:**	**22209**
PROPERTY DESCRIPTION:	**96.7 AC**	**BOOK:**	9653
ACRES:	**96.7**	**PAGE:**	523
SQUARE FEET:		**DATE OF RECORDATION:**	11-20-2017
LAST SALE PRICE:	**4385000**	**TOTAL ASSESSMENT:**	**13170**
ASSESSMENT DATE:	**12-15-2017**	**Lot Assessment:**	**13170**
Municipality Number:	**70**	**Property Assessment:**	**0**

Parcel History

Owner Name	Deed Volume	Book	Page	Sale Date	Sale Price	Lot Location	Prop Description	Total Assessment
CONSERVATION FUND		9653	523	11-20-2017	4385000	SES OF CHESTERVILLE RD	96.7 AC	13170
DELAWARE TRUST CO				08-01-1984	0	SE RT 841& T354	781.9 AC &DWG	48580
DELAWARE TRUST CO	B	64	175	08-01-1984	0	SE RT 841& T354	781.9 AC &DWG	48570

Records 1 to 3 of 3

Current Parcel Details

UPI:	**70-5-7**	**PLAN NUMBER:**	
PIN:	7005 00070000	**LUC:**	V-10 VACANT LAND
Street Number:	1	**Street Direction:**	
Street Name:	SPRINGLAWN	**Street Type:**	RD
Situs Address:	**1 SPRINGLAWN RD**	**MAILING ADDRESS:**	**1655 N FORT MYER DR**
OWNER(S):	**CONSERVATION FUND**		**STE 1300**
			ARLINGTON VA
LOT LOCATION:	**ES OF CHESTERVILLE RD**	**ZIP:**	**22209**
PROPERTY DESCRIPTION:	**71.9 AC S**	**BOOK:**	9653
ACRES:	**71.9**	**PAGE:**	523
SQUARE FEET:		**DATE OF RECORDATION:**	11-20-2017
LAST SALE PRICE:	**4385000**	**TOTAL ASSESSMENT:**	**9800**
ASSESSMENT DATE:	**12-15-2017**	**Lot Assessment:**	**9800**
Municipality Number:	**70**	**Property Assessment:**	**0**

Parcel History

Owner Name	Deed Volume	Book	Page	Sale Date	Sale Price	Lot Location	Prop Description	Total Assessment
CONSERVATION FUND		9653	523	11-20-2017	4385000	ES OF CHESTERVILLE RD	71.9 AC S	9800

Record 1 of 1

Current Parcel Details

UPI:	**70-5-8**	**PLAN NUMBER:**	
PIN:	7005 00080000	**LUC:**	V-10 VACANT LAND
Street Number:	633	**Street Direction:**	
Street Name:	STRICKERSVILLE	**Street Type:**	RD
Situs Address:	**633 STRICKERSVILLE RD**	**MAILING ADDRESS:**	**C/O BARBARA BUCKMAN 193-0328**
OWNER(S):	**DELAWARE TRUST CO**		**1735 MARKET ST 3RD FLOOR**
	STRAWBRIDGE GEORGE ETAL		**PHILADELPHIA PA**
LOT LOCATION:	**NS OF STRICKERSVILLE RD**	**ZIP:**	**19103**
PROPERTY DESCRIPTION:	**346.7 AC S**	**BOOK:**	B64
ACRES:	**346.7**	**PAGE:**	175
SQUARE FEET:		**DATE OF RECORDATION:**	08-01-1958
LAST SALE PRICE:	**0**	**TOTAL ASSESSMENT:**	**47200**
ASSESSMENT DATE:	**12-15-2017**	**Lot Assessment:**	**47200**
Municipality Number:	**70**	**Property Assessment:**	**0**

Parcel History

No Records returned

Current Parcel Details

UPI:	**71-4-32.3**	**PLAN NUMBER:**	**140001239**
PIN:	7104 00320300	**LUC:**	V-10 VACANT LAND
Street Number:	2057	**Street Direction:**	
Street Name:	CHESTERVILLE	**Street Type:**	RD
Situs Address:	**2057 CHESTERVILLE RD**	**MAILING ADDRESS:**	**1655 N FORT MYER DR**
OWNER(S):	**CONSERVATION FUND**		**STE 1300**
			ARLINGTON VA
LOT LOCATION:	**SS OF RT 841**	**ZIP:**	**22209**
PROPERTY DESCRIPTION:	**19.3 AC LOT B**	**BOOK:**	9653
ACRES:	**19.3**	**PAGE:**	523
SQUARE FEET:		**DATE OF RECORDATION:**	11-20-2017
LAST SALE PRICE:	**4385000**	**TOTAL ASSESSMENT:**	**12990**
ASSESSMENT DATE:	**12-15-2017**	**Lot Assessment:**	**12990**
Municipality Number:	**71**	**Property Assessment:**	**0**

Parcel History

Owner Name	Deed Volume	Book	Page	Sale Date	Sale Price	Lot Location	Prop Description	Total Assessment
CONSERVATION FUND		9653	523	11-20-2017	4385000	SS OF RT 841	19.3 AC LOT B	12990

Record 1 of 1

Current Parcel Details

UPI:	**72-6-1**	**PLAN NUMBER:**	
PIN:	7206 00010000	**LUC:**	V-10 VACANT LAND
Street Number:	0	**Street Direction:**	
Street Name:		**Street Type:**	
Situs Address:	**LANDLOCKED**	**MAILING ADDRESS:**	**1655 N FORT MYER DR**
OWNER(S):	**CONSERVATION FUND**		**STE 1300**
			ARLINGTON VA
LOT LOCATION:	**SS & REAR OF RT 841**	**ZIP:**	**22209**
PROPERTY DESCRIPTION:	**14.4 AC S**	**BOOK:**	9653
ACRES:	**14.4**	**PAGE:**	523
SQUARE FEET:		**DATE OF RECORDATION:**	11-20-2017
LAST SALE PRICE:	**4385000**	**TOTAL ASSESSMENT:**	**2360**
ASSESSMENT DATE:	**12-15-2017**	**Lot Assessment:**	**2360**
Municipality Number:	**72**	**Property Assessment:**	**0**

Parcel History

Owner Name	Deed Volume	Book	Page	Sale Date	Sale Price	Lot Location	Prop Description	Total Assessment
FREDERICK J ROBERT &	W	24	147		0	N&REAR OF T354	47&6 AC	2380
CONSERVATION FUND		9653	523	11-20-2017	4385000	SS & REAR OF RT 841	14.4 AC S	2360
TRIMBLE JANE F		1631	296	07-01-1989	0	N&REAR OF T354	47.6 AC	2380

TRIMBLE JANE F		**1631**	**296**	**07-01-1989**	**0**	**N&REAR OF T354**	**14.4 AC S**	**85870**

Records 1 to 4 of 4

Current Parcel Details

UPI:	**72-6-4**	**PLAN NUMBER:**	
PIN:	7206 00040000	**LUC:**	V-10 VACANT LAND
Street Number:	99	**Street Direction:**	
Street Name:	BULLOCK	**Street Type:**	RD
Situs Address:	**99 BULLOCK RD**	**MAILING ADDRESS:**	**C/O BARBARA BUCKMAN 193-0328**
OWNER(S):	**DELAWARE TRUST CO**		**1735 MARKET ST 3RD FLOOR**
	TRUSTEE FOR STRAWBRIDGE		**PHILADELPHIA PA**
LOT LOCATION:	**SS OF BULLOCK RD**	**ZIP:**	**19103**
PROPERTY DESCRIPTION:	**370.1 AC**	**BOOK:**	B64
ACRES:	**370.1**	**PAGE:**	175
SQUARE FEET:		**DATE OF RECORDATION:**	08-01-1984
LAST SALE PRICE:	**0**	**TOTAL ASSESSMENT:**	**52840**
ASSESSMENT DATE:	**12-15-2017**	**Lot Assessment:**	**52840**
Municipality Number:	**72**	**Property Assessment:**	**0**

Parcel History

Owner Name	Deed Volume	Book	Page	Sale Date	Sale Price	Lot Location	Prop Description	Total Assessment
DELAWARE TRUST CO	**B**	**64**	**175**	**08-01-1984**	**0**	**SW INT T356&T303**	**370.1 AC FARM**	**40580**

Record 1 of 1

Current Parcel Details

UPI:	**72-6-10**	**PLAN NUMBER:**	
PIN:	7206 00100000	**LUC:**	V-10 VACANT LAND
Street Number:	401	**Street Direction:**	
Street Name:	STRICKERSVILLE	**Street Type:**	RD
Situs Address:	**401 STRICKERSVILLE RD**	**MAILING ADDRESS:**	**1655 N FORT MYER DR**
OWNER(S):	**CONSERVATION FUND**		**STE 1300 ARLINGTON VA**
LOT LOCATION:	**NS OF STRICKERSVILLE RD**	**ZIP:**	**22209**
PROPERTY DESCRIPTION:	**63.5 AC**	**BOOK:**	9653
ACRES:	**63.5**	**PAGE:**	523
SQUARE FEET:		**DATE OF RECORDATION:**	11-20-2017
LAST SALE PRICE:	**4385000**	**TOTAL ASSESSMENT:**	**8760**
ASSESSMENT DATE:	**12-15-2017**	**Lot Assessment:**	**8760**
Municipality Number:	**72**	**Property Assessment:**	**0**

Parcel History

Owner Name	Deed Volume	Book	Page	Sale Date	Sale Price	Lot Location	Prop Description	Total Assessment
CONSERVATION FUND		9653	523	11-20-2017	4385000	NS OF STRICKERSVILLE RD	63.5 AC	8760
DELAWARE TRUST CO	B	64	175	08-01-1984	0	NS 15016	63.5 AC	6350

Records 1 to 2 of 2

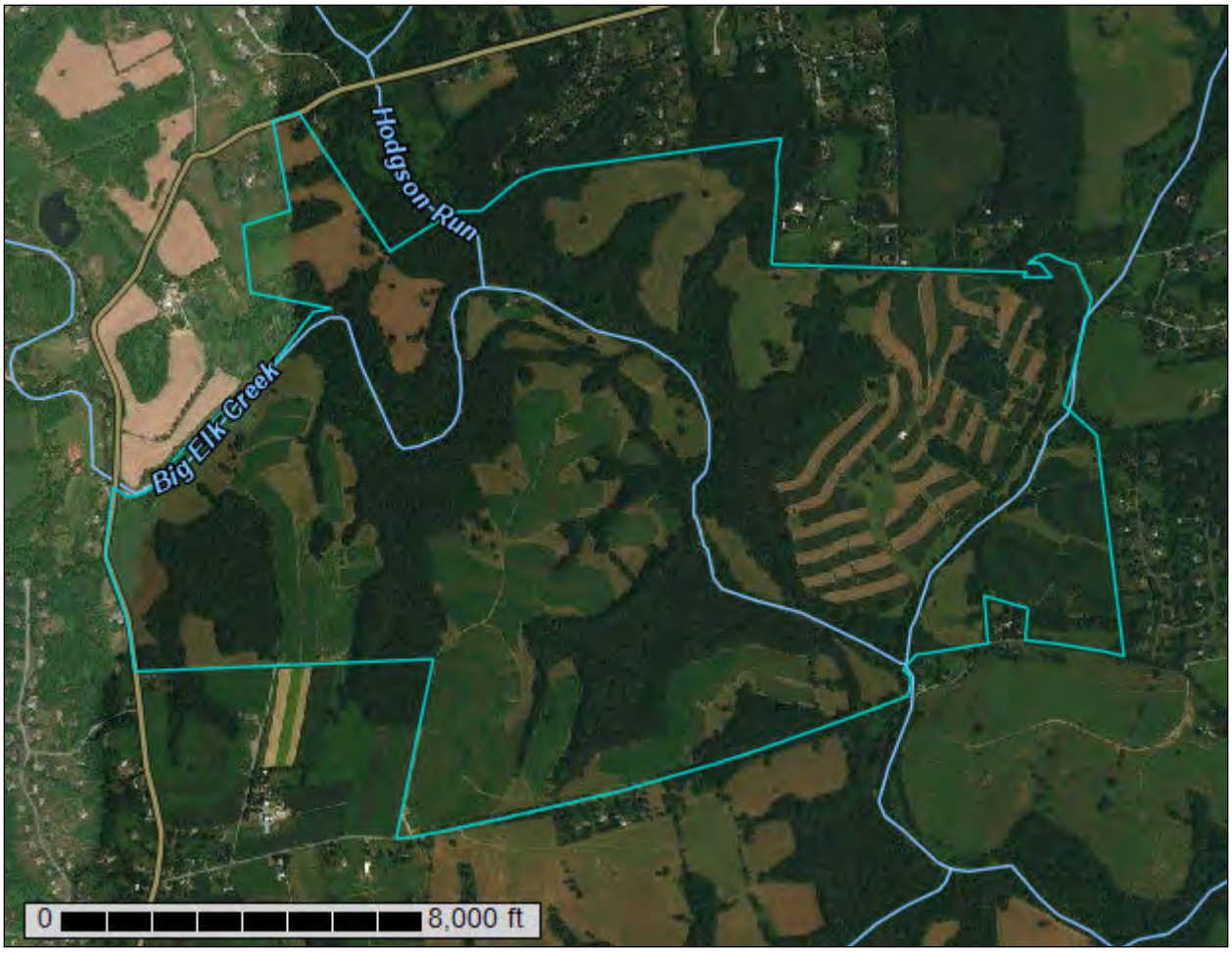
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Chester County, Pennsylvania



July 27, 2018
Addendum F

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.....2
How Soil Surveys Are Made.....6
Soil Map.....9
Soil Map (2018-075).....10
Legend.....11
Map Unit Legend (2018-075).....12
Map Unit Descriptions (2018-075).....12
Chester County, Pennsylvania.....15
Ba—Baile silt loam.....15
BaB—Baile silt loam, 3 to 8 percent slopes.....16
Co—Codorus silt loam.....17
Cs—Comus silt loam.....19
GgB—Glenelg silt loam, 3 to 8 percent slopes.....20
GgC—Glenelg silt loam, 8 to 15 percent slopes.....21
GlA—Glenville silt loam, 0 to 3 percent slopes.....23
GlB—Glenville silt loam, 3 to 8 percent slopes.....24
GlC—Glenville silt loam, 8 to 15 percent slopes.....25
Ha—Hatboro silt loam.....26
MaB—Manor loam, 3 to 8 percent slopes.....28
MaC—Manor loam, 8 to 15 percent slopes.....29
MaD—Manor loam, 15 to 25 percent slopes.....31
MaE—Manor loam, 25 to 35 percent slopes.....32
UrmB—Urban land-Glenelg complex, 0 to 8 percent slopes.....33
UrsB—Urban land-Manor complex, 0 to 8 percent slopes.....35
UrsD—Urban land-Manor complex, 8 to 25 percent slopes.....36
W—Water.....38
Soil Information for All Uses.....39
Suitabilities and Limitations for Use.....39
Building Site Development.....39
Dwellings With Basements (2018-075).....39
Land Classifications.....45
Farmland Classification (2018-075).....46
Hydric Rating by Map Unit (2018-075).....51
Nonirrigated Capability Class (2018-075).....56
Sanitary Facilities.....60
Septic System Sand Mound Bed or Trench (PA) (2018-075).....60
Vegetative Productivity.....67
Yields of Non-Irrigated Crops (Map Unit): Corn (Bu) (2018-075).....68
Forest Productivity (Tree Site Index): American sycamore (Briscoe, Ferrill 1958 (700)) (2018-075).....72
Forest Productivity (Tree Site Index): black oak (Schnur 1937 (820)) (2018-075).....76
Forest Productivity (Tree Site Index): black walnut (Kellog 1939a (190)) (2018-075).....80

Forest Productivity (Tree Site Index): eastern white pine (Lloyd 1970b (660)) (2018-075)....84
Forest Productivity (Tree Site Index): northern red oak (Schnur 1937 (820)) (2018-075)....88
Forest Productivity (Tree Site Index): red maple (Lloyd 1971a (070)) (2018-075)....92
Forest Productivity (Tree Site Index): sugar maple (Lloyd 1971a (070)) (2018-075)....96
Forest Productivity (Tree Site Index): Virginia pine (Nelson, Clutter, Chaiken 1961 (620)) (2018-075)....100
Forest Productivity (Tree Site Index): white ash (Lloyd 1971a (170)) (2018-075)....104
Forest Productivity (Tree Site Index): white oak (Schnur 1937 (820)) (2018-075)....108
Forest Productivity (Tree Site Index): yellow-poplar (Beck 1962 (360)) (2018-075)....112
References....117

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

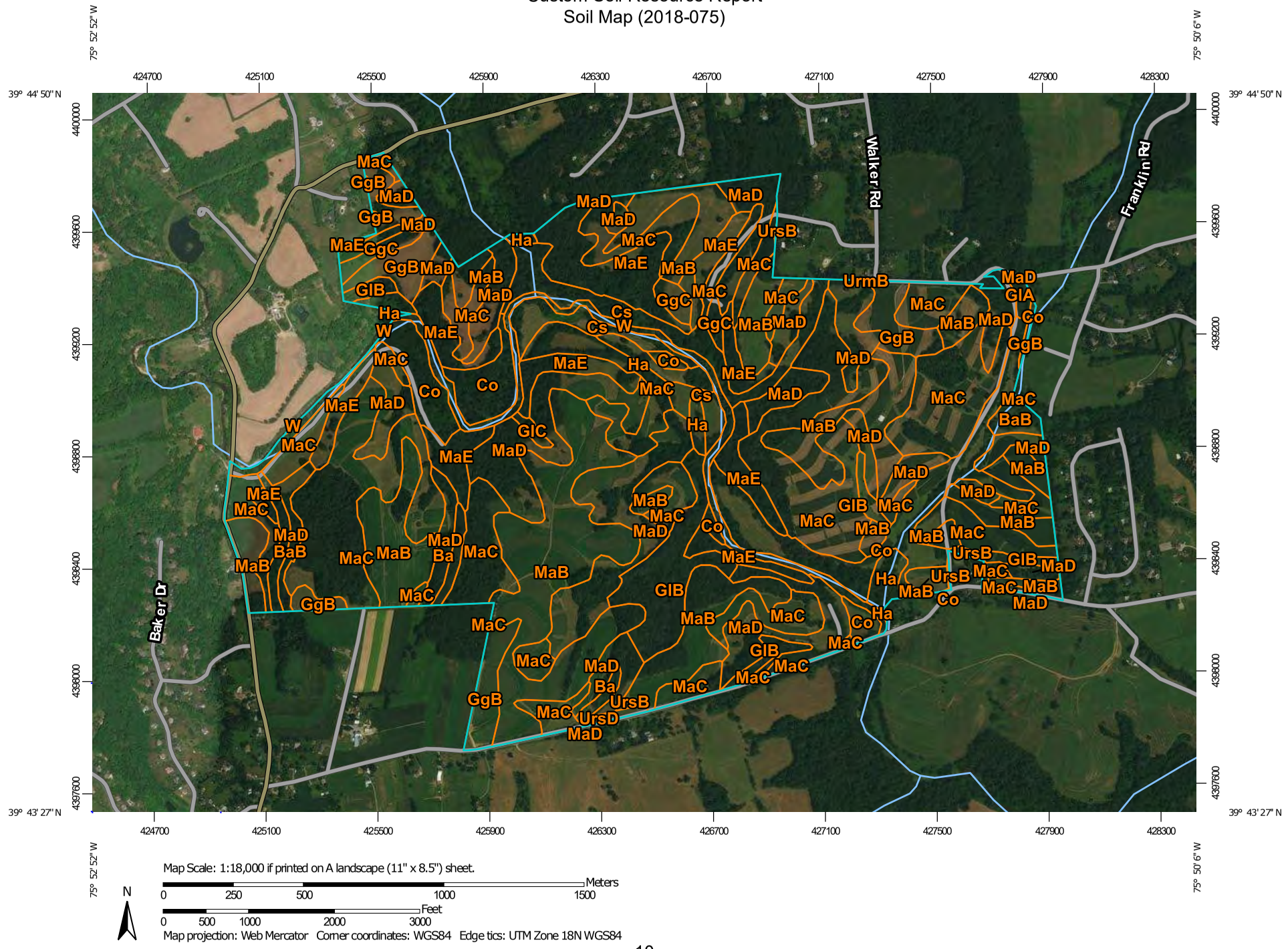
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map (2018-075)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (2018-075)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ba	Baile silt loam	5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes	8.9	0.9%
Co	Codorus silt loam	75.6	7.7%
Cs	Comus silt loam	43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes	33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes	14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	1.5	0.2%
Ha	Hatboro silt loam	15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes	265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes	174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes	79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes	0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes	2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes	0.5	0.0%
W	Water	19.4	2.0%
Totals for Area of Interest		**982.6**	**100.0%**

Map Unit Descriptions (2018-075)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic

class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Chester County, Pennsylvania

Ba—Baile silt loam

Map Unit Setting

National map unit symbol: pjb7
Elevation: 200 to 2,000 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 45 to 61 degrees F
Frost-free period: 110 to 235 days
Farmland classification: Not prime farmland

Map Unit Composition

Baile and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Baile

Setting

Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Local alluvium over residuum weathered from mica schist

Typical profile

Ap - 0 to 10 inches: silt loam
Btg - 10 to 40 inches: silt loam
Cg - 40 to 60 inches: loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Glenville

Percent of map unit: 9 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope

Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

Manor

Percent of map unit: 2 percent
Landform: Hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Glenelg

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Chester

Percent of map unit: 2 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

BaB—Baile silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: yrhy
Elevation: 330 to 2,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Baile and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Baile

Setting

Landform: Depressions
Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Local alluvium over residuum weathered from mica schist

Typical profile

Ap - 0 to 10 inches: silt loam
Btg - 10 to 40 inches: silt loam
Cg - 40 to 60 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Co—Codorus silt loam

Map Unit Setting

National map unit symbol: pjfx
Elevation: 200 to 2,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 120 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Codorus and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Codorus

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Alluvium derived from gneiss and/or alluvium derived from mica schist

Typical profile

Ap - 0 to 12 inches: silt loam
Bw - 12 to 48 inches: silt loam
C - 48 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 72 to 99 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Hatboro

Percent of map unit: 8 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Glenville

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

Baile

Percent of map unit: 3 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Cs—Comus silt loam

Map Unit Setting

National map unit symbol: pjdx
Elevation: 200 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 61 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Comus and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Comus

Setting

Landform: Flood plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite and gneiss and/or alluvium derived from mica schist

Typical profile

A - 0 to 12 inches: silt loam
B - 12 to 39 inches: silt loam
C - 39 to 60 inches: stratified gravelly loamy sand to loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 72 to 99 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Holly

Percent of map unit: 8 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Newark

Percent of map unit: 2 percent
Landform: Depressions, flood plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

GgB—Glenelg silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v7gr
Elevation: 30 to 1,200 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 192 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Glenelg and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glenelg

Setting

Landform: Hillslopes, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear, concave, convex
Parent material: Residuum weathered from mica schist

Typical profile

Ap - 0 to 8 inches: silt loam
Bt1 - 8 to 18 inches: clay loam
Bt2 - 18 to 30 inches: clay loam
BCt - 30 to 42 inches: loam

CBt - 42 to 54 inches: loam
C - 54 to 76 inches: channery fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Gaila

Percent of map unit: 10 percent
Landform: Hillslopes, ridges
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Glenville

Percent of map unit: 5 percent
Landform: Drainageways, swales
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

GgC—Glenelg silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2tt89
Elevation: 30 to 1,200 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 192 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Glenelg and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glenelg

Setting

Landform: Hillslopes, interfluves
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear, concave, convex
Parent material: Residuum weathered from mica schist

Typical profile

Ap - 0 to 8 inches: silt loam
Bt1 - 8 to 18 inches: clay loam
Bt2 - 18 to 30 inches: clay loam
BCt - 30 to 42 inches: loam
CBt - 42 to 54 inches: loam
C - 54 to 76 inches: channery fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Gaila

Percent of map unit: 10 percent
Landform: Hillslopes, ridges
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Glenville

Percent of map unit: 5 percent
Landform: Drainageways, swales
Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

GlA—Glenville silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: pjk8
Elevation: 200 to 2,000 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 45 to 61 degrees F
Frost-free period: 110 to 235 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Glenville and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glenville

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Colluvium and/or residuum weathered from mica schist

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 19 inches: silt loam
Bx - 19 to 39 inches: silt loam
C - 39 to 82 inches: channery loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 15 to 30 inches to fragipan; 60 to 99 inches to paralithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 6 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Glenelg

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Baile

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: Yes

GlB—Glenville silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tmch
Elevation: 20 to 1,090 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 192 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Glenville and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glenville

Setting

Landform: Swales, drainageways
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Head slope, base slope, interfluve
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Colluvium derived from metamorphic rock over schist, gneiss or phyllite residuum

Typical profile

Ap - 0 to 11 inches: silt loam
Bt1 - 11 to 20 inches: channery silt loam
Bt2 - 20 to 30 inches: silt loam
Btx - 30 to 40 inches: silt loam
C1 - 40 to 59 inches: loam
C2 - 59 to 82 inches: loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 29 to 31 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.03 to 0.11 in/hr)
Depth to water table: About 18 to 22 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 15 percent
Landform: Drainageways
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

Baile

Percent of map unit: 10 percent
Landform: Drainageways, swales
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: Yes

GIC—Glenville silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: pjkc

Elevation: 200 to 800 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Glenville and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glenville

Setting
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Parent material: Colluvium and/or residuum weathered from mica schist

Typical profile
Ap - 0 to 10 inches: silt loam
BA - 10 to 16 inches: silt loam
Bt - 16 to 30 inches: silt loam
Btx - 30 to 50 inches: silty clay loam
C - 50 to 70 inches: channery loam

Properties and qualities
Slope: 8 to 15 percent
Depth to restrictive feature: 15 to 30 inches to fragipan; 60 to 99 inches to paralithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 6 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Ha—Hatboro silt loam

Map Unit Setting
National map unit symbol: 1lwqq
Elevation: 200 to 800 feet
Mean annual precipitation: 36 to 50 inches

Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Hatboro and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hatboro

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Alluvium derived from metamorphic and sedimentary rock

Typical profile

Ap - 0 to 9 inches: silt loam
Bg - 9 to 44 inches: silt loam
Cg - 44 to 56 inches: sandy clay loam
C - 56 to 70 inches: stratified gravelly sand to clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 60 to 99 inches to lithic bedrock
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Glenville

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

MaB—Manor loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: pjl2
Elevation: 200 to 1,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 140 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Manor and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manor

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Residuum weathered from mica schist

Typical profile

Ap - 0 to 8 inches: loam
Bw - 8 to 23 inches: channery loam
C - 23 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 72 to 99 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Glenville

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

Hatboro

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

MaC—Manor loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2tkpw
Elevation: 50 to 1,080 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Manor and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manor

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from mica schist

Typical profile

A1 - 0 to 2 inches: loam
A2 - 2 to 6 inches: sandy loam
Bw1 - 6 to 13 inches: fine sandy loam
Bw2 - 13 to 22 inches: fine sandy loam

C1 - 22 to 30 inches: fine sandy loam
C2 - 30 to 44 inches: channery coarse sand
C3 - 44 to 53 inches: loamy sand
C4 - 53 to 83 inches: channery loamy sand
Cr - 83 to 108 inches: bedrock
R - 108 to 138 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 59 to 100 inches to paralithic bedrock; 100 to 128 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.07 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Glenville

Percent of map unit: 5 percent
Landform: Drainageways, swales
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Mt. airy

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Blocktown

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, interfluve, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

MaD—Manor loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2tmcg
Elevation: 250 to 1,000 feet
Mean annual precipitation: 40 to 55 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 192 days
Farmland classification: Not prime farmland

Map Unit Composition

Manor and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manor

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from mica schist

Typical profile

A1 - 0 to 2 inches: loam
A2 - 2 to 6 inches: sandy loam
Bw1 - 6 to 13 inches: fine sandy loam
Bw2 - 13 to 22 inches: fine sandy loam
C1 - 22 to 30 inches: fine sandy loam
C2 - 30 to 44 inches: channery coarse sand
C3 - 44 to 53 inches: loamy sand
C4 - 53 to 83 inches: channery loamy sand
Cr - 83 to 108 inches: bedrock
R - 108 to 138 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 59 to 100 inches to paralithic bedrock; 100 to 128 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.07 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Glenville

Percent of map unit: 5 percent
Landform: Drainageways, swales
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Base slope, head slope, interfluve
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Mt. airy

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Blocktown

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

MaE—Manor loam, 25 to 35 percent slopes

Map Unit Setting

National map unit symbol: pjlc
Elevation: 200 to 1,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Manor and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manor

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Residuum weathered from mica schist

Typical profile

A - 0 to 4 inches: loam
Bw - 4 to 19 inches: channery loam
C - 19 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 25 to 35 percent
Depth to restrictive feature: 72 to 99 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Glenville

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

UrmB—Urban land-Glenelg complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: pjnd
Elevation: 200 to 2,000 feet
Mean annual precipitation: 40 to 55 inches

Mean annual air temperature: 45 to 61 degrees F
Frost-free period: 110 to 235 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Glenelg and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Pavement, buildings and other artifically covered areas

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Glenelg

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Residuum weathered from mica schist

Typical profile

A - 0 to 8 inches: channery silt loam
Bt - 8 to 26 inches: channery silt loam
C - 26 to 60 inches: channery loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 60 to 120 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Glenville

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

UrsB—Urban land-Manor complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: pjnk
Elevation: 250 to 1,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 50 percent
Manor and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Variable

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock

Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Manor

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Residuum weathered from mica schist

Typical profile

A - 0 to 7 inches: loam
Bw - 7 to 21 inches: channery loam
C - 21 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 72 to 99 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

UrsD—Urban land-Manor complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: pjnl
Elevation: 250 to 1,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 50 percent
Manor and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Variable

Typical profile

C - 0 to 6 inches: variable

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 10 to 99 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Manor

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Residuum weathered from mica schist

Typical profile

A - 0 to 7 inches: loam
Bw - 7 to 21 inches: channery loam
C - 21 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 72 to 99 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: pjp3
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 120 to 214 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Setting

Parent material: Rivers streams ponds

Properties and qualities

Runoff class: Negligible
Frequency of ponding: Frequent

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Dwellings With Basements (2018-075)

Dwellings are single-family houses of three stories or less. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet.

The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification of the soil. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the

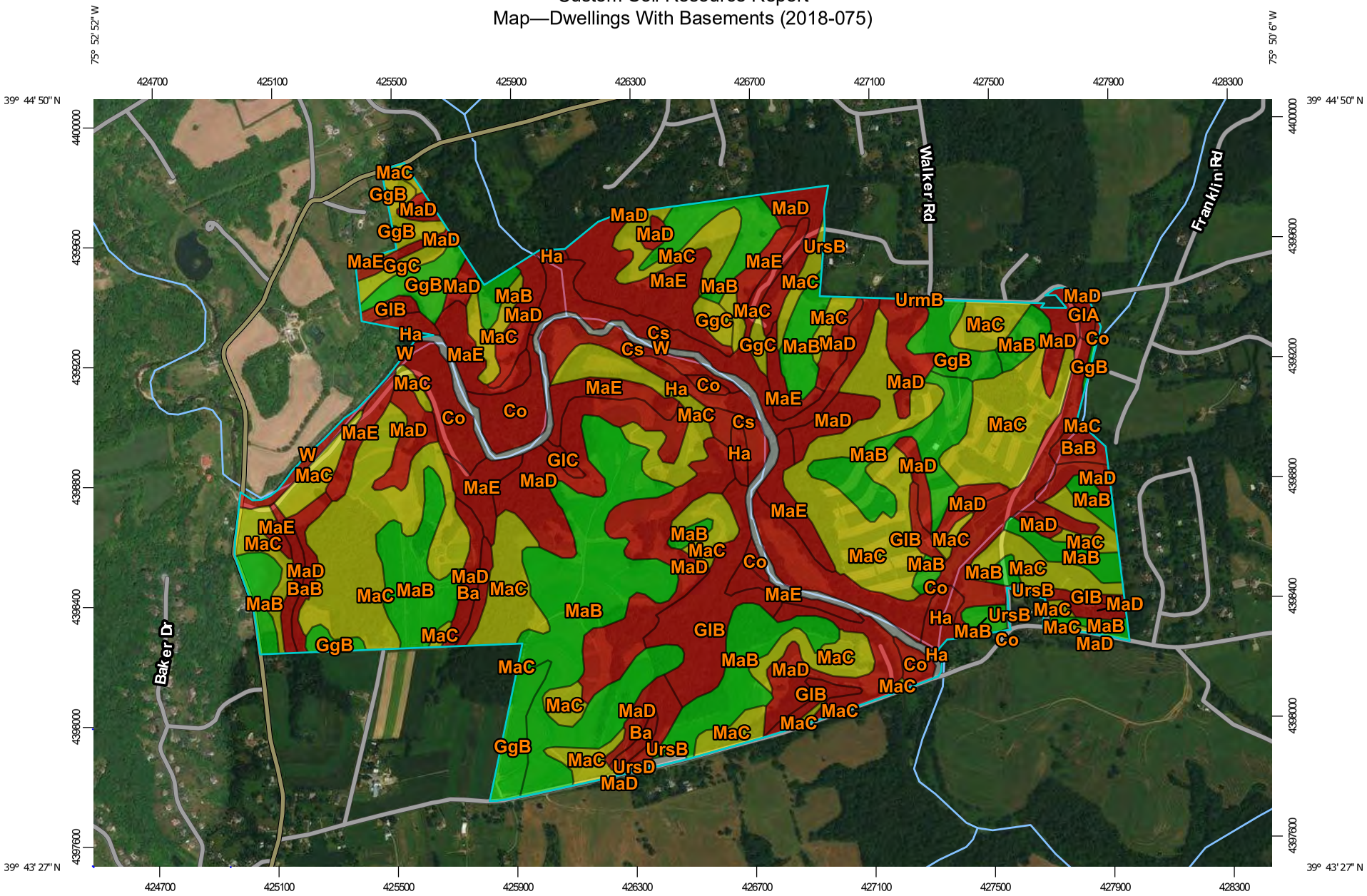
specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Dwellings With Basements (2018-075)



Addendum F

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Lines
- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Points
- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Dwellings With Basements (2018-075)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Ba	Baile silt loam	Very limited	Baile (85%)	Depth to saturated zone (1.00)	5.4	0.5%
				Shrink-swell (0.03)		
			Glenville (9%)	Depth to saturated zone (1.00)		
BaB	Baile silt loam, 3 to 8 percent slopes	Very limited	Baile (85%)	Depth to saturated zone (1.00)	8.9	0.9%
				Shrink-swell (0.03)		
Co	Codorus silt loam	Very limited	Codorus (85%)	Flooding (1.00)	75.6	7.7%
				Depth to saturated zone (1.00)		
			Hatboro (8%)	Flooding (1.00)		
				Depth to saturated zone (1.00)		
			Glenville (4%)	Depth to saturated zone (1.00)		
			Baile (3%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Shrink-swell (0.01)		
Cs	Comus silt loam	Very limited	Comus (90%)	Flooding (1.00)	43.5	4.4%
			Holly (8%)	Flooding (1.00)		
				Depth to saturated zone (1.00)		
			Newark (2%)	Flooding (1.00)		
				Depth to saturated zone (1.00)		
GgB	Glenelg silt loam, 3 to 8 percent slopes	Not limited	Glenelg (85%)		33.1	3.4%
			Gaila (10%)			
GgC	Glenelg silt loam, 8 to 15 percent slopes	Somewhat limited	Glenelg (85%)	Slope (0.63)	14.6	1.5%
			Gaila (10%)	Slope (0.63)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
GlA	Glenville silt loam, 0 to 3 percent slopes	Very limited	Glenville (90%)	Depth to saturated zone (1.00)	2.1	0.2%
			Baile (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Shrink-swell (0.01)		
GlB	Glenville silt loam, 3 to 8 percent slopes	Very limited	Glenville (75%)	Depth to saturated zone (1.00)	36.7	3.7%
			Unnamed (15%)	Depth to saturated zone (1.00)		
			Baile (10%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
GlC	Glenville silt loam, 8 to 15 percent slopes	Very limited	Glenville (100%)	Depth to saturated zone (1.00)	1.5	0.2%
				Slope (0.63)		
Ha	Hatboro silt loam	Very limited	Hatboro (95%)	Flooding (1.00)	15.9	1.6%
				Depth to saturated zone (1.00)		
			Glenville (5%)	Depth to saturated zone (1.00)		
MaB	Manor loam, 3 to 8 percent slopes	Not limited	Manor (95%)		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes	Somewhat limited	Manor (85%)	Slope (0.63)	265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes	Very limited	Manor (85%)	Slope (1.00)	174.2	17.7%
			Blocktown (5%)	Slope (1.00)		
				Depth to hard bedrock (1.00)		
				Depth to soft bedrock (1.00)		
			Glenville (5%)	Slope (1.00)		
				Depth to saturated zone (1.00)		
			Mt. Airy (5%)	Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Depth to hard bedrock (1.00)		
MaE	Manor loam, 25 to 35 percent slopes	Very limited	Manor (98%)	Slope (1.00)	79.8	8.1%
			Glenville (2%)	Depth to saturated zone (1.00)		
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes	Not rated	Urban land (65%)		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes	Not rated	Urban land (50%)		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes	Not rated	Urban land (50%)		0.5	0.0%
W	Water	Not rated	Water (100%)		19.4	2.0%
Totals for Area of Interest					**982.6**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	443.6	45.1%
Somewhat limited	279.9	28.5%
Not limited	236.9	24.1%
Null or Not Rated	22.2	2.3%
Totals for Area of Interest	**982.6**	**100.0%**

Rating Options—Dwellings With Basements (2018-075)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

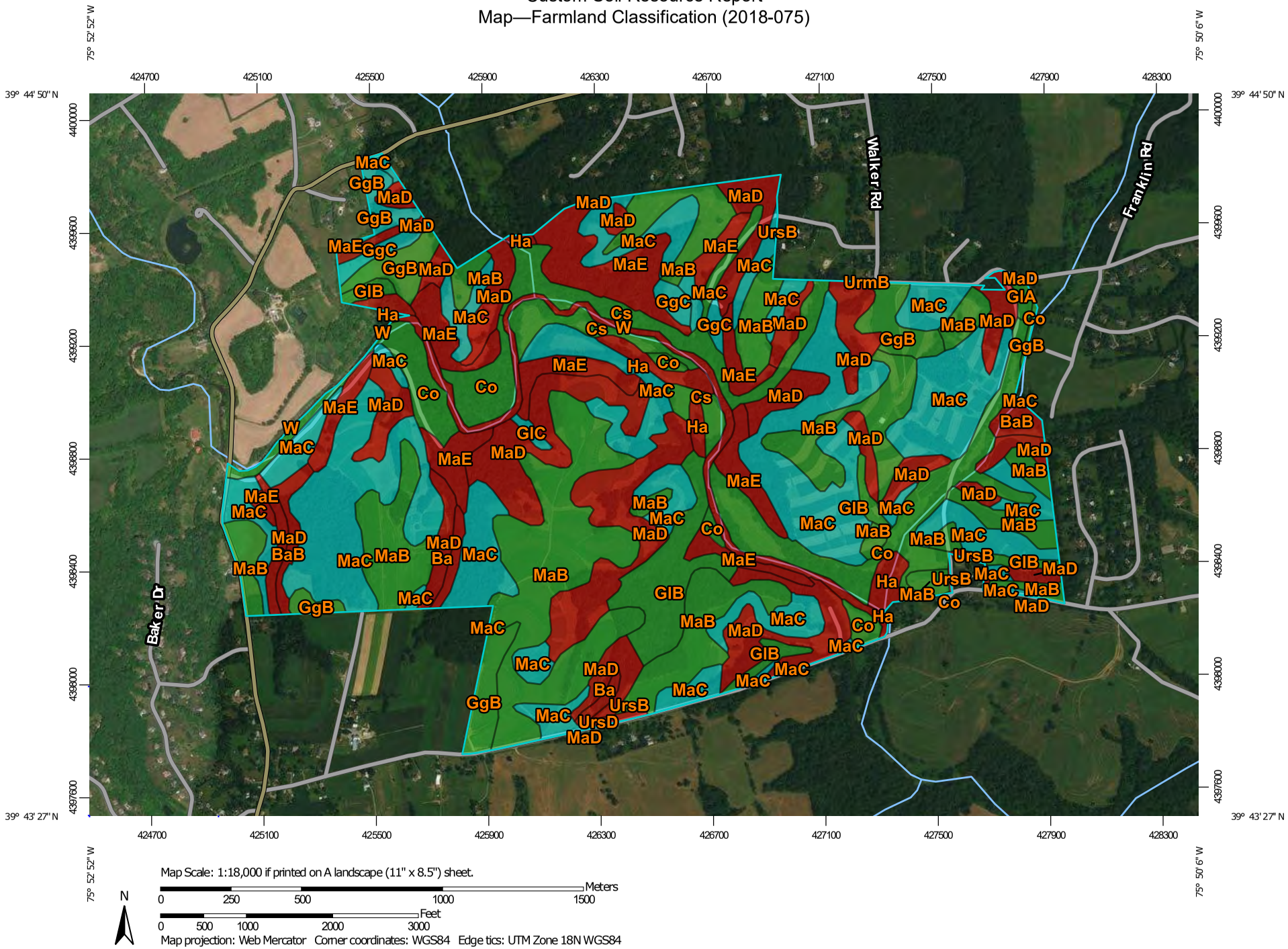
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification (2018-075)

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Custom Soil Resource Report
Map—Farmland Classification (2018-075)



Addendum F

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

Addendum F

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification (2018-075)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ba	Baile silt loam	Not prime farmland	5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes	Not prime farmland	8.9	0.9%
Co	Codorus silt loam	All areas are prime farmland	75.6	7.7%
Cs	Comus silt loam	All areas are prime farmland	43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes	All areas are prime farmland	33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes	Farmland of statewide importance	14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	All areas are prime farmland	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	All areas are prime farmland	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	Farmland of statewide importance	1.5	0.2%
Ha	Hatboro silt loam	Not prime farmland	15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes	All areas are prime farmland	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes	Farmland of statewide importance	265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes	Not prime farmland	174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes	Not prime farmland	79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes	Not prime farmland	0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes	Not prime farmland	2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes	Not prime farmland	0.5	0.0%
W	Water	Not prime farmland	19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Farmland Classification (2018-075)

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Hydric Rating by Map Unit (2018-075)

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

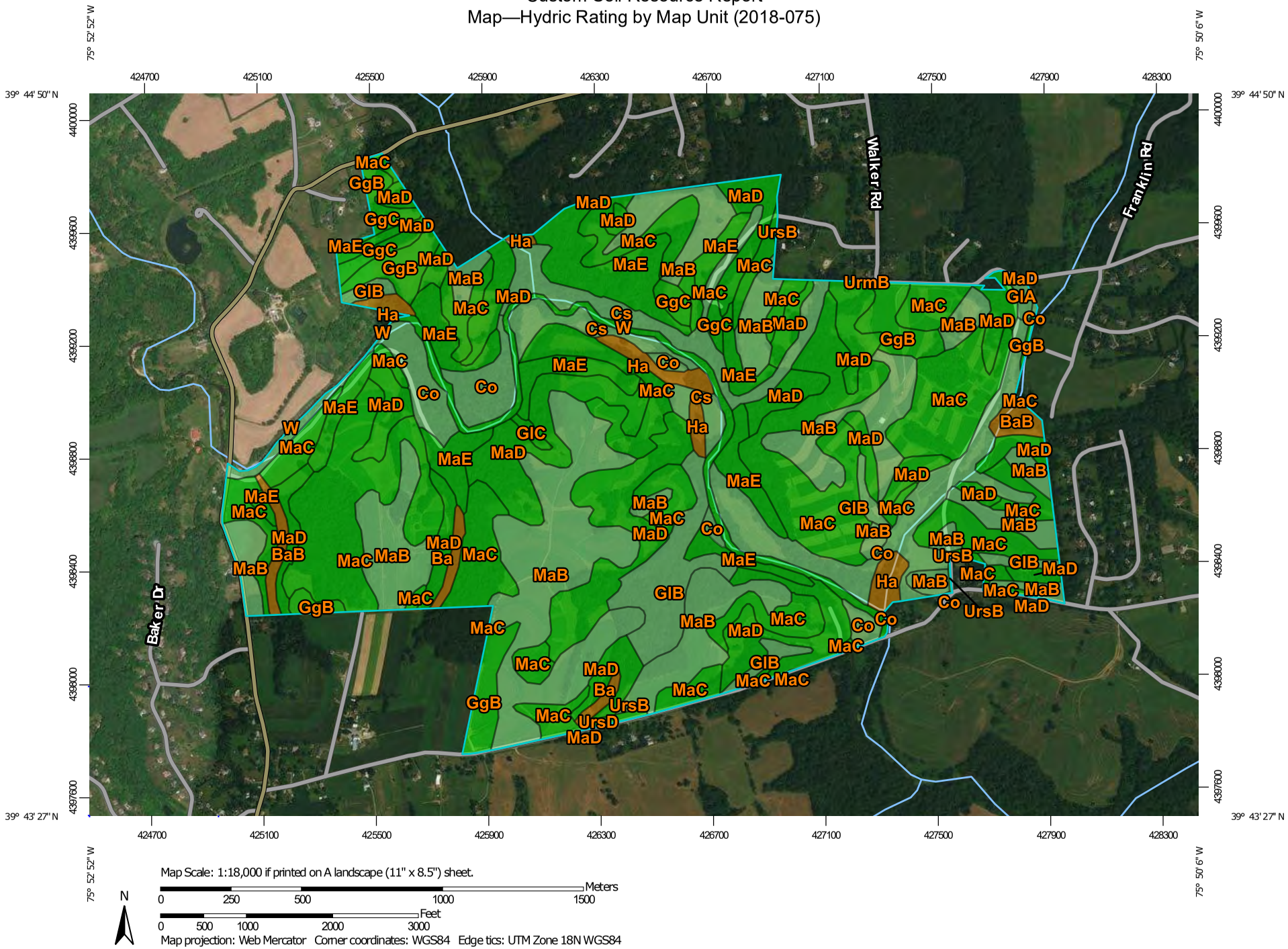
Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Custom Soil Resource Report
Map—Hydric Rating by Map Unit (2018-075)



Map Scale: 1:18,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 250 500 1000 1500

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Addendum F

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydric Rating by Map Unit (2018-075)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ba	Baile silt loam	85	5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes	85	8.9	0.9%
Co	Codorus silt loam	11	75.6	7.7%
Cs	Comus silt loam	8	43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes	0	33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes	0	14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	5	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	10	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	0	1.5	0.2%
Ha	Hatboro silt loam	95	15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes	2	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes	0	265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes	0	174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes	0	79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes	0	0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes	0	2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes	0	0.5	0.0%
W	Water	0	19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Hydric Rating by Map Unit (2018-075)

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Nonirrigated Capability Class (2018-075)

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels-capability class, subclass, and unit. Only class and subclass are included in this data set.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

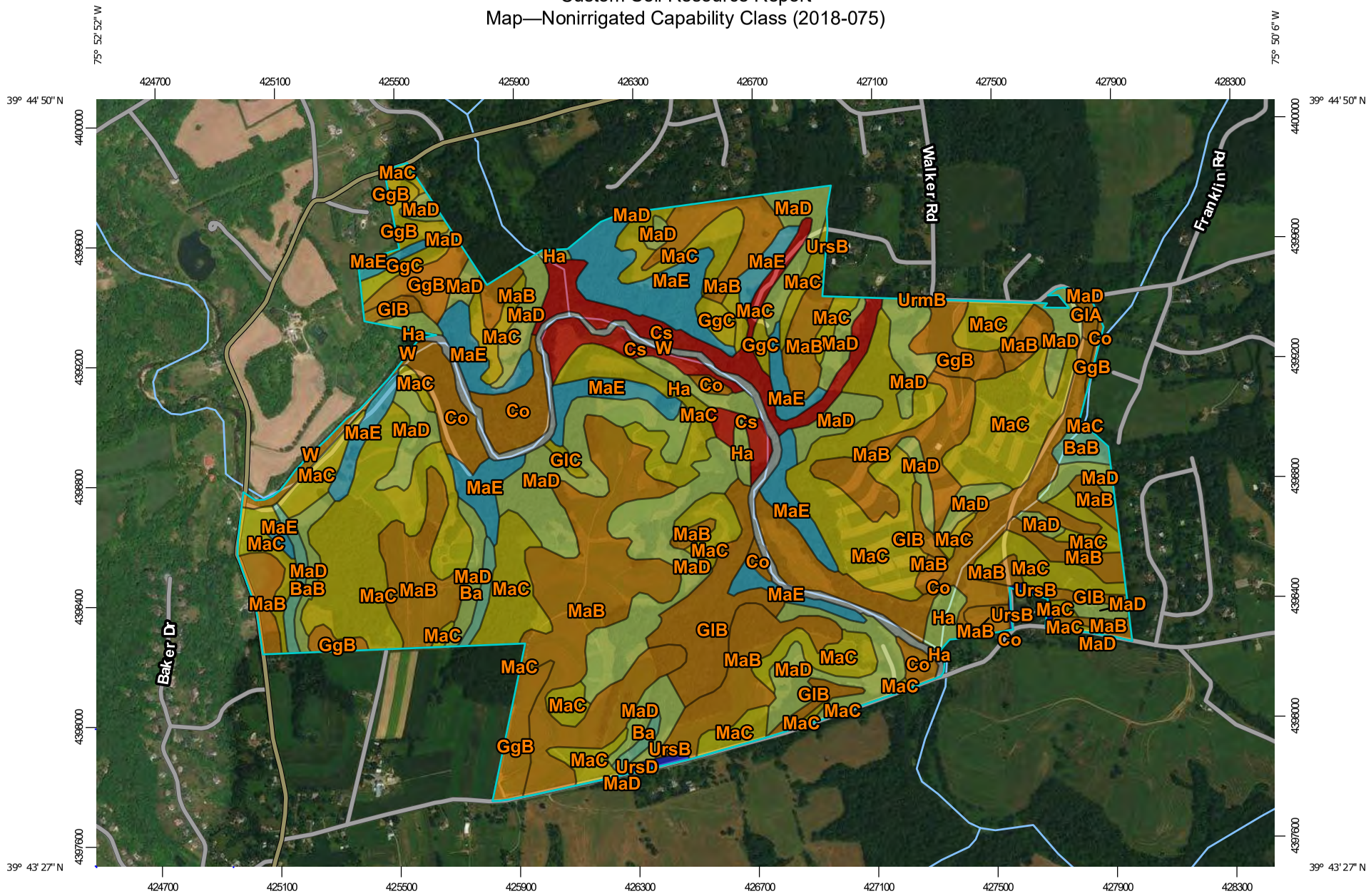
Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Map—Nonirrigated Capability Class (2018-075)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Capability Class - I
Capability Class - II
Capability Class - III
Capability Class - IV
Capability Class - V
Capability Class - VI
Capability Class - VII
Capability Class - VIII
Not rated or not available

Soil Rating Lines

Capability Class - I
Capability Class - II
Capability Class - III
Capability Class - IV
Capability Class - V
Capability Class - VI
Capability Class - VII
Capability Class - VIII
Not rated or not available

Soil Rating Points

Capability Class - I
Capability Class - II
Capability Class - III
Capability Class - IV
Capability Class - V
Capability Class - VI
Capability Class - VII
Capability Class - VIII
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Nonirrigated Capability Class (2018-075)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ba	Baile silt loam	5	5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes	5	8.9	0.9%
Co	Codorus silt loam	2	75.6	7.7%
Cs	Comus silt loam	1	43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes	2	33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes	3	14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	2	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	2	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	3	1.5	0.2%
Ha	Hatboro silt loam	4	15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes	2	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes	3	265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes	4	174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes	6	79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes	8	0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes	8	2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes	8	0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Nonirrigated Capability Class (2018-075)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Sanitary Facilities

Sanitary Facilities interpretations are tools designed to guide the user in site selection for the safe disposal of sewage and solid waste. Example interpretations include septic tank absorption fields, sewage lagoons, and sanitary landfills.

Septic System Sand Mound Bed or Trench (PA) (2018-075)

This is a system of pressurized lines that distribute effluent from a septic tank into a mound with sand under aggregate. The mound is placed on top of the mineral soil surface. About 1 to 4 feet of sand could be placed on the mineral soil surface in a sand mound system. Only the part of the soils between depths of 0 and 20 inches is considered when the soils are rated.

The soil properties and site features considered are those that affect absorption of the effluent and construction and maintenance of the system and those that may affect public health. These include depth to a water table, depth to bedrock, content of rock fragments, flooding, slope, and saturated hydraulic conductivity (Ksat). Flooding is a serious problem because it can result in improper treatment of the effluent and contamination of ground water or surface water. If Ksat is too fast or too slow, if the content of rock fragments is too high, or if the water table is too close to the surface, the effluent can contaminate the ground water. If this system is improperly installed on the steeper slopes, the effluent could flow along the surface of the soils. Additional grading may be needed in areas downslope from the system.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Slightly limited" indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. "Moderately limited" indicates that the soil has features that are somewhat favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

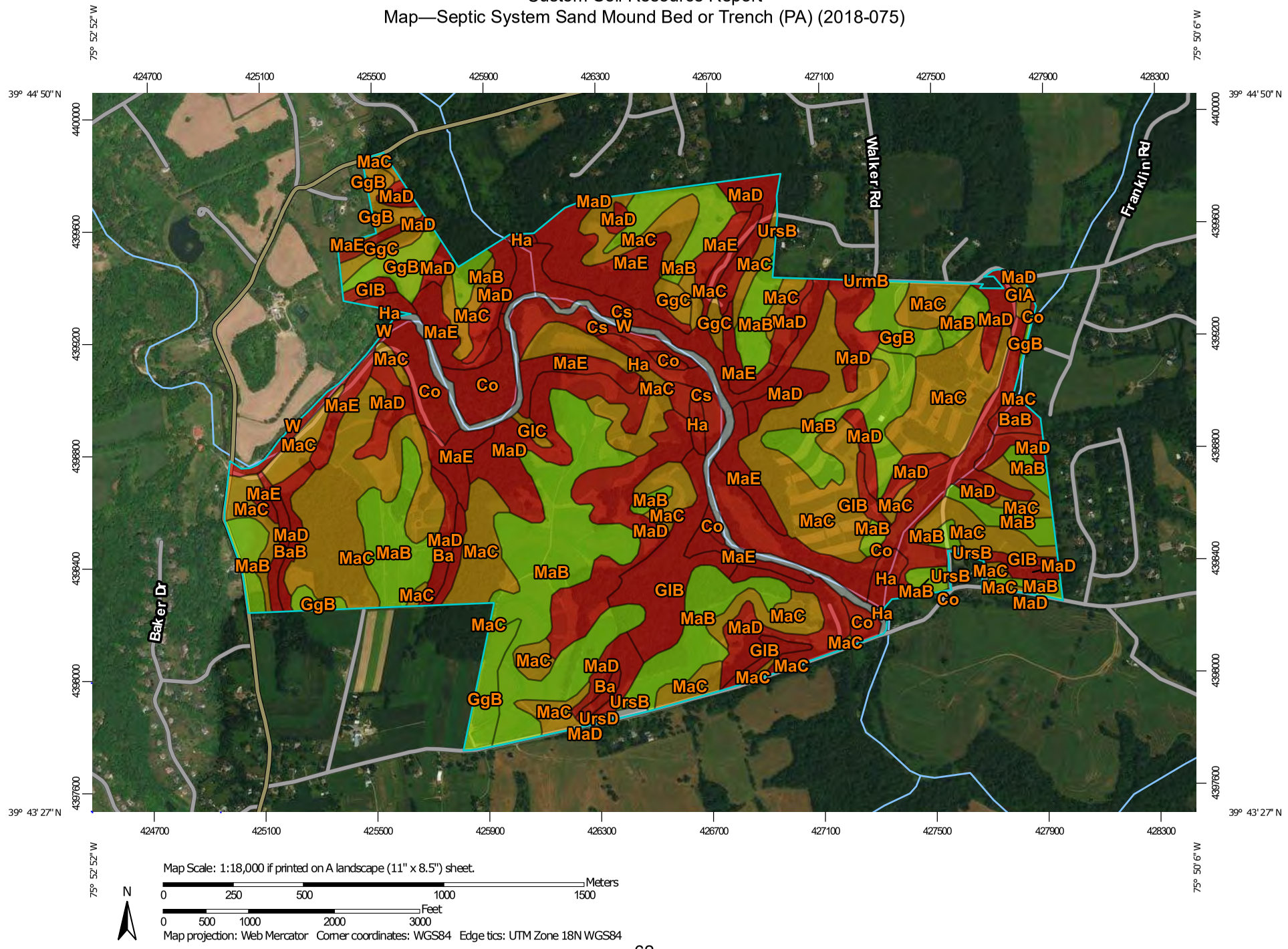
Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer

are determined by the aggregation method chosen, which is displayed on the report. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the Selected Soil Interpretations report with this interpretation included from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Septic System Sand Mound Bed or Trench (PA) (2018-075)



Addendum F

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

Soil Rating Lines
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

Soil Rating Points
- Very limited
- Moderately limited
- Slightly limited
- Not limited
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Septic System Sand Mound Bed or Trench (PA) (2018-075)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Ba	Baile silt loam	Very limited	Baile (85%)	Potential seasonal high water table (1.00)	5.4	0.5%
				Slow percolation 12-20" (1.00)		
				Slope (0.18)		
BaB	Baile silt loam, 3 to 8 percent slopes	Very limited	Baile (85%)	Potential seasonal high water table (1.00)	8.9	0.9%
				Slow percolation 12-20" (1.00)		
				Slope (0.35)		
Co	Codorus silt loam	Very limited	Codorus (85%)	Flooding (1.00)	75.6	7.7%
				Low potential seasonal high water table (0.67)		
				Slope (0.18)		
			Hatboro (8%)	Potential seasonal high water table (1.00)		
				Flooding (1.00)		
				Slope (0.18)		
			Baile (3%)	Potential seasonal high water table (1.00)		
				Slow percolation 12-20" (1.00)		
				Slope (0.18)		
Cs	Comus silt loam	Very limited	Comus (90%)	Flooding (1.00)	43.5	4.4%
				Slope (0.18)		
			Holly (8%)	Potential seasonal high water table (1.00)		
				Flooding (1.00)		
				Slope (0.18)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Newark (2%)	Potential seasonal high water table (1.00)		
				Flooding (1.00)		
				Potential karst (0.30)		
				Slope (0.18)		
GgB	Glenelg silt loam, 3 to 8 percent slopes	Slightly limited	Glenelg (85%)	Slope (0.40)	33.1	3.4%
			Gaila (10%)	Slope (0.40)		
			Glenville (5%)	Low potential seasonal high water table (0.50)		
				Slope (0.40)		
GgC	Glenelg silt loam, 8 to 15 percent slopes	Moderately limited	Glenelg (85%)	Too steep (0.85)	14.6	1.5%
			Gaila (10%)	Too steep (0.85)		
			Glenville (5%)	Too steep (0.85)		
				Low potential seasonal high water table (0.50)		
GlA	Glenville silt loam, 0 to 3 percent slopes	Moderately limited	Glenville (90%)	Potential seasonal high water table (0.98)	2.1	0.2%
				Slow percolation 12-20" (0.79)		
				Slope (0.18)		
GlB	Glenville silt loam, 3 to 8 percent slopes	Very limited	Glenville (75%)	Potential seasonal high water table (1.00)	36.7	3.7%
				Slope (0.40)		
			Unnamed (15%)	Potential seasonal high water table (1.00)		
				Slope (0.40)		
			Baile (10%)	Potential seasonal high water table (1.00)		
				Slow percolation 12-20" (1.00)		
				Slope (0.40)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
GlC	Glenville silt loam, 8 to 15 percent slopes	Moderately limited	Glenville (100%)	Potential seasonal high water table (0.98)	1.5	0.2%
				Too steep (0.85)		
				Slow percolation 12-20" (0.79)		
Ha	Hatboro silt loam	Very limited	Hatboro (95%)	Potential seasonal high water table (1.00)	15.9	1.6%
				Flooding (1.00)		
				Slope (0.18)		
MaB	Manor loam, 3 to 8 percent slopes	Slightly limited	Manor (95%)	Slope (0.40)	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes	Moderately limited	Manor (85%)	Too steep (0.85)	265.3	27.0%
			Mt. Airy (5%)	Too steep (0.85)		
				Potential bedrock near 20" (0.20)		
				Slight voided fragments (0.02)		
			Glenville (5%)	Too steep (0.85)		
				Low potential seasonal high water table (0.50)		
MaD	Manor loam, 15 to 25 percent slopes	Very limited	Manor (85%)	Too steep (1.00)	174.2	17.7%
			Blocktown (5%)	Bedrock, above 20" (1.00)		
				Too steep (1.00)		
				Slow percolation 12-20" (0.58)		
				Slight voided fragments (0.06)		
			Glenville (5%)	Potential seasonal high water table (1.00)		
				Too steep (1.00)		
			Mt. Airy (5%)	Too steep (1.00)		
				Potential bedrock near 20" (0.20)		
MaE	Manor loam, 25 to 35 percent slopes	Very limited	Manor (98%)	Too steep (1.00)	79.8	8.1%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes	Not rated	Urban land (65%)		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes	Not rated	Urban land (50%)		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes	Not rated	Urban land (50%)		0.5	0.0%
W	Water	Not rated	Water (100%)		19.4	2.0%
Totals for Area of Interest					**982.6**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	440.0	44.8%
Moderately limited	283.5	28.8%
Slightly limited	236.9	24.1%
Null or Not Rated	22.2	2.3%
Totals for Area of Interest	**982.6**	**100.0%**

Rating Options—Septic System Sand Mound Bed or Trench (PA) (2018-075)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Vegetative Productivity

Vegetative productivity includes estimates of potential vegetative production for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture and rangeland. In the underlying database, some states maintain crop yield data by individual map unit component. Other states maintain the data at the map unit level. Attributes are included for both, although only one or the other is likely to contain data for any given geographic area. For other land uses, productivity data is shown only at the map unit component level. Examples include potential crop yields under irrigated and nonirrigated conditions, forest productivity, forest site index, and total rangeland production under of normal, favorable and unfavorable conditions.

Yields of Non-Irrigated Crops (Map Unit): Corn (Bu) (2018-075)

These are the estimated average yields per acre that can be expected of selected nonirrigated crops under a high level of management. In any given year, yields may be higher or lower than those indicated because of variations in rainfall and other climatic factors.

In the database, some states maintain crop yield data by individual map unit component and others maintain the data at the map unit level. Attributes are included in this application for both, although only one or the other is likely to contain data for any given geographic area. This attribute uses data maintained at the map unit level.

The yields are actually recorded as three separate values in the database. A low value and a high value indicate the range for the soil component. A "representative" value indicates the expected value for the component. For these yields, only the representative value is used.

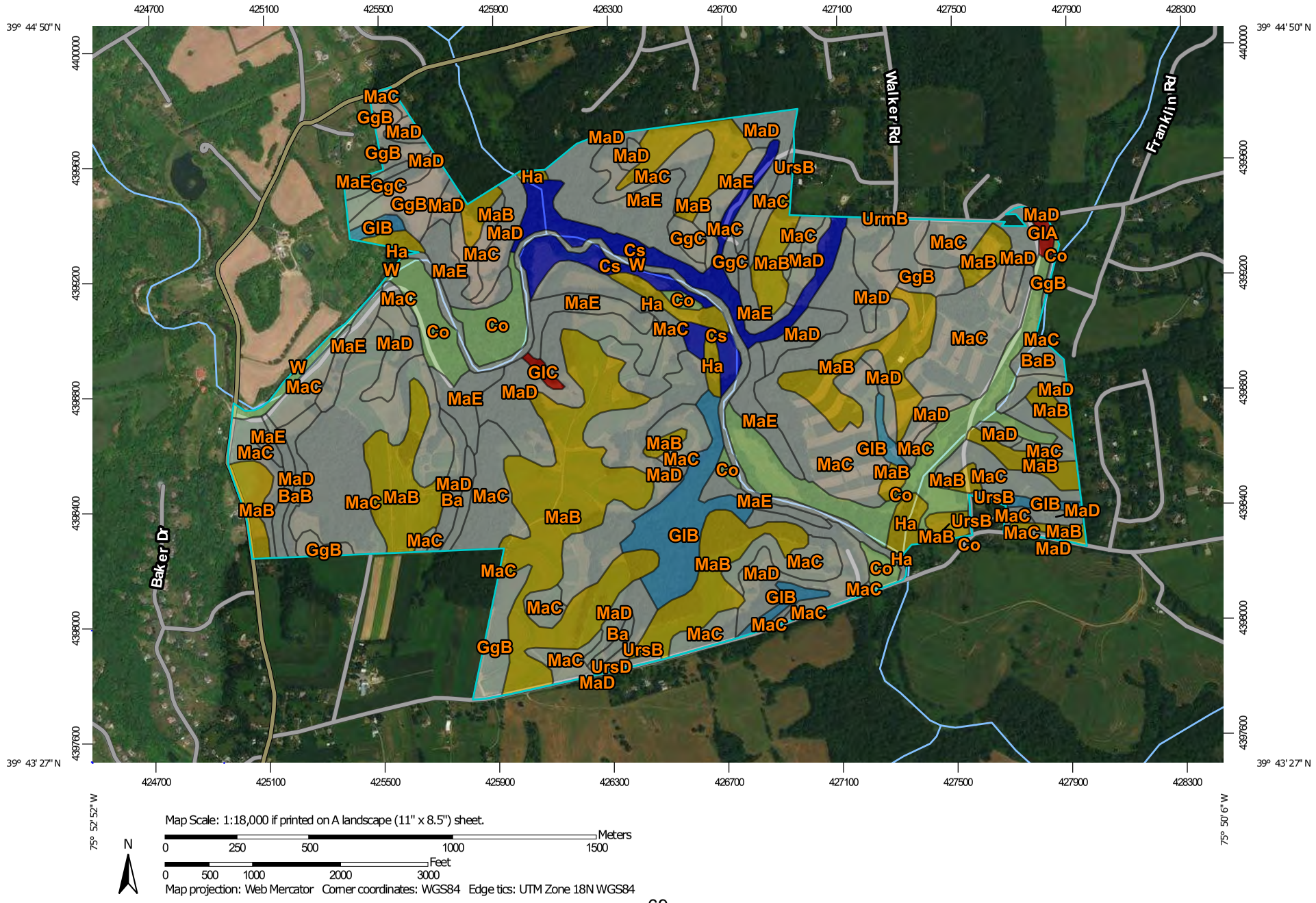
The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby areas and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for the selected crop. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Custom Soil Resource Report

Map—Yields of Non-Irrigated Crops (Map Unit): Corn (Bu) (2018-075)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- <= 100.00
- > 100.00 and <= 115.00
- > 115.00 and <= 130.00
- > 130.00 and <= 145.00
- > 145.00 and <= 175.00
- Not rated or not available

Soil Rating Lines
- <= 100.00
- > 100.00 and <= 115.00
- > 115.00 and <= 130.00
- > 130.00 and <= 145.00
- > 145.00 and <= 175.00
- Not rated or not available

Soil Rating Points
- <= 100.00
- > 100.00 and <= 115.00
- > 115.00 and <= 130.00
- > 130.00 and <= 145.00
- > 145.00 and <= 175.00
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Yields of Non-Irrigated Crops (Map Unit): Corn (Bu) (2018-075)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam	130.00	75.6	7.7%
Cs	Comus silt loam	175.00	43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	100.00	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	145.00	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	95.00	1.5	0.2%
Ha	Hatboro silt loam	115.00	15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes	115.00	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Yields of Non-Irrigated Crops (Map Unit): Corn (Bu) (2018-075)

Crop: Corn

Yield Units: Bu

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Higher

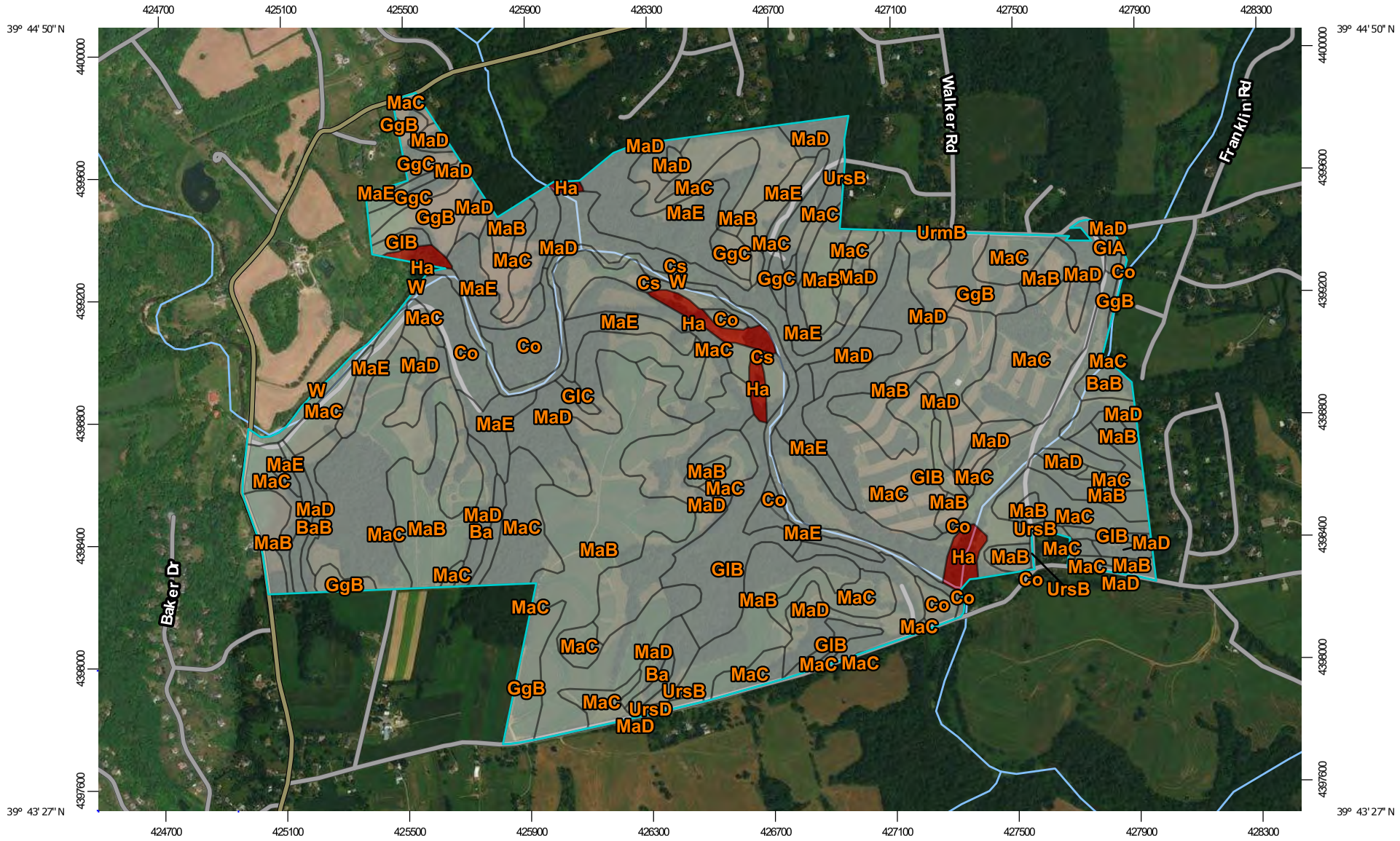
Forest Productivity (Tree Site Index): American sycamore (Briscoe, Ferrill 1958 (700)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Custom Soil Resource Report

Map—Forest Productivity (Tree Site Index): American sycamore (Briscoe, Ferrill 1958 (700)) (2018-075)



Map Scale: 1:18,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 250 500 1000 1500

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Addendum F

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 60

Not rated or not available

Soil Rating Lines

= 60

Not rated or not available

Soil Rating Points

= 60

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): American sycamore (Briscoe, Ferrill 1958 (700)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam		75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes		2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes		36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes		1.5	0.2%
Ha	Hatboro silt loam	60	15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): American sycamore (Briscoe, Ferrill 1958 (700)) (2018-075)

Units of Measure: feet

Tree: American sycamore

Site Index Base: Briscoe, Ferrill 1958 (700)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

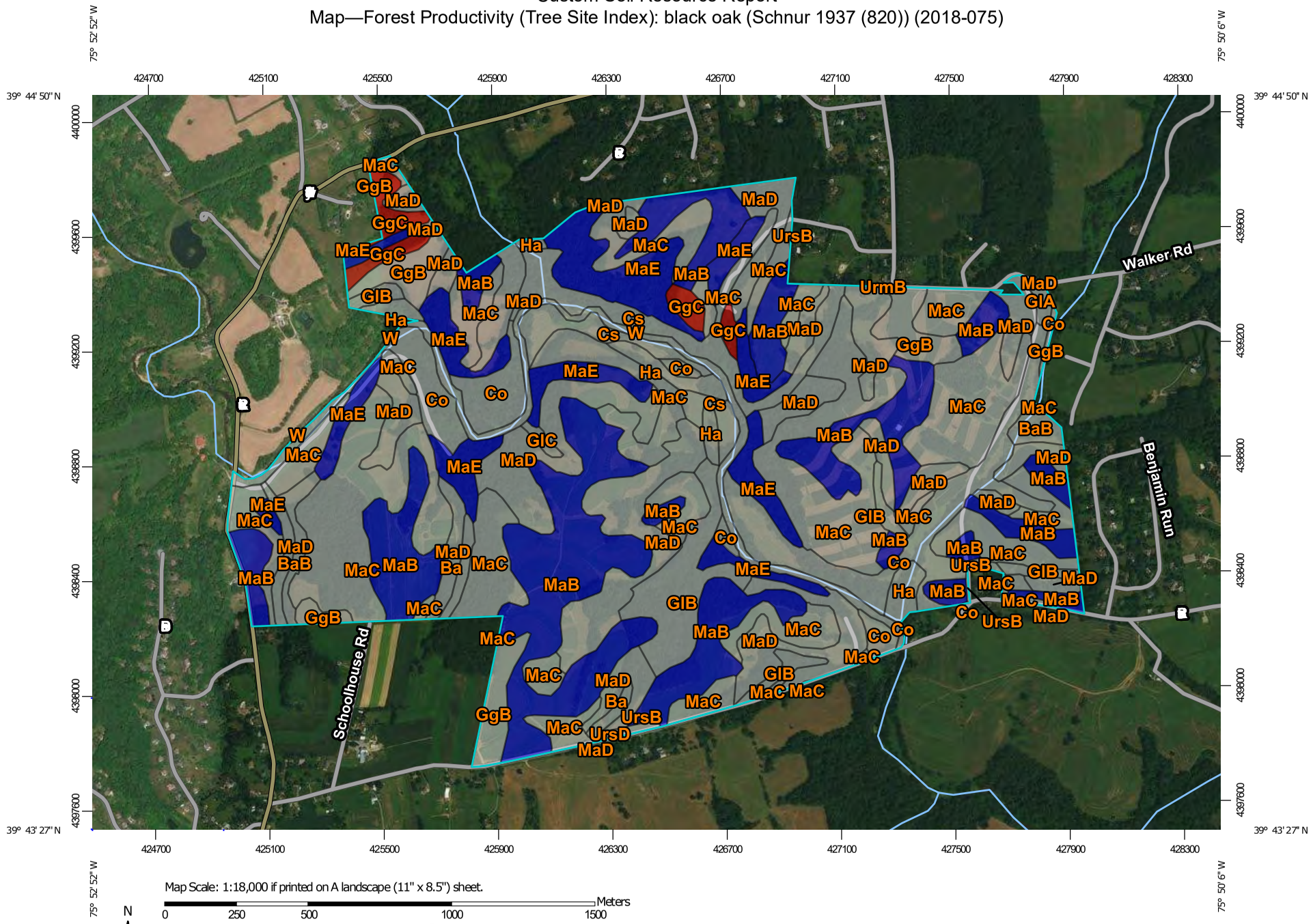
Forest Productivity (Tree Site Index): black oak (Schnur 1937 (820)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Custom Soil Resource Report

Map—Forest Productivity (Tree Site Index): black oak (Schnur 1937 (820)) (2018-075)



Addendum F

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 78

> 78 and <= 80

Not rated or not available

Soil Rating Lines

<= 78

> 78 and <= 80

Not rated or not available

Soil Rating Points

<= 78

> 78 and <= 80

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): black oak (Schnur 1937 (820)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam		75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes	78	14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes		2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes		36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes		1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes	80	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes	80	79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): black oak (Schnur 1937 (820)) (2018-075)

Units of Measure: feet

Tree: black oak

Site Index Base: Schnur 1937 (820)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

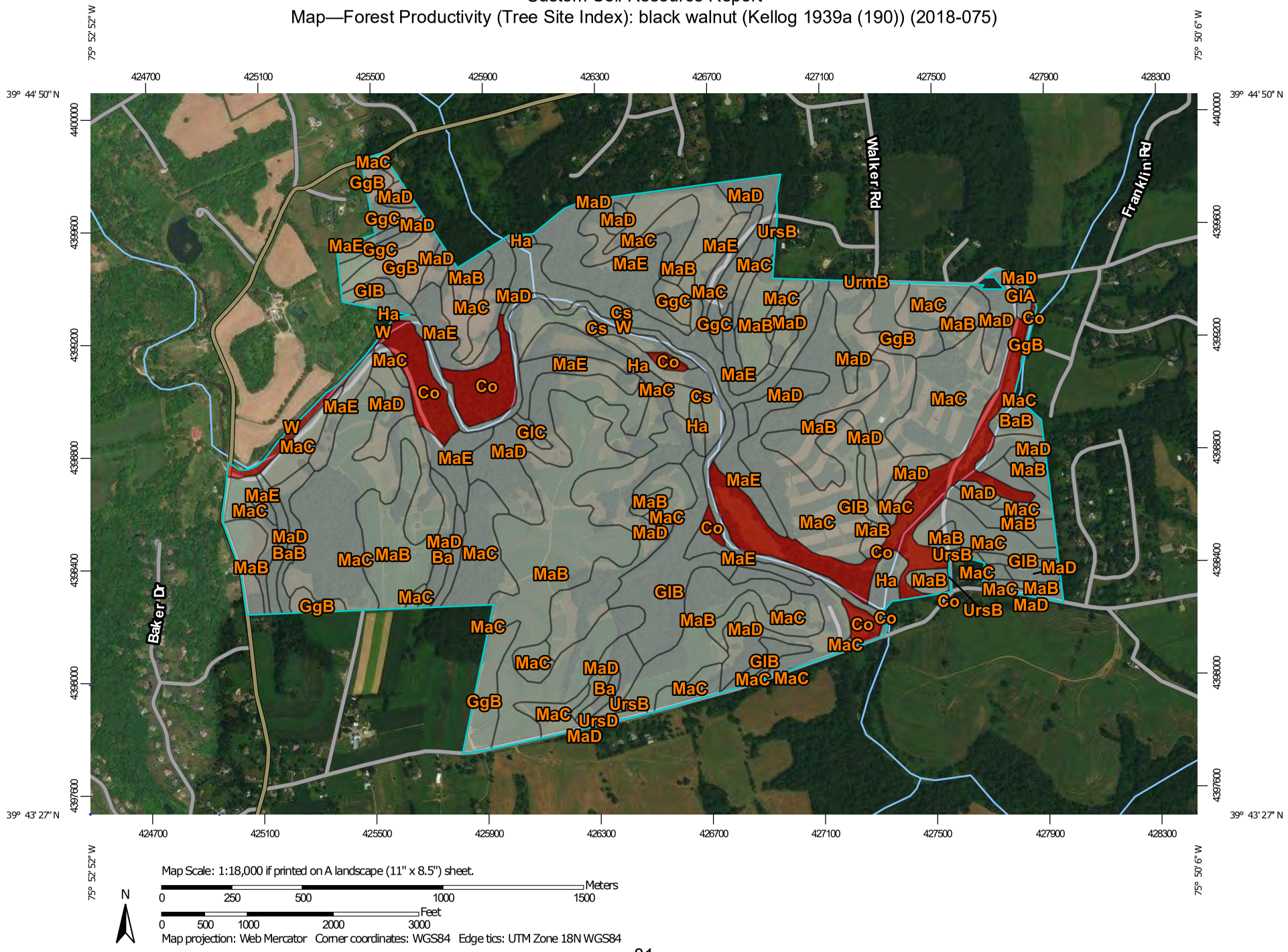
Forest Productivity (Tree Site Index): black walnut (Kellog 1939a (190)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Custom Soil Resource Report

Map—Forest Productivity (Tree Site Index): black walnut (Kellog 1939a (190)) (2018-075)


75° 52' 52" W
75° 50' 6" W
39° 44' 50" N
39° 43' 27" N
424700
425100
425500
425900
426300
426700
427100
427500
427900
428300
4400000
4399600
4399200
4398800
4398400
4398000
4397600
Walker Rd
Franklin Rd
Baker Dr
MaC GgB MaD GgC MaE Ha GIB W Co BaB MaB Ba GIC Cs UrsB UrmB GIA MaC MaD MaE MaB GgC MaC MaD MaE MaB MaC MaD MaE Ha Co MaC Cs MaD MaC MaC BaB MaD MaB MaE MaD MaC MaB MaD GIB MaC MaC MaB MaD MaB MaC MaC MaB MaD MaB MaC MaB MaD MaB MaC MaB MaD MaB

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 100

Not rated or not available

Soil Rating Lines

= 100

Not rated or not available

Soil Rating Points

= 100

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): black walnut (Kellog 1939a (190)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam	100	75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes		2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes		36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes		1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): black walnut (Kellog 1939a (190)) (2018-075)

Units of Measure: feet

Tree: black walnut

Site Index Base: Kellog 1939a (190)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

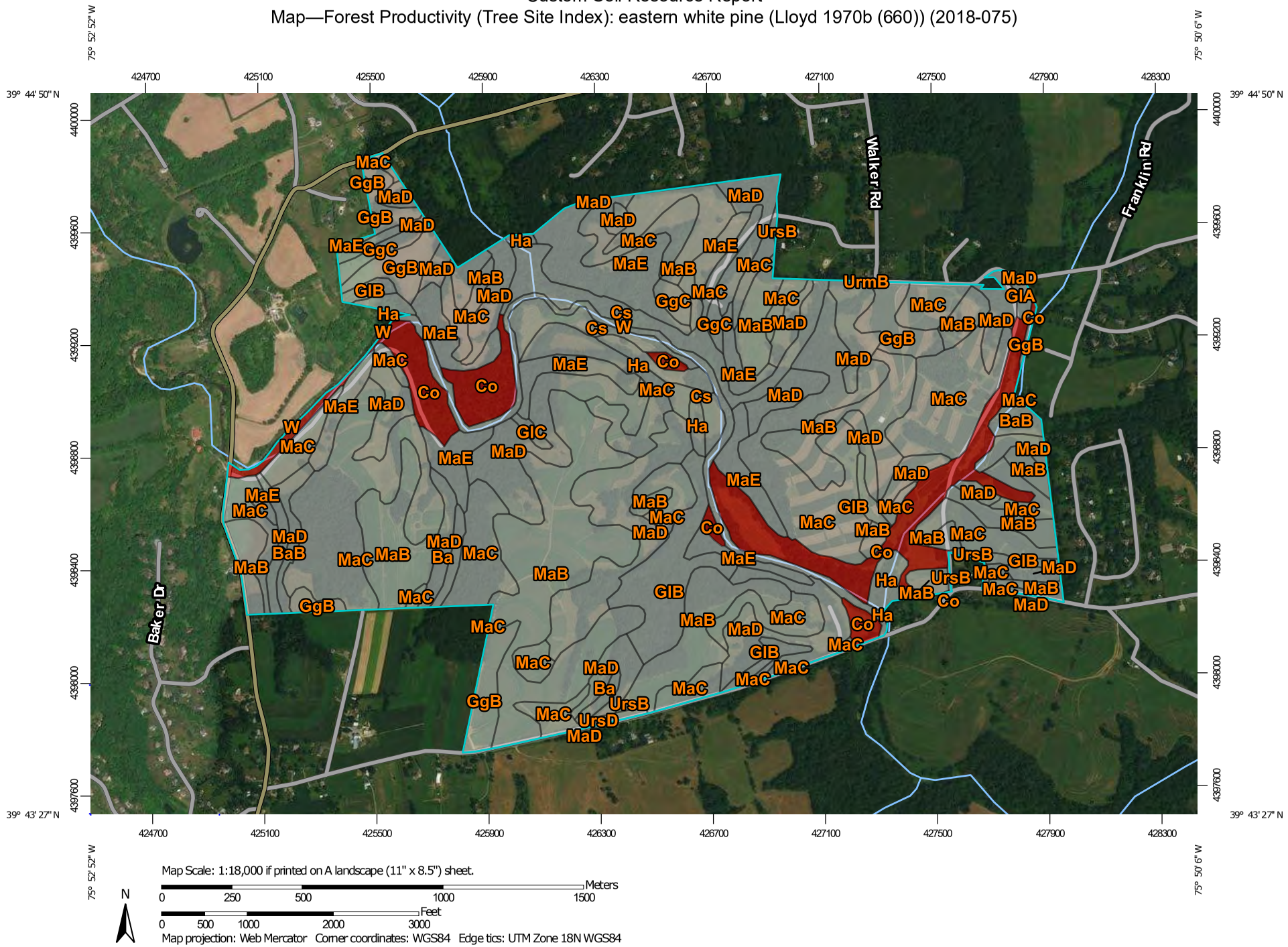
Interpret Nulls as Zero: No

Forest Productivity (Tree Site Index): eastern white pine (Lloyd 1970b (660)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Map—Forest Productivity (Tree Site Index): eastern white pine (Lloyd 1970b (660)) (2018-075)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 100

Not rated or not available

Soil Rating Lines

= 100

Not rated or not available

Soil Rating Points

= 100

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): eastern white pine (Lloyd 1970b (660)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam	100	75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes		2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes		36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes		1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): eastern white pine (Lloyd 1970b (660)) (2018-075)

Units of Measure: feet

Tree: eastern white pine

Site Index Base: Lloyd 1970b (660)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

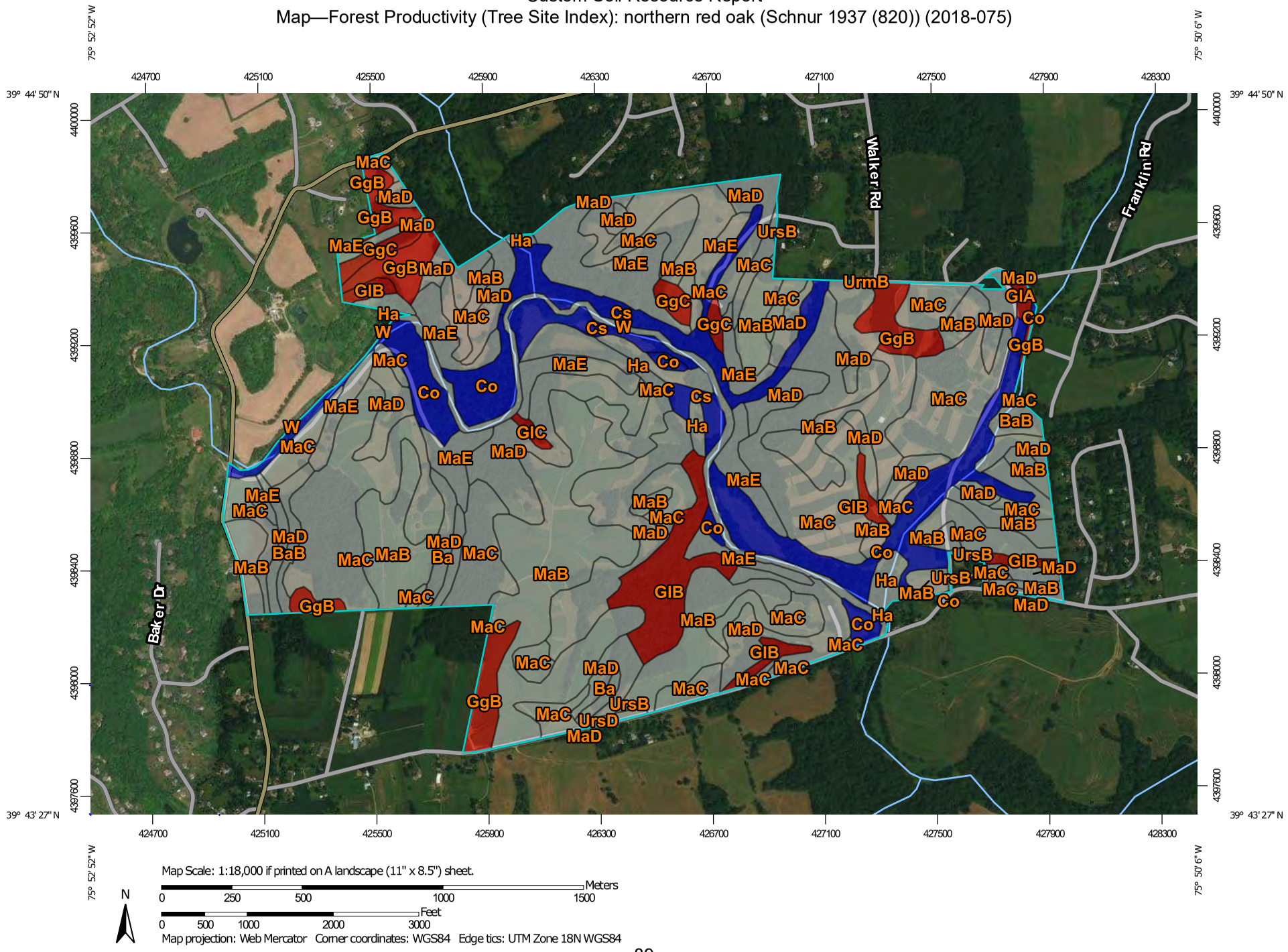
Forest Productivity (Tree Site Index): northern red oak (Schnur 1937 (820)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Custom Soil Resource Report

Map—Forest Productivity (Tree Site Index): northern red oak (Schnur 1937 (820)) (2018-075)



Addendum F

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 80

> 80 and <= 85

Not rated or not available

Soil Rating Lines

<= 80

> 80 and <= 85

Not rated or not available

Soil Rating Points

<= 80

> 80 and <= 85

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): northern red oak (Schnur 1937 (820)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam	85	75.6	7.7%
Cs	Comus silt loam	85	43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes	80	33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes	80	14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	80	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	80	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	80	1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): northern red oak (Schnur 1937 (820)) (2018-075)

Units of Measure: feet

Tree: northern red oak

Site Index Base: Schnur 1937 (820)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

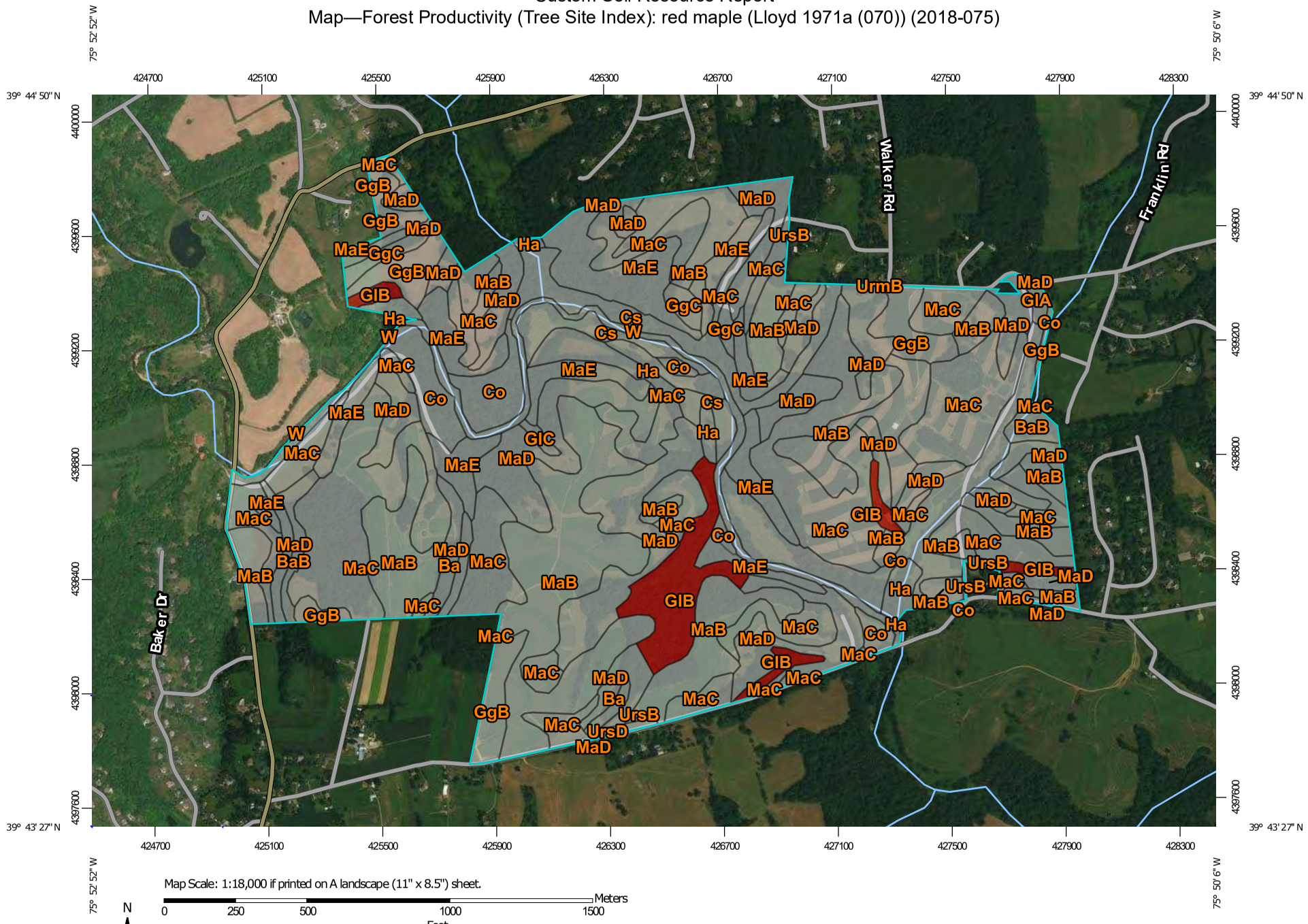
Interpret Nulls as Zero: No

Forest Productivity (Tree Site Index): red maple (Lloyd 1971a (070)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Map—Forest Productivity (Tree Site Index): red maple (Lloyd 1971a (070)) (2018-075)


75° 52' 52" W
75° 50' 6" W
424700
425100
425500
425900
426300
426700
427100
427500
427900
428300
39° 44' 50" N
39° 43' 27" N
4400000
4399600
4399200
4398800
4398400
4398000
4397600
Walker Rd
Franklin Rd
Baker Dr
MaC
GgB
MaD
GgB
MaD
MaE
GgC
GgB
MaD
GIB
Ha
W
MaE
MaC
MaC
Co
Co
MaE
MaD
W
MaC
GIC
MaE
MaD
MaE
MaC
MaD
BaB
MaB
MaC
MaB
MaD
Ba
MaC
MaB
GgB
MaC
MaC
GgB
MaD
MaD
MaD
MaD
MaE
Ha
Co
MaC
Cs
Cs
W
GgC
MaB
MaD
MaC
MaE
MaB
MaC
MaD
MaC
GgC
MaC
UrsB
Ha
MaB
MaD
MaE
MaB
MaC
MaC
GIB
MaC
MaB
MaB
MaC
Co
MaE
GIB
MaB
MaD
MaD
Co
MaE
MaC
MaD
MaB
MaD
MaC
MaC
MaB
MaD
MaC
MaC
MaB
MaD
UrsB
GIB
MaD
Ha
UrsB
MaC
MaC
MaB
MaB
Co
MaD
Co
Ha
MaC
MaC
MaD
MaB
MaD
GIB
MaC
MaC
MaD
MaD
MaB
MaC
MaB
MaD
MaC
MaC
MaB
MaD
MaC
MaD
MaB
MaD
MaC
MaC
MaD
MaD
MaC
MaC
MaD
MaD
MaC
MaC
MaD

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 90

Not rated or not available

Soil Rating Lines

= 90

Not rated or not available

Soil Rating Points

= 90

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): red maple (Lloyd 1971a (070)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam		75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes		2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	90	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes		1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): red maple (Lloyd 1971a (070)) (2018-075)

Units of Measure: feet

Tree: red maple

Site Index Base: Lloyd 1971a (070)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

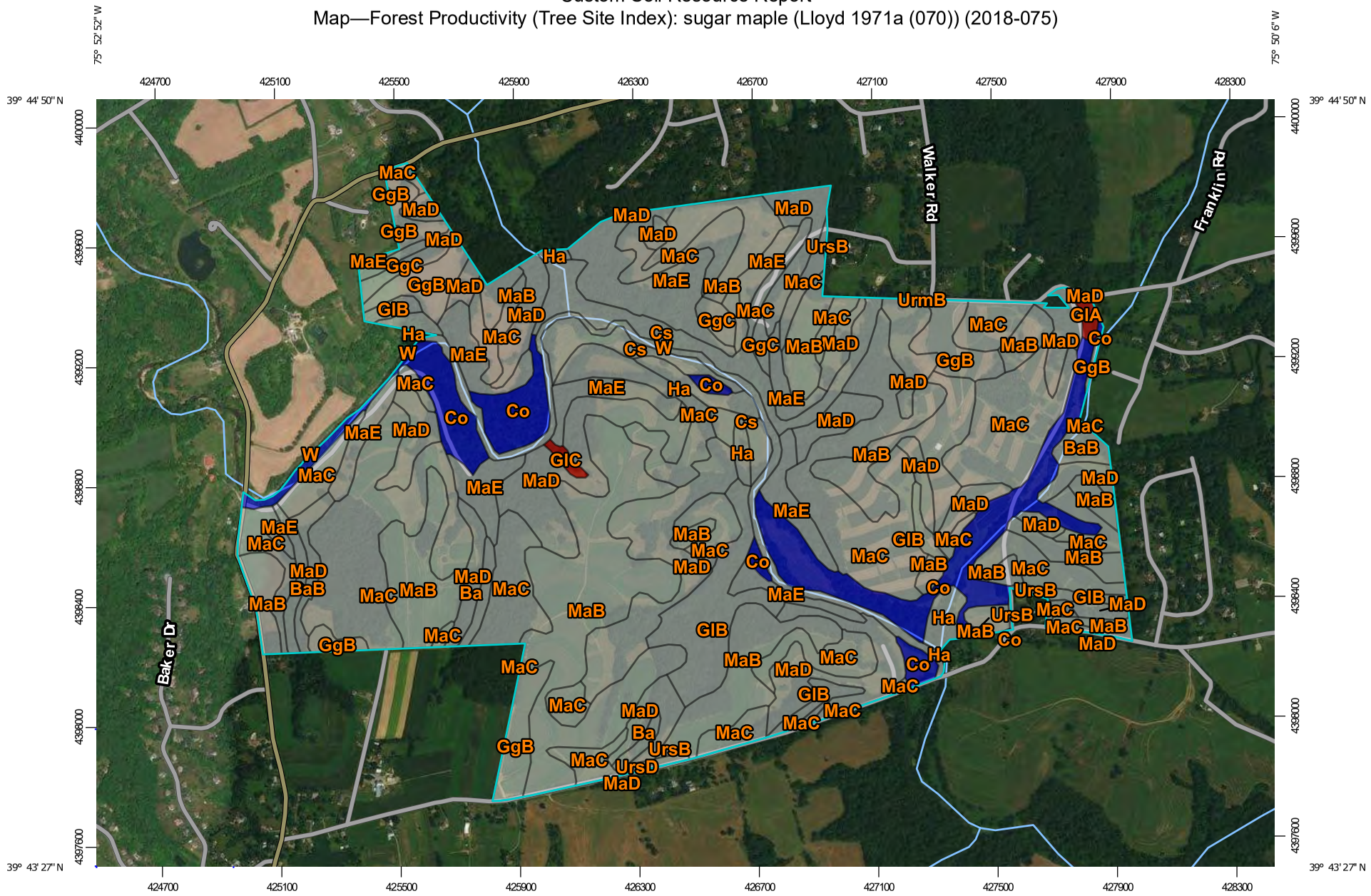
Forest Productivity (Tree Site Index): sugar maple (Lloyd 1971a (070)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Custom Soil Resource Report

Map—Forest Productivity (Tree Site Index): sugar maple (Lloyd 1971a (070)) (2018-075)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 80

> 80 and <= 90

Not rated or not available

Soil Rating Lines

<= 80

> 80 and <= 90

Not rated or not available

Soil Rating Points

<= 80

> 80 and <= 90

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): sugar maple (Lloyd 1971a (070)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam	90	75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	80	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes		36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	80	1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): sugar maple (Lloyd 1971a (070)) (2018-075)

Units of Measure: feet

Tree: sugar maple

Site Index Base: Lloyd 1971a (070)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

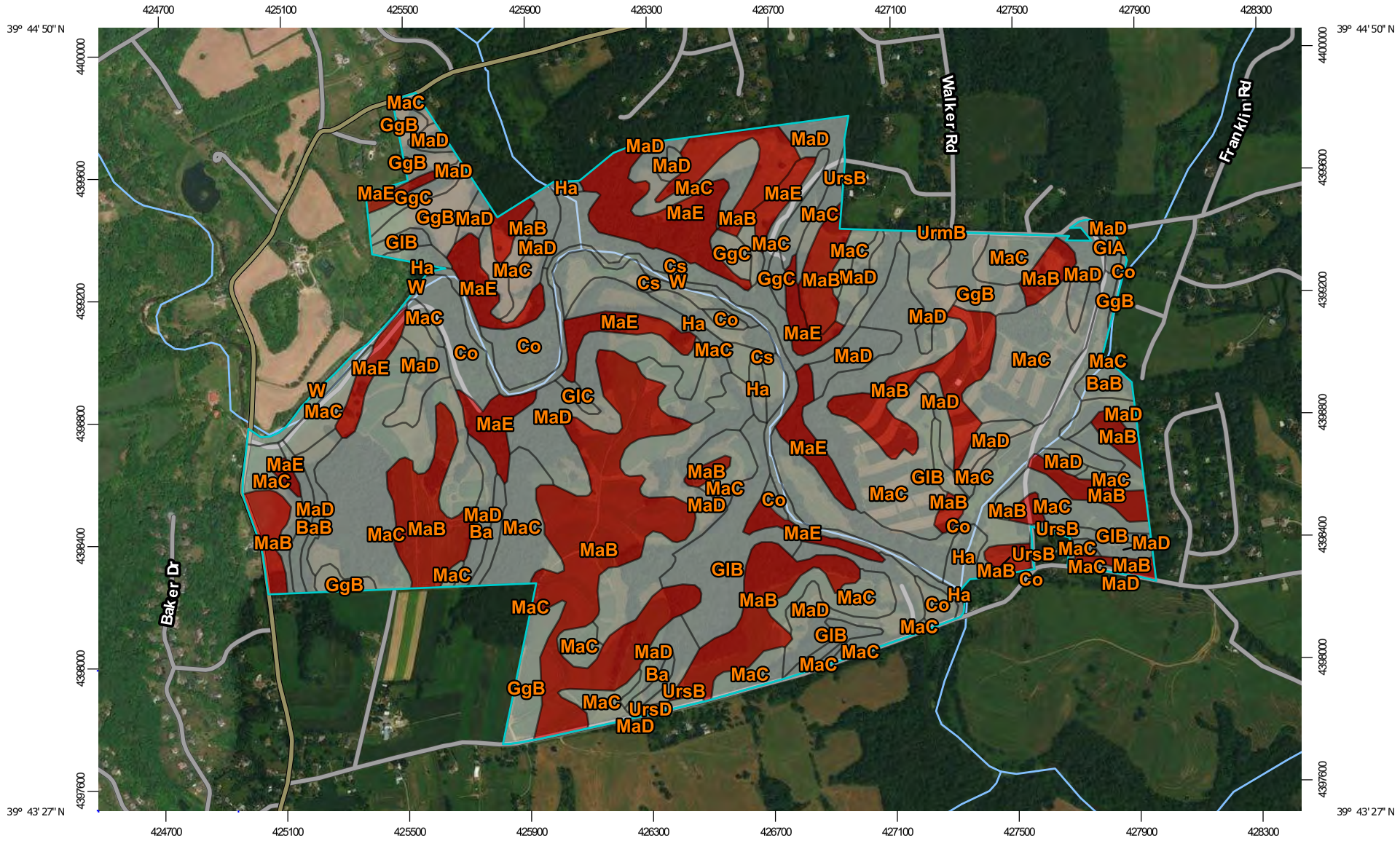
Interpret Nulls as Zero: No

Forest Productivity (Tree Site Index): Virginia pine (Nelson, Clutter, Chaiken 1961 (620)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Map—Forest Productivity (Tree Site Index): Virginia pine (Nelson, Clutter, Chaiken 1961 (620)) (2018-075)


75° 52' 52" W
75° 50' 6" W
424700
425100
425500
425900
426300
426700
427100
427500
427900
428300
39° 44' 50" N
39° 43' 27" N
4400000
4399600
4399200
4398800
4398400
4398000
4397600
Walker Rd
Franklin Rd
Baker Dr
MaC GgB MaD GgB MaD MaE GgC GgB MaD GlB Ha W MaE MaC MaE MaD Co W Co MaE MaD GIC MaC MaE MaD MaE MaC MaD MaB MaC BaB MaB MaC MaB MaD Ba MaC MaB GgB MaC MaC MaD MaD Ha MaE Co MaC Cs Cs W MaE Ha Co MaC Cs Ha MaB MaC MaB MaD MaE MaC MaD MaE MaB MaC MaC MaD MaC MaD MaE MaC MaB MaC MaD Co MaE MaB MaC MaD Ba UrsB GgB MaC UrsD MaD MaC MaD MaC MaB MaD MaC MaC MaD MaC MaB MaD MaC MaB MaD MaC MaB

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 80

Not rated or not available

Soil Rating Lines

= 80

Not rated or not available

Soil Rating Points

= 80

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): Virginia pine (Nelson, Clutter, Chaiken 1961 (620)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam		75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes		2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes		36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes		1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes	80	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes	80	79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): Virginia pine (Nelson, Clutter, Chaiken 1961 (620)) (2018-075)

Units of Measure: feet

Tree: Virginia pine

Site Index Base: Nelson, Clutter, Chaiken 1961 (620)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

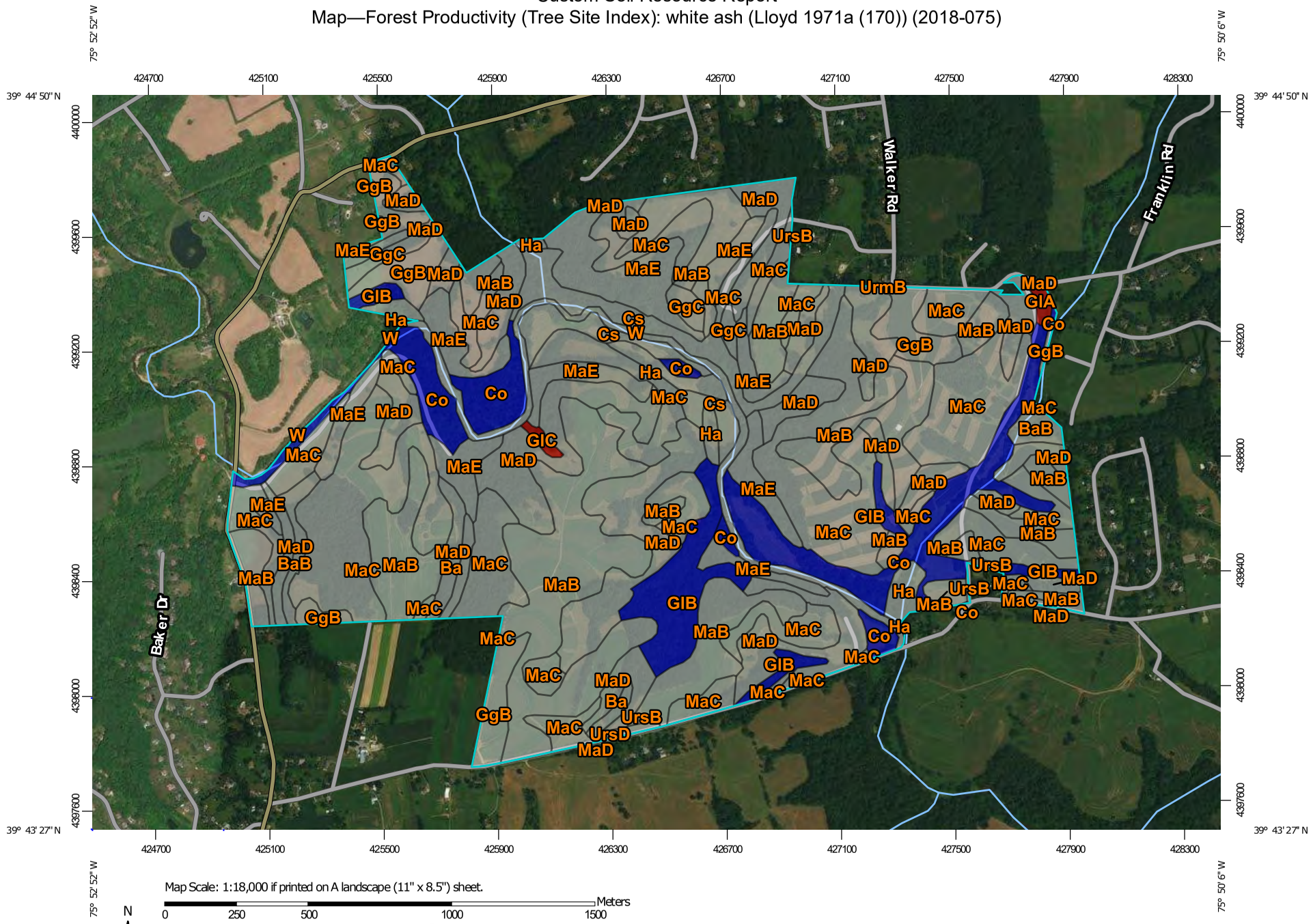
Forest Productivity (Tree Site Index): white ash (Lloyd 1971a (170)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Custom Soil Resource Report

Map—Forest Productivity (Tree Site Index): white ash (Lloyd 1971a (170)) (2018-075)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 80

> 80 and <= 90

Not rated or not available

Soil Rating Lines

<= 80

> 80 and <= 90

Not rated or not available

Soil Rating Points

<= 80

> 80 and <= 90

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): white ash (Lloyd 1971a (170)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam	90	75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	80	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	90	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	80	1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): white ash (Lloyd 1971a (170)) (2018-075)

Units of Measure: feet

Tree: white ash

Site Index Base: Lloyd 1971a (170)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

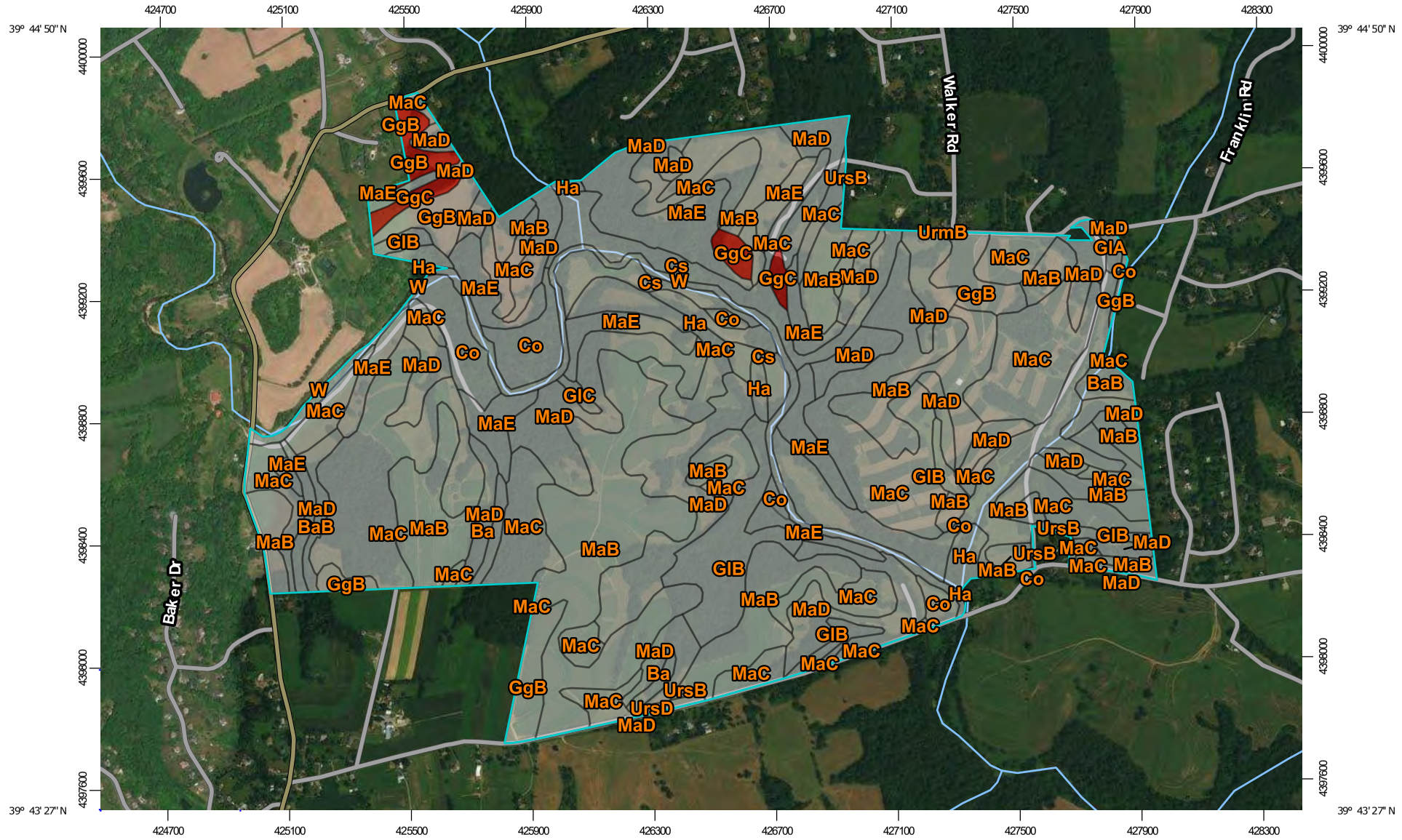
Interpret Nulls as Zero: No

Forest Productivity (Tree Site Index): white oak (Schnur 1937 (820)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Map—Forest Productivity (Tree Site Index): white oak (Schnur 1937 (820)) (2018-075)



Map Scale: 1:18,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 250 500 1000 1500

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 75

Not rated or not available

Soil Rating Lines

= 75

Not rated or not available

Soil Rating Points

= 75

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): white oak (Schnur 1937 (820)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam		75.6	7.7%
Cs	Comus silt loam		43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes	75	14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes		2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes		36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes		1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes		203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes		79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): white oak (Schnur 1937 (820)) (2018-075)

Units of Measure: feet

Tree: white oak

Site Index Base: Schnur 1937 (820)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

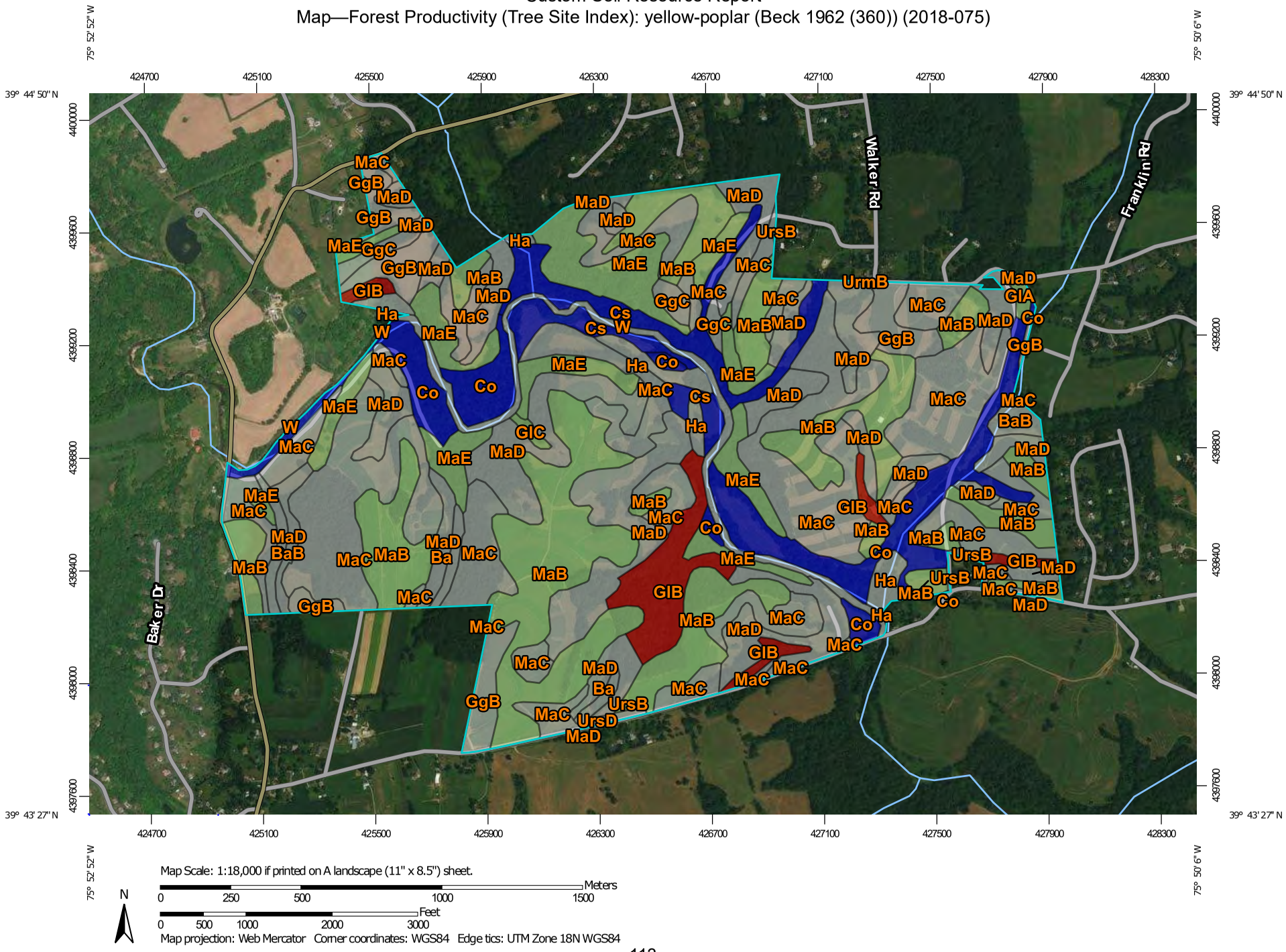
Forest Productivity (Tree Site Index): yellow-poplar (Beck 1962 (360)) (2018-075)

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Custom Soil Resource Report

Map—Forest Productivity (Tree Site Index): yellow-poplar (Beck 1962 (360)) (2018-075)


75° 52' 52" W
75° 50' 6" W
39° 44' 50" N
39° 43' 27" N
424700
425100
425500
425900
426300
426700
427100
427500
427900
428300
4400000
4399600
4399200
4398800
4398400
4398000
4397600
Walker Rd
Franklin Rd
Baker Dr
MaC GgB MaD GgB MaD MaE GgC GgB MaD GIB Ha W MaE MaC MaE MaD W MaC MaD MaE MaC MaD BaB MaB MaC MaB MaD Ba MaC MaB GgB MaC MaC GgB MaD MaD MaB MaD MaC Ha MaE GgC GgB MaD MaB MaD GIB Ha W MaE MaC Co Co MaE MaD GIC MaE MaD MaE Ha Co MaC Cs Ha MaB MaC Cs W MaD MaE MaD MaC GgC MaB MaD MaB MaC MaD MaE MaC MaB MaC MaD Co MaE MaB MaC MaD MaB Ba UrsB GIB MaC MaB MaC MaD MaC MaC MaD MaC MaC MaB MaD MaC MaB MaD MaB MaC MaB MaD MaC MaB MaD MaC MaB MaD

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- <= 85
- > 85 and <= 90
- > 90 and <= 95
- Not rated or not available

Soil Rating Lines
- <= 85
- > 85 and <= 90
- > 90 and <= 95
- Not rated or not available

Soil Rating Points
- <= 85
- > 85 and <= 90
- > 90 and <= 95
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chester County, Pennsylvania
Survey Area Data: Version 9, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2010—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Forest Productivity (Tree Site Index): yellow-poplar (Beck 1962 (360)) (2018-075)

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
Ba	Baile silt loam		5.4	0.5%
BaB	Baile silt loam, 3 to 8 percent slopes		8.9	0.9%
Co	Codorus silt loam	95	75.6	7.7%
Cs	Comus silt loam	95	43.5	4.4%
GgB	Glenelg silt loam, 3 to 8 percent slopes		33.1	3.4%
GgC	Glenelg silt loam, 8 to 15 percent slopes		14.6	1.5%
GlA	Glenville silt loam, 0 to 3 percent slopes	90	2.1	0.2%
GlB	Glenville silt loam, 3 to 8 percent slopes	85	36.7	3.7%
GlC	Glenville silt loam, 8 to 15 percent slopes	90	1.5	0.2%
Ha	Hatboro silt loam		15.9	1.6%
MaB	Manor loam, 3 to 8 percent slopes	90	203.8	20.7%
MaC	Manor loam, 8 to 15 percent slopes		265.3	27.0%
MaD	Manor loam, 15 to 25 percent slopes		174.2	17.7%
MaE	Manor loam, 25 to 35 percent slopes	90	79.8	8.1%
UrmB	Urban land-Glenelg complex, 0 to 8 percent slopes		0.0	0.0%
UrsB	Urban land-Manor complex, 0 to 8 percent slopes		2.3	0.2%
UrsD	Urban land-Manor complex, 8 to 25 percent slopes		0.5	0.0%
W	Water		19.4	2.0%
Totals for Area of Interest			**982.6**	**100.0%**

Rating Options—Forest Productivity (Tree Site Index): yellow-poplar (Beck 1962 (360)) (2018-075)

Units of Measure: feet

Tree: yellow-poplar

Site Index Base: Beck 1962 (360)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Silvix LLC

Forestry & Prescribed Fire Services

8/1/2018

Shannon Henry
Silvix
20 Pfautz Ave
Lititz PA 17543

Greg Snyder
Certified Appraiser
Snyder Appraisal Associates

Per your request, Silvix prepared a timber appraisal for the Conservation Fund/George Strawbridge Property directly north east of Lewisville, PA as identified on the map you provided. We found the timber resources on the property to be substantial. A high percentage of the timber encountered while cruising the forest was sized well into the saw timber class and of reasonable quality.

Expanding the results of this cruise to represent the total of the forest on the property and using the most recent pricing reported on the PA timber Market Report, we estimate the range of value for merchantable trees on the property to be approximately $300,000.00 - $500,000.00.

Possibly this is a conservative estimate as it is based on a perfunctory cruise and averaged stumpage prices. A comprehensive forest inventory was not conducted and individual stands were combined into one large stand for this purpose. However, the cruise preformed is adequate to provide a reasonable opinion of value.

Please let me know if you have any questions.

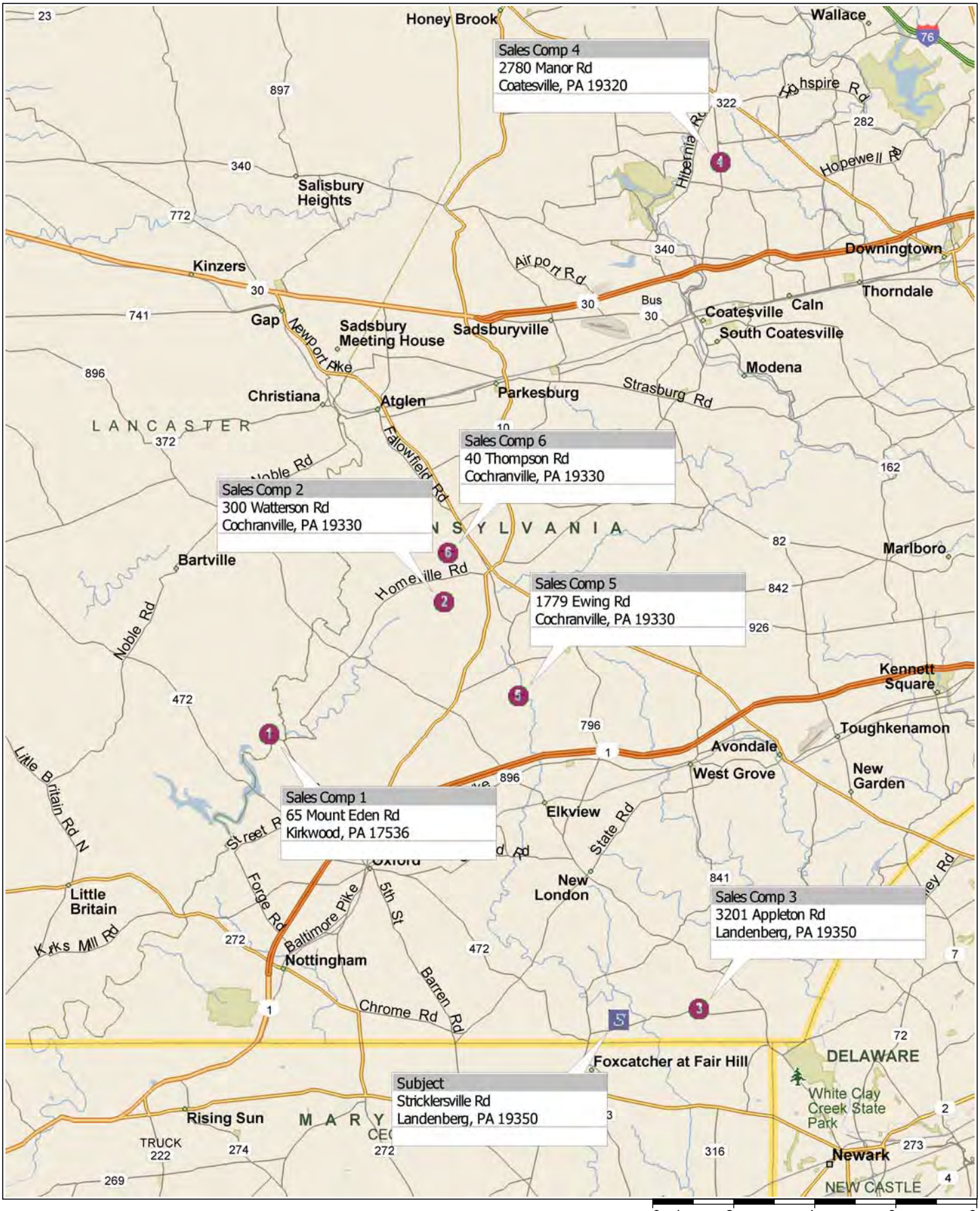
Thank you,

Shannon Henry, CF
President
Silvix

Thank you for selecting Silvix! We look forward to helping you achieve your goals.

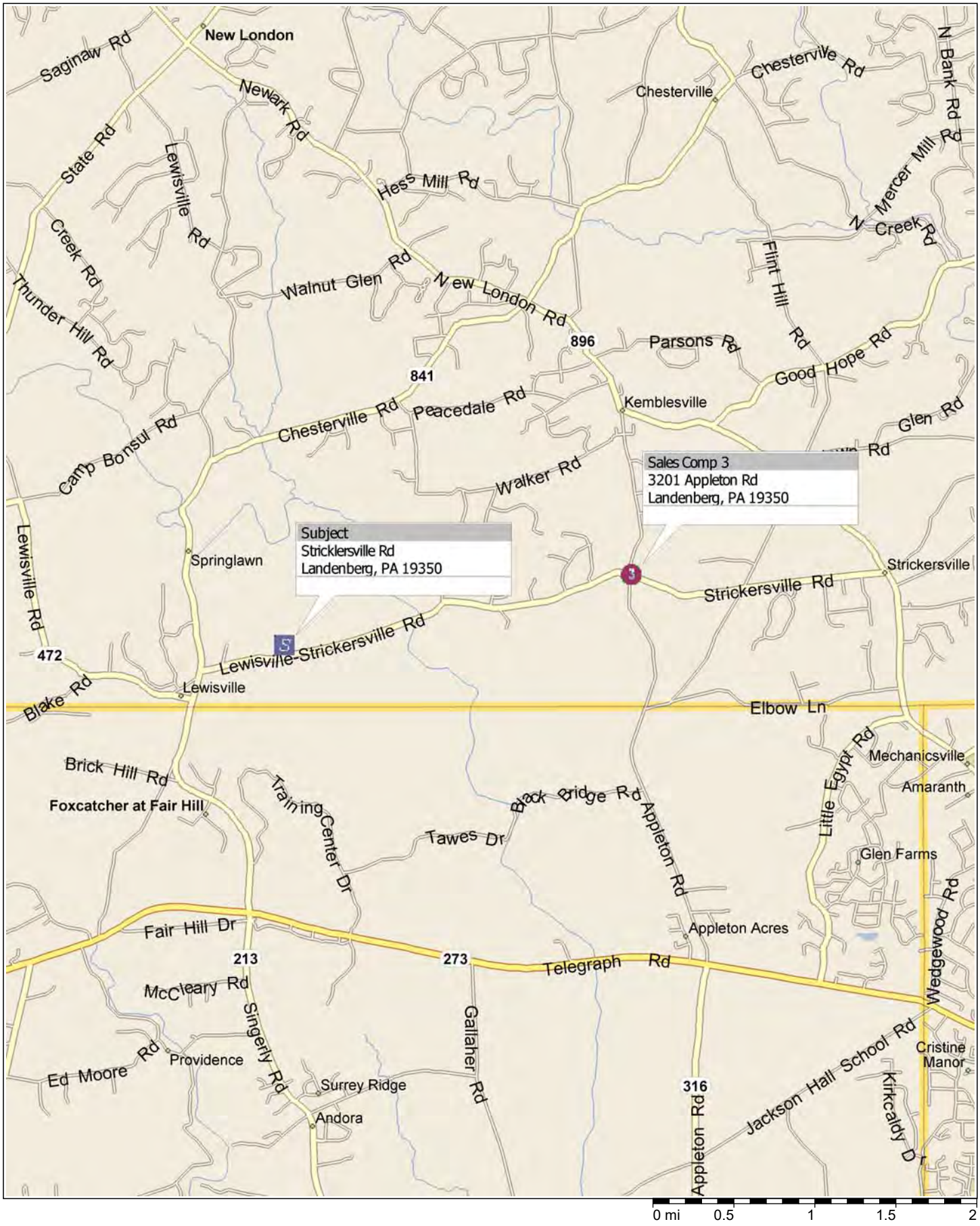
www.silvixforestry.com
shannon@silvixforestry.com 717.723.8114
Corporate Office: 20 Pfautz Ave, Lititz, PA 17543

2018-075 - Sales Comp Location Map



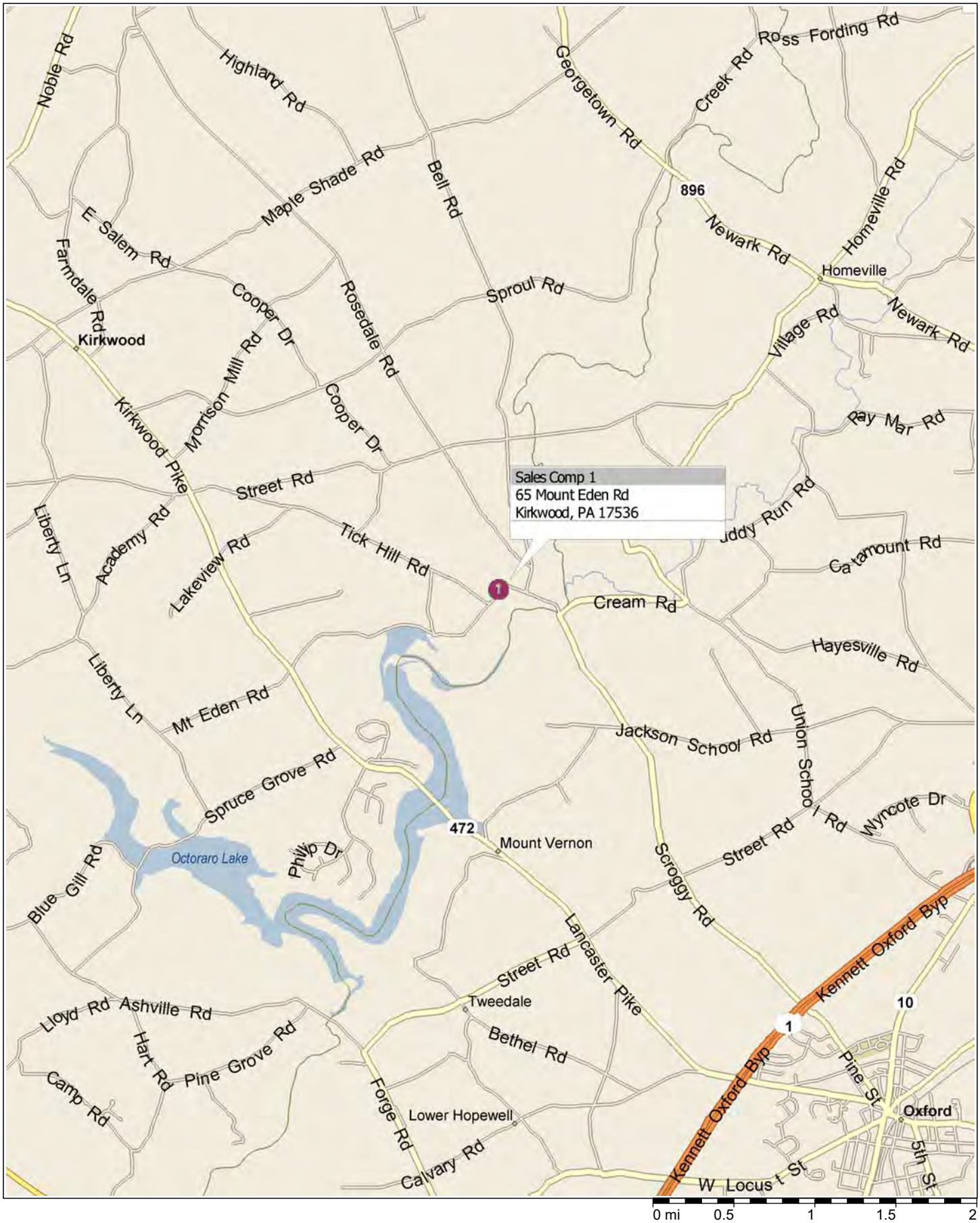
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-075 - Sales Comp Location Map



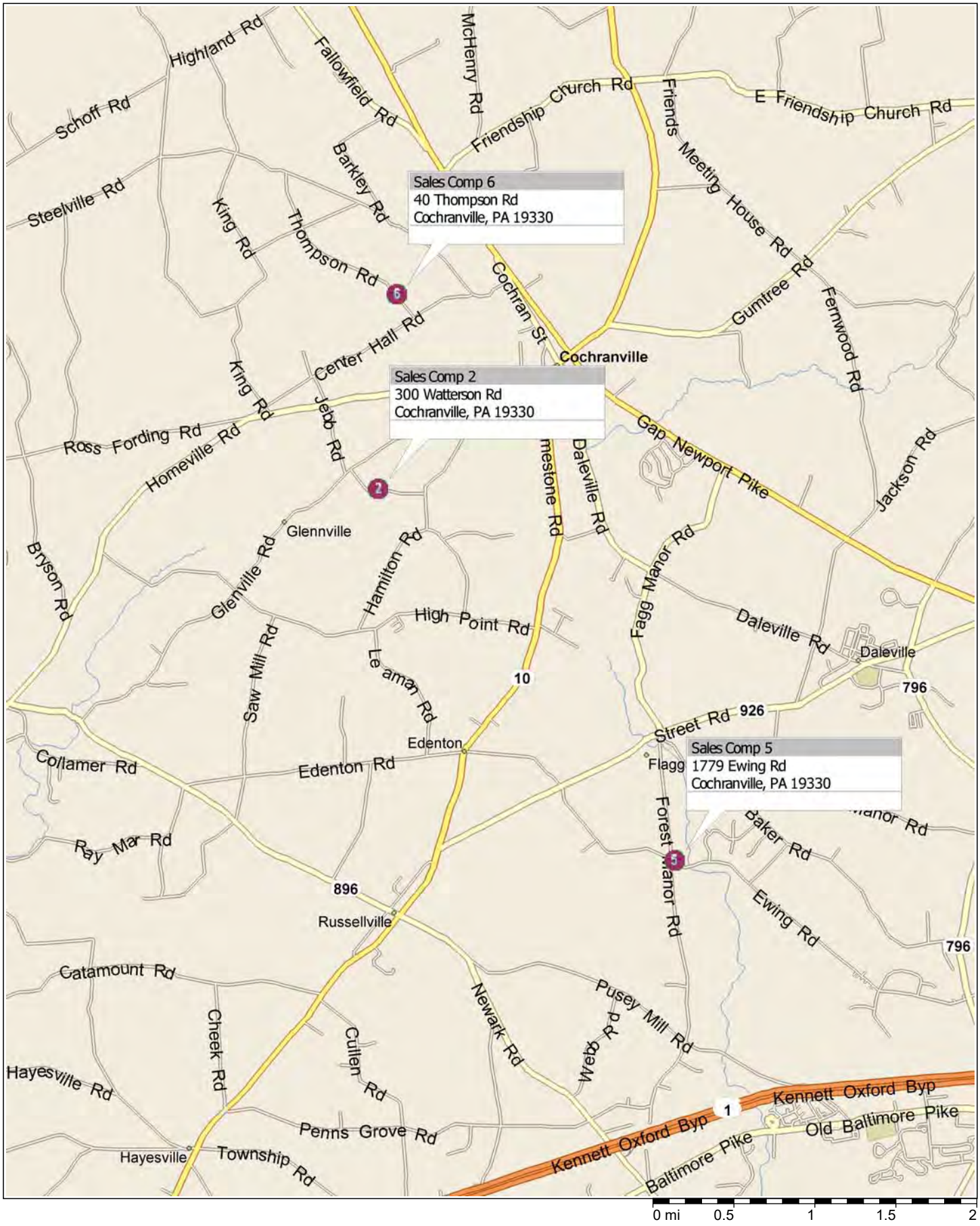
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-075 - Sales Comp Location Map



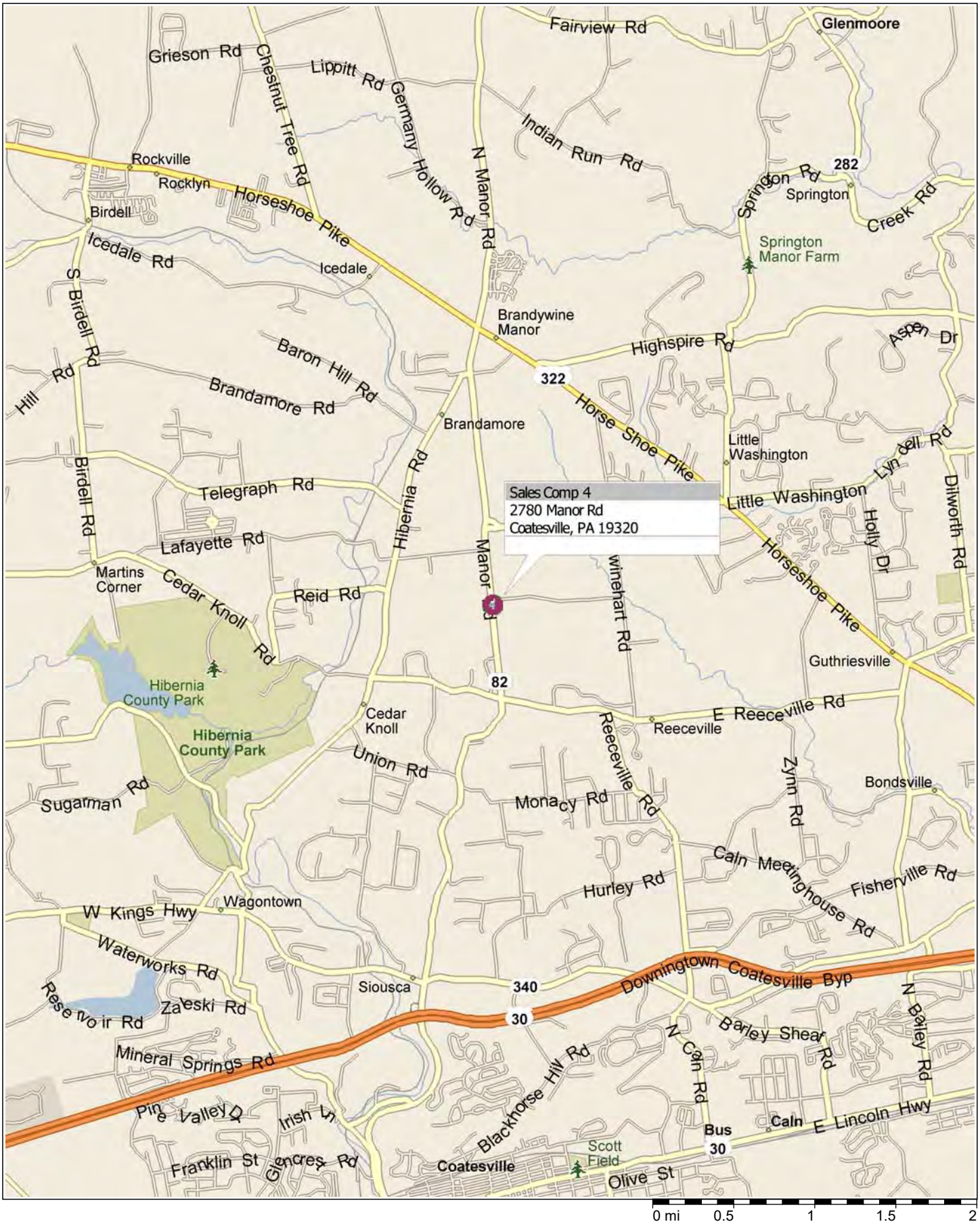
Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-075 - Sales Comp Location Map



Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

2018-075 - Sales Comp Location Map



Copyright © and (P) 1988–2010 Microsoft Corporation and/or its suppliers. All rights reserved. http://www.microsoft.com/streets/
Certain mapping and direction data © 2010 NAVTEQ. All rights reserved. The Data for areas of Canada includes information taken with permission from Canadian authorities, including: © Her Majesty the Queen in Right of Canada, © Queen's Printer for Ontario. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2010 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North America are trademarks of Tele Atlas, Inc. © 2010 by Applied Geographic Systems. All rights reserved.

Sales Analysis

Property Identification

Sale #	7117832	Date Sold	December-17	Deed Reference	6374239
Tax Parcel ID	100-37355	Sale Price	$1,650,000	Zoning	90% A/10% CN
Municipal Code	100	Total Acres	116.30	Type of Operation	Bareland
Seller (Grantor)	William Riddle	Price Per Acre	$14,187	Specialty Code	9.0
Buyer (Grantee)	John S. Fisher	% Tillable	61%	Highest & Best Use	Cropland
Street Address	(65) Mount Eden Rd			County Zone	V
County	Lancaster	Financing		Zip Code	17536
Township	Colerain	Type of Lender	Bank	Previous Sale Date	7/14/04
School District	Solanco	Amount Financed	$925,000		
Nearest Town	Kirkwood	Rate		Verified:	PR/Insp/Realtor
Distance From	3 miles southeast	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$1,650,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	10-15%	Environmental Issues:	None
Cons Easement	Brandywine Cons	Easement Issues	Typical ROWs	Rights Transferred	Restricted (Cons Ease)

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	71.01	Acres X	$16,289	/Acre =	$1,156,686	100%
Permanent Pasture	20.12	Acres X	13,031	/Acre =	262,189	80%
Woodland	20.27	Acres X	11,402	/Acre =	231,125	70%
Farmstead	0.00	Acres X	16,289	/Acre =	0	100%
Roads & Waste	4.90	Acres X	0	/Acre =	0	0%
Total Land Value	116.30	Acres X	$14,187	/Acre =	$1,650,000	

Pasture Soil Types: CbB, CbC, GbC, GbD, MbF, Nd

Woodland Soil Types: CbA, CbB, CbC, GbC, GbD, MbF, Nd

Tillable Soil Types	%	Yield
CbA	1%	170
CbB	56%	170
CbC	27%	160
GbC	5%	160
GbD	1%	140
MbF	0%	0
Nd	10%	140
--	0%	0
--	0%	0

Soil Classifications	
Class I	5%
Class II	44%
Class III	40%
Class IV	8%
Class V	0%
Class VI	0%
Class VII	2%
Yield	163

Improvement Analysis

	Impr. #1	Impr. #2	Impr. #3	Impr. #4	Impr. #5	Impr. #6	Impr. #7	Impr. #8	Impr. #9	Impr. #10
Improvement Name	None									
Size - Width	0	0	0	0	0	0	0	0	0	0
- Length	0	0	0	0	0	0	0	0	0	0
- Stories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Total	0	0	0	0	0	0	0	0	0	0
Unit	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft
Condition										
Utility										
Construction - Exterior										
- Foundation										
- Floor										
- Roof										
Total Economic Life	0	0	0	0	0	0	0	0	0	0
Effective Age	0	0	0	0	0	0	0	0	0	0
Remaining Economic Life	0	0	0	0	0	0	0	0	0	0
RCN/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
RCN - $	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Physical Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Phys. Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Functional Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Func Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% External Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Improvement CV	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Contribution $/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Total Improvement Contribution $0 Total % of Depreciation 0.0% Improvement /Acre $0

Fixtures Included None

SA - (8-11) ver 10 Date Inspected : 4/17/2018 k **Sale # 7117832**

Sale # 7117832

Income Analysis

Basis of Income Estimate

___ Cash Rent ___ Contract Grower ___ Owner Operator

Income Source	Acres/ Quantity	Rental Rate &/or Price	Income	% Share	Gross Income
Tillable Acres	71.01	$0	$0	100%	$0
Pasture Acres	20.12	$0	0	100%	0
Buildings	12	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
			Total Gross Income		**$0**

Expense Items:	
Real Estate Taxes	$0
Insurance - Buildings	0
Maintenance	0
Management Fee	0
	0
	0
	0
	0
	0
Gross Total Expense	**$0**

Land	$126,000
Building	$0
Tax Assessment	$126,000

Act 319	319
Millage	16.23990

Net Income $0

Cap Rate 0.00%

Sales Comments

Bareland property that is subject to a Grant of Easement held by the Brandywine Conservancy. Easement permits the construction of one primary residence, one secondary residence and (2) attached apartments. The easement does not permit any further subdivision. Fox Hunting Deed restriction. Purchased by Plain Sect farmer to establish farm.

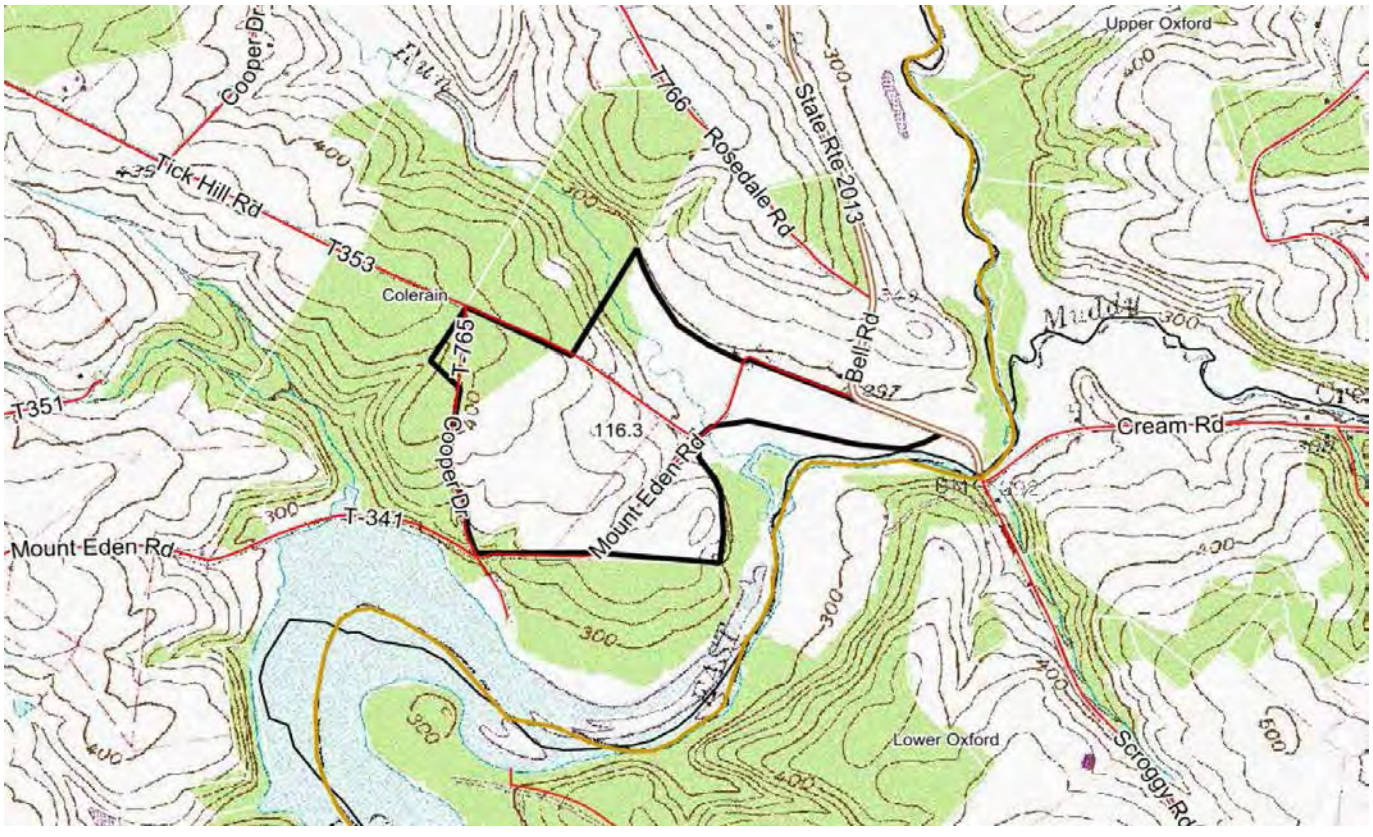
Sales Photos/Map

Sale # 7117832

Physical Analysis

Soil Type		Acres	Slope	Class	Hydric	Prime Farmland	Yield
CbA	Chester Silt Loam	5.89	0-3%	1	N	Prime	170
CbB	Chester Silt Loam	51.64	3-8%	2e	N	Prime	170
CbC	Chester Silt Loam	22.32	8-15%	3e	N	State	160
GbC	Glenelg Silt Loam	3.70	8-15%	3e	N	State	160
GbD	Glenelg Silt Loam	9.52	15-25%	4e	N	--	140
MbF	Manor Very Stony Silt Loam	2.67	25-60%	7s	N	--	0
Nd	Newark Silt Loam	20.56	Level	2w	Y	State	140
--		0.00					0
--		0.00					0
--		0.00					0
--		0.00					0
--		0.00					0
--		0.00					0

Road Frontage: 12,930 Feet
Proximity to UGB/VGB: N/A Miles
Topography: Rolling
Environmental Issues: None
Flood Plain: 10-15%
Est % of Acres w/ Dev Limitations: 0%
Hydric Soils: 18%
Physical Limits to Development:
Utilities : None
Grant of Easement
Easements: Typical ROWs
% of Prime Farmlands and State Importance: 90%
Cons Easements: Brandywine Cons
Residential Subdivisions: None
 # Additional Dwellings Allowed under Conservation Easement: 2 dwellings
Subdivision allowed under Conservation Easement: None



Sales Analysis

Property Identification

Sale #	2917454	Date Sold	July-17	Deed Reference	9571-2333
Tax Parcel ID	44-7-86	Sale Price	$1,175,000	Zoning	Ag
Municipal Code	44	Total Acres	77.05	Type of Operation	Bareland
Seller (Grantor)	Glenville Farms	Price Per Acre	$15,250	Specialty Code	9.0
Buyer (Grantee)	A. Duane Hershey	% Tillable	44%	Highest & Best Use	Cropland
Street Address	300 Watterson Rd			County Zone	I
County	Chester	Financing		Zip Code	19330
Township	West Fallowfield	Type of Lender	None	Previous Sale Date	11/12/13
School District	Octorara	Amount Financed	$0		
Nearest Town	Cochranville	Rate		Verified:	PR/Insp/Buyer
Distance From	1 mile southwest	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$1,175,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	None	Environmental Issues:	None
Cons Easement	County	Easement Issues	Typical ROWs	Rights Transferred	Restricted (Cons Ease)

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	33.94	Acres X	$17,317	/Acre =	$587,751	100%
Permanent Pasture	39.16	Acres X	13,854	/Acre =	542,518	80%
Woodland	3.69	Acres X	12,122	/Acre =	44,731	70%
Farmstead	0.00	Acres X	17,317	/Acre =	0	100%
Roads & Waste	0.26	Acres X	0	/Acre =	0	0%
Total Land Value	77.05	Acres X	$15,250	/Acre =	$1,175,000	

Pasture Soil Types: Cs, GgB, GgC, GlB, Ha, MaB, MaC, MaD, MbD

Woodland Soil Types: GgB, MaC

Tillable Soil Types	%	Yield
Cs	0%	175
GgB	66%	170
GgC	5%	160
GlB	0%	100
Ha	0%	115
MaB	4%	115
MaC	25%	105
MaD	0%	95
MbD	0%	0

Soil Classifications	
Class I	4%
Class II	39%
Class III	33%
Class IV	22%
Class V	0%
Class VI	2%
Class VII	0%
Yield	151

Improvement Analysis

	Impr. #1	Impr. #2	Impr. #3	Impr. #4	Impr. #5	Impr. #6	Impr. #7	Impr. #8	Impr. #9	Impr. #10
Improvement Name	None									
Size - Width	0	0	0	0	0	0	0	0	0	0
- Length	0	0	0	0	0	0	0	0	0	0
- Stories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Total	0	0	0	0	0	0	0	0	0	0
Unit	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft
Condition										
Utility										
Construction - Exterior										
- Foundation										
- Floor										
- Roof										
Total Economic Life	0	0	0	0	0	0	0	0	0	0
Effective Age	0	0	0	0	0	0	0	0	0	0
Remaining Economic Life	0	0	0	0	0	0	0	0	0	0
RCN/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
RCN - $	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Physical Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Phys. Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Functional Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Func Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% External Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Improvement CV	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Contribution $/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Total Improvement Contribution $0 Total % of Depreciation 0.0% Improvement /Acre $0

Fixtures Included None

SA - (8-11) ver 9 Date Inspected : 5/18/2017 g **Sale # 2917454**

Sale # 2917454

Income Analysis

Basis of Income Estimate

___ Cash Rent ___ Contract Grower ___ Owner Operator

Income Source	Acres/ Quantity	Rental Rate &/or Price	Income	% Share	Gross Income
Tillable Acres	33.94	$0	$0	100%	$0
Pasture Acres	39.16	$0	0	100%	0
Buildings	12	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
				Total Gross Income	**$0**

Expense Items:	
Real Estate Taxes	$0
Insurance - Buildings	0
Maintenance	0
Management Fee	0
	0
	0
	0
	0
	0
Gross Total Expense	**$0**

Land	$31,670
Building	$0
Tax Assessment	$31,670

Act 319	319
Millage	44.46400

Net Income $0

Cap Rate 0.00%

Sales Comments

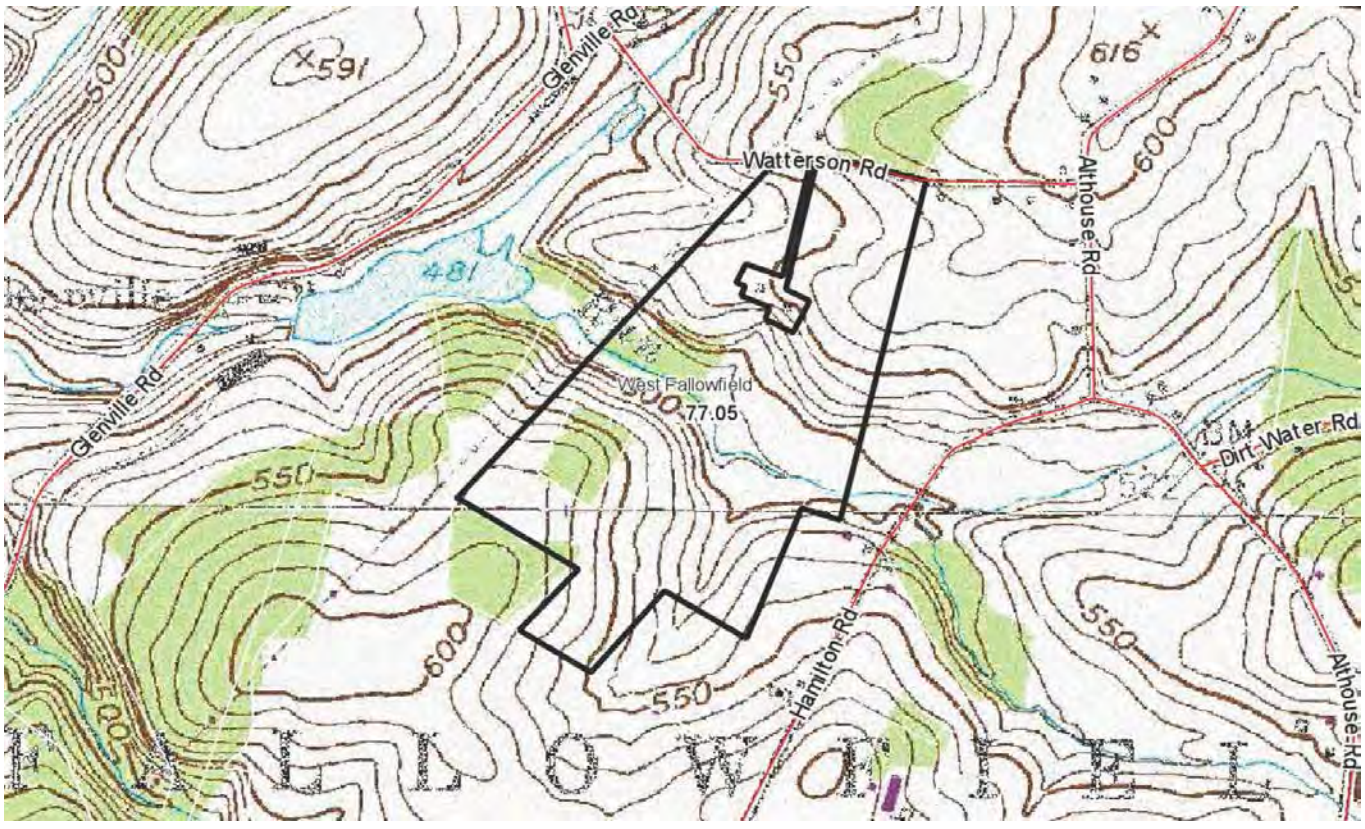
Bareland tract that is subject to an Agricultural Conservation easement held by the County of Chester. The easement allows for the construction of one dwelling; no further subdivision is permitted. The buyer is an adjoining dairy farmer. Sellers were in bankruptcy and were motivated to sell. The improvements located in the center of the property were subdivided and retained by seller.

Sales Photos/Map

Physical Analysis

Soil Type		Acres	Slope	Class	Hydric	Prime Farmland	Yield
Cs	Comus Silt Loam	2.89	--	1	N	Prime	175
GgB	Glenelg Silt Loam	28.50	3-8%	2e	N	Prime	170
GgC	Glenelg Silt Loam	1.62	8-15%	3e	N	State	160
GlB	Glenville Silt Loam	0.10	3-8%	2e	N	Prime	100
Ha	Hatboro Silt Loam	9.61	--	4w	Y	--	115
MaB	Manor Loam	1.25	3-8%	2e	N	Prime	115
MaC	Manor Loam	24.13	8-15%	3e	N	State	105
MaD	Manor Loam	7.54	15-25%	4e	N	--	95
MbD	Manor Loam, Very Stony	1.41	8-25%	6s	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0

Road Frontage: 678 Feet
Proximity to UGB/VGB: N/A Miles
Topography: Rolling
Environmental Issues: None
Flood Plain: None
Est % of Acres w/ Dev Limitations: 100%
Hydric Soils: 12%
Physical Limits to Development: Conservation Easement
Utilities : None
Easements: Typical ROWs
% of Prime Farmlands and State Importance: 76%
Cons Easements: County
Residential Subdivisions: None
 # Additional Dwellings Allowed under Conservation Easement: One Dwelling
Subdivision allowed under Conservation Easement: None



Sales Analysis

Property Identification

Sale #	2917250	Date Sold	April-17	Deed Reference	9523-1156
Tax Parcel ID	72-7-03, 10, & 15	Sale Price	$1,600,000	Zoning	AR
Municipal Code	72	Total Acres	107.67	Type of Operation	Crop
Seller (Grantor)	Louise Vannoy Fam Trst	Price Per Acre	$14,860	Specialty Code	3.0
Buyer (Grantee)	Samuel Stoltzfus et al	% Tillable	74%	Highest & Best Use	Crop Farming
Street Address	3201 Appleton Rd			County Zone	II
County	Chester	Financing		Zip Code	19350
Township	Franklin	Type of Lender	Bank	Previous Sale Date	10/22/13
School District	Avon Grove	Amount Financed	$693,000		
Nearest Town	Landenburg	Rate		Verified:	PR/Insp/Buyer
Distance From	3 miles southwest	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$1,600,000	Cap Rate	1.94%
Utilities:	On-Site	Flood Plain	None	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	79.62	Acres X	$14,255	/Acre =	$1,135,014	100%
Permanent Pasture	6.39	Acres X	11,404	/Acre =	72,874	80%
Woodland	14.94	Acres X	9,979	/Acre =	149,083	70%
Farmstead	3.72	Acres X	14,255	/Acre =	53,030	100%
Roads & Waste	3.00	Acres X	0	/Acre =	0	0%
Total Land Value	107.67	Acres X	$13,096	/Acre =	$1,410,000	

Pasture Soil Types: Ba, GgC, GlB

Woodland Soil Types: Ba, GgB, GgC, GgD, GlB

Tillable Soil Types	%	Yield
Ba	16%	0
GgA	11%	135
GgB	46%	170
GgC	6%	160
GgD	0%	140
GlB	17%	100
UrmB	3%	0
--	0%	0
--	0%	0

Soil Classifications	
Class I	9%
Class II	52%
Class III	7%
Class IV	7%
Class V	20%
Class VI	0%
Class VII	0%
Yield	121

Improvement Analysis

	Impr. #1	Impr. #2	Impr. #3	Impr. #4	Impr. #5	Impr. #6	Impr. #7	Impr. #8	Impr. #9	Impr. #10
Improvement Name	Dwelling	Bank Barn	Corn Shed	Garage	Silo	Silo				
Size - Width	3,716	11,142	28	32	10	10	0	0	0	0
- Length	1	1	40	85	50	50	0	0	0	0
- Stories	1.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
- Total	3,716	11,142	1,120	2,720	102	102	0	0	0	0
Unit	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Tons	Tons	Sq Ft	Sq Ft	Sq Ft	Sq Ft
Condition	Avg	Avg-	Avg	Avg-	Fair	Fair				
Utility	Avg-	Fair	Poor	Fair	Poor	Poor				
Construction - Exterior	Stucco	Wood/Meta	Wood	Wood	Stave	Stave				
- Foundation	Stone	Stone	Conc	Conc						
- Floor	??	Conc	Conc	Conc						
- Roof	AS	Metal	Metal	Metal/AS						
Total Economic Life	60	35	25	25	20	20	0	0	0	0
Effective Age	36	16	11	11	15	15	0	0	0	0
Remaining Economic Life	24	19	14	14	5	5	0	0	0	0
RCN/Unit	$115.71	$29.35	$26.18	$16.29	$155.00	$155.00	$0.00	$0.00	$0.00	$0.00
RCN - $	$429,978	$327,018	$29,322	$44,309	$15,810	$15,810	$0	$0	$0	$0
% Physical Depr.	60%	45%	45%	45%	75%	75%	0%	0%	0%	0%
Phys. Depr. RCN	$171,991	$179,860	$16,127	$24,370	$3,953	$3,953	$0	$0	$0	$0
% Functional Depr.	42%	58%	100%	38%	100%	100%	0%	0%	0%	0%
Func Depr. RCN	$100,000	$75,000	$0	$15,000	$0	$0	$0	$0	$0	$0
% External Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Improvement CV	$100,000	$75,000	$0	$15,000	$0	$0	$0	$0	$0	$0
Contribution $/Unit	$26.91	$6.73	$0.00	$5.51	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Total Improvement Contribution $190,000 Total % of Depreciation 78.0% Improvement /Acre $1,765

Fixtures Included None

SA - (8-11) ver 9 Date Inspected : 2/15/2018 g **Sale # 2917250**

Sale # 2917250

Income Analysis

Basis of Income Estimate

XX Cash Rent ___ Contract Grower ___ Owner Operator

Income Source	Acres/ Quantity	Rental Rate &/or Price	Income	% Share	Gross Income
Tillable Acres	79.62	$325	$25,877	100%	$25,877
Pasture Acres	6.39	$10	64	100%	64
Buildings	12	$1,900	22,800	100%	22,800
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
			Total Gross Income		**$48,740**

Expense Items:	
Real Estate Taxes	$8,467
Insurance - Buildings	2,850
Maintenance	4,015
Management Fee	2,437
	0
	0
	0
	0
	0
Gross Total Expense	**$17,769**

Land	$24,190
Building	$178,480
Tax Assessment	$202,670

Act 319	319
Millage	41.77780

Net Income $30,971

Cap Rate 1.94%

Sales Comments

Property located on three tax parcels purchased by three Amish families that will subdivide into three operatiions. Existing barn has already been approved into a dairy barn and a second barn has been built on the west side Appleton Road. The bank barn had 26 horse stalls at time of sale. Dwelling has 5 bedrooms and 2 baths.

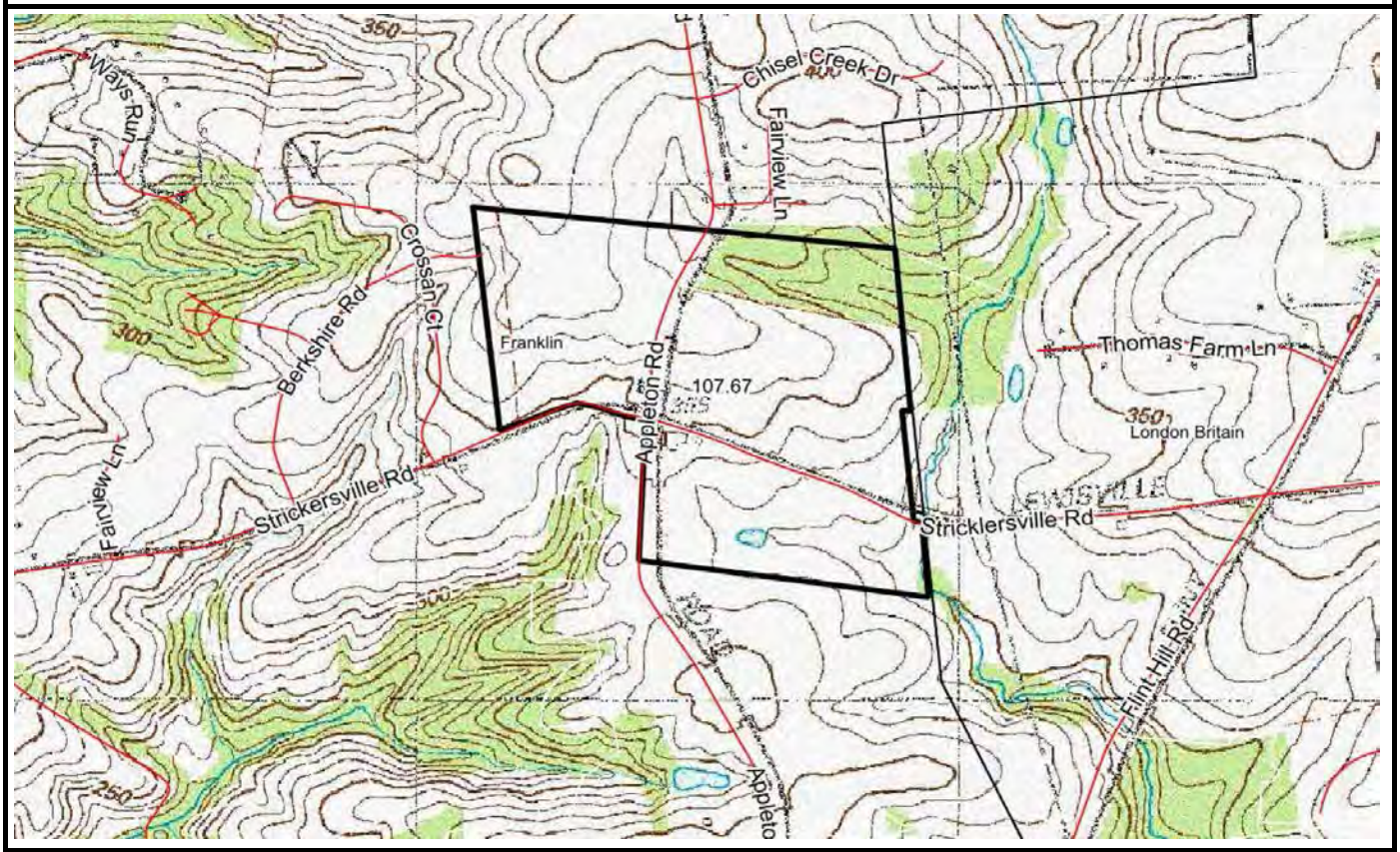
Sales Photos/Map

Sale # 2917250

Physical Analysis

Soil Type		Acres	Slope	Class	Hydric	Prime Farmland	Yield
Ba	Baile Silt Loam	21.60	--	5w	Y	--	0
GgA	Glenelg Silt Loam	9.47	0-3%	1	N	Prime	135
GgB	Glenelg Silt Loam	39.17	3-8%	2e	N	Prime	170
GgC	Glenelg Silt Loam	7.95	8-15%	3e	N	State	160
GgD	Glenelg Silt Loam	7.77	15-25%	4e	N	--	140
GlB	Glenville Silt Loam	16.72	3-8%	2e	N	Prime	100
UrmB	Urban Land-Glenelg Complex	4.99	0-8%	8s	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0

Road Frontage: 7,909 Feet
Proximity to UGB/VGB: N/A Miles
Topography: Rolling
Environmental Issues: None
Flood Plain: None
Est % of Acres w/ Dev Limitations: 20%
Hydric Soils: 20%
Physical Limits to Development: Hydric Soils
Utilities : On-Site
Easements: Typical ROWs
% of Prime Farmlands and State Importance: 68%
Cons Easements: None
Residential Subdivisions: >80,000 SF Lots
 # Additional Dwellings Allowed under Conservation Easement: N/A
Subdivision allowed under Conservation Easement: N/A



Sales Analysis

Property Identification

Sale #	2917009	Date Sold	January-17	Deed Reference	9476-1760
Tax Parcel ID	29-7-21 & 22	Sale Price	$1,000,000	Zoning	50% R-1/50% R-2
Municipal Code	29	Total Acres	86.10	Type of Operation	Bareland
Seller (Grantor)	Poplar Realty Invest.	Price Per Acre	$11,614	Specialty Code	9.0
Buyer (Grantee)	Benuel L. Stoltzfus	% Tillable	72%	Highest & Best Use	Cropland
Street Address	2780 Manor Rd			County Zone	I
County	Chester	Financing		Zip Code	19320
Township	West Brandywine	Type of Lender	Bank	Previous Sale Date	6/5/06
School District	Coatesville	Amount Financed	$489,000		
Nearest Town	4	Rate		Verified:	PR/Insp/Buyer
Distance From	Northeast	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$1,000,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	None	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	61.78	Acres X	$12,851	/Acre =	$793,914	100%
Permanent Pasture	0.00	Acres X	10,281	/Acre =	0	80%
Woodland	22.91	Acres X	8,995	/Acre =	206,086	70%
Farmstead	0.00	Acres X	12,851	/Acre =	0	100%
Roads & Waste	1.41	Acres X	0	/Acre =	0	0%
Total Land Value	86.10	Acres X	$11,614	/Acre =	$1,000,000	

Pasture Soil Types: None

Woodland Soil Types: CaB, CpB, GbB, GeD

Tillable Soil Types	%	Yield
CaB	28%	120
CpB	0%	100
GdB	64%	130
GeD	5%	0
GgA	3%	135
--	0%	0
--	0%	0
--	0%	0
--	0%	0

Soil Classifications	
Class I	2%
Class II	79%
Class III	0%
Class IV	19%
Class V	0%
Class VI	0%
Class VII	0%
Yield	121

Improvement Analysis

	Impr. #1	Impr. #2	Impr. #3	Impr. #4	Impr. #5	Impr. #6	Impr. #7	Impr. #8	Impr. #9	Impr. #10
Improvement Name	None									
Size - Width	0	0	0	0	0	0	0	0	0	0
- Length	0	0	0	0	0	0	0	0	0	0
- Stories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Total	0	0	0	0	0	0	0	0	0	0
Unit	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft
Condition										
Utility										
Construction - Exterior										
- Foundation										
- Floor										
- Roof										
Total Economic Life	0	0	0	0	0	0	0	0	0	0
Effective Age	0	0	0	0	0	0	0	0	0	0
Remaining Economic Life	0	0	0	0	0	0	0	0	0	0
RCN/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
RCN - $	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Physical Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Phys. Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Functional Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Func Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% External Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Improvement CV	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Contribution $/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Total Improvement Contribution $0 Total % of Depreciation 0.0% Improvement /Acre $0

Fixtures Included None

SA - (8-11) ver 9 Date Inspected : 5/1/2017 g **Sale # 2917009**

Sale # 2917009

Income Analysis

Basis of Income Estimate

___ Cash Rent ___ Contract Grower ___ Owner Operator

Income Source	Acres/ Quantity	Rental Rate &/or Price	Income	% Share	Gross Income
Tillable Acres	61.78	$0	$0	100%	$0
Pasture Acres	0.00	$0	0	100%	0
Buildings	12	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
				Total Gross Income	**$0**

Expense Items:	
Real Estate Taxes	$0
Insurance - Buildings	0
Maintenance	0
Management Fee	0
	0
	0
	0
	0
	0
Gross Total Expense	**$0**

Land	$35,490
Building	$0
Tax Assessment	$35,490

Act 319	319
Millage	39.93080

Net Income $0

Cap Rate 0.00%

Sales Comments

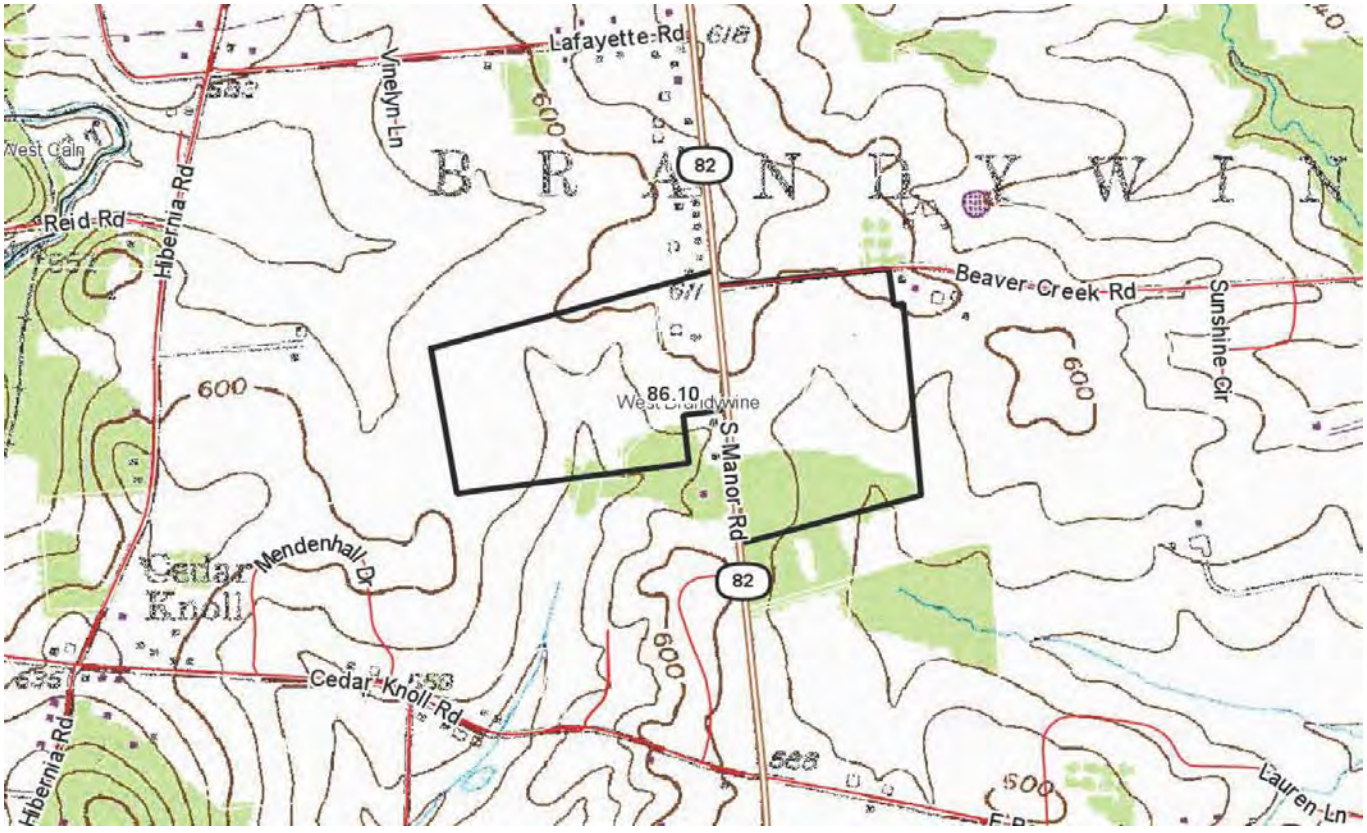
Bareland tract divided by a road, Purchased by a Plain Sect buyer to eventually establish a farm.

Sales Photos/Map

Physical Analysis

Soil Type		Acres	Slope	Class	Hydric	Prime Farmland	Yield
CaB	Califon Loam	21.62	3-8%	2e	N	Prime	120
CpB	Cokesbury Silt Loam	6.45	3-8%	4w	Y	--	100
GdB	Gladstone Gravelly Loam	46.40	3-8%	2e	N	Prime	130
GeD	Gladstone-Parker Gravelly Loam	9.66	15-25%	4e	N	--	0
GgA	Glenelg Silt Loam	1.97	0-3%	1	N	Prime	135
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0

Road Frontage: 3,716 Feet
Proximity to UGB/VGB: N/A Miles
Topography: Rolling
Environmental Issues: None
Flood Plain: None
Est % of Acres w/ Dev Limitations: 7%
Hydric Soils: 7%
Physical Limits to Development: Hydric Soils
Utilities : None
Easements: Typical ROWs
% of Prime Farmlands and State Importance: 81%
Cons Easements: None
Residential Subdivisions: R-1 - >1.5 A. R-2 - >1 Acre
 # Additional Dwellings Allowed under Conservation Easement: N/A
Subdivision allowed under Conservation Easement: N/A



Sales Analysis

Property Identification

Sale #	2916307	Date Sold	May-16	Deed Reference	9314-1689
Tax Parcel ID	See Comments	Sale Price	$1,787,000	Zoning	AR-1
Municipal Code	57	Total Acres	125.80	Type of Operation	Bareland
Seller (Grantor)	Alfred Fortugno, Jr	Price Per Acre	$14,205	Specialty Code	9.0
Buyer (Grantee)	Sarah Fisher	% Tillable	52%	Highest & Best Use	Cropland
Street Address	1779 Ewing Rd			County Zone	I
County	Chester	Financing		Zip Code	19352
Township	Upper Oxford	Type of Lender	None	Previous Sale Date	9/18/08
School District	Oxford	Amount Financed	$0		
Nearest Town	Cochranville	Rate		Verified:	PR/Insp/Buyer
Distance From	3 miles southeast	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$1,787,000	Cap Rate	0.00%
Utilities:	On-Site	Flood Plain	5-10%	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	65.16	Acres X	$16,487	/Acre =	$1,074,287	100%
Permanent Pasture	29.72	Acres X	13,190	/Acre =	391,993	80%
Woodland	27.79	Acres X	11,541	/Acre =	320,720	70%
Farmstead	0.00	Acres X	16,487	/Acre =	0	100%
Roads & Waste	3.13	Acres X	0	/Acre =	0	0%
Total Land Value	125.80	Acres X	$14,205	/Acre =	$1,787,000	

Pasture Soil Types: BaB, Co, GgB, GlA, Ha, MaB, MaC, MaD, MbB

Woodland Soil Types: Co, GgB, Ha, MaB, MaC, MaD, MbB

Tillable Soil Types	%	Yield
BaB	28%	0
Co	0%	130
GgB	1%	170
GlA	0%	100
Ha	3%	115
MaB	45%	115
MaC	21%	105
MaD	1%	95
MbB	0%	0

Soil Classifications	
Class I	0%
Class II	43%
Class III	23%
Class IV	17%
Class V	16%
Class VI	2%
Class VII	0%

Yield	81

Improvement Analysis

	Impr. #1	Impr. #2	Impr. #3	Impr. #4	Impr. #5	Impr. #6	Impr. #7	Impr. #8	Impr. #9	Impr. #10
Improvement Name	None									
Size - Width	0	0	0	0	0	0	0	0	0	0
- Length	0	0	0	0	0	0	0	0	0	0
- Stories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Total	0	0	0	0	0	0	0	0	0	0
Unit	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft
Condition										
Utility										
Construction - Exterior										
- Foundation										
- Floor										
- Roof										
Total Economic Life	0	0	0	0	0	0	0	0	0	0
Effective Age	0	0	0	0	0	0	0	0	0	0
Remaining Economic Life	0	0	0	0	0	0	0	0	0	0
RCN/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
RCN - $	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Physical Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Phys. Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Functional Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Func Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% External Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Improvement CV	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Contribution $/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Total Improvement Contribution $0 Total % of Depreciation 0.0% Improvement /Acre $0

Fixtures Included None

SA - (8-11) ver 9 Date Inspected : 7/8/2016 g **Sale # 2916307**

Sale # 2916307

Income Analysis

Basis of Income Estimate

___ Cash Rent ___ Contract Grower ___ Owner Operator

Income Source	Acres/ Quantity	Rental Rate &/or Price	Income	% Share	Gross Income
Tillable Acres	65.16	$0	$0	100%	$0
Pasture Acres	29.72	$0	0	100%	0
Buildings	12	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
				Total Gross Income	**$0**

Expense Items:	
Real Estate Taxes	$0
Insurance - Buildings	0
Maintenance	0
Management Fee	0
	0
	0
	0
	0
	0
Gross Total Expense	**$0**

Land	$16,450
Building	$0
Tax Assessment	$16,450

Act 319	319
Millage	35.42940

Net Income $0

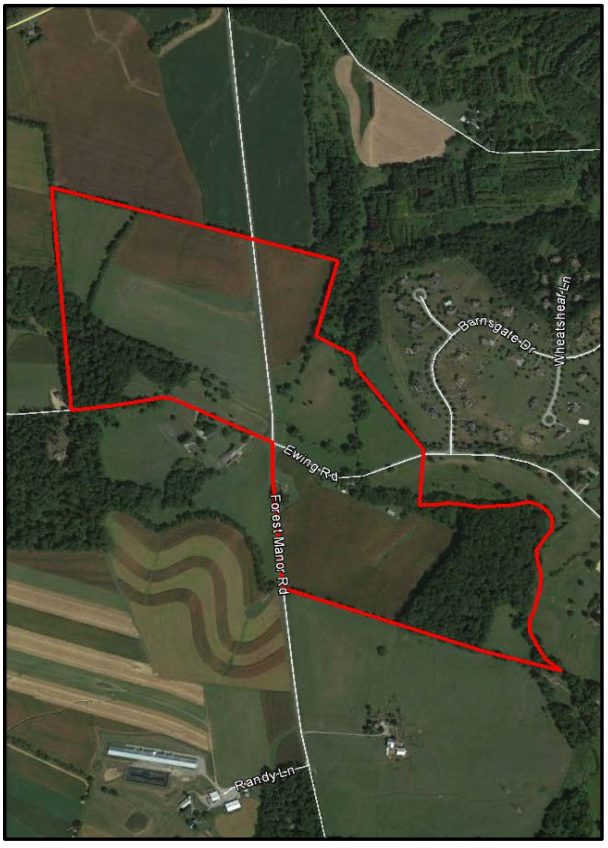
Cap Rate 0.00%

Sales Comments

Bareland tract with mostly tillable acreage. Purchased by Plain Sect to establish farm.

Multiple UPIs: 57-5-19, 57-5-11, 46-4-32, 57-5-7, 57-5-10.

Sales Photos/Map

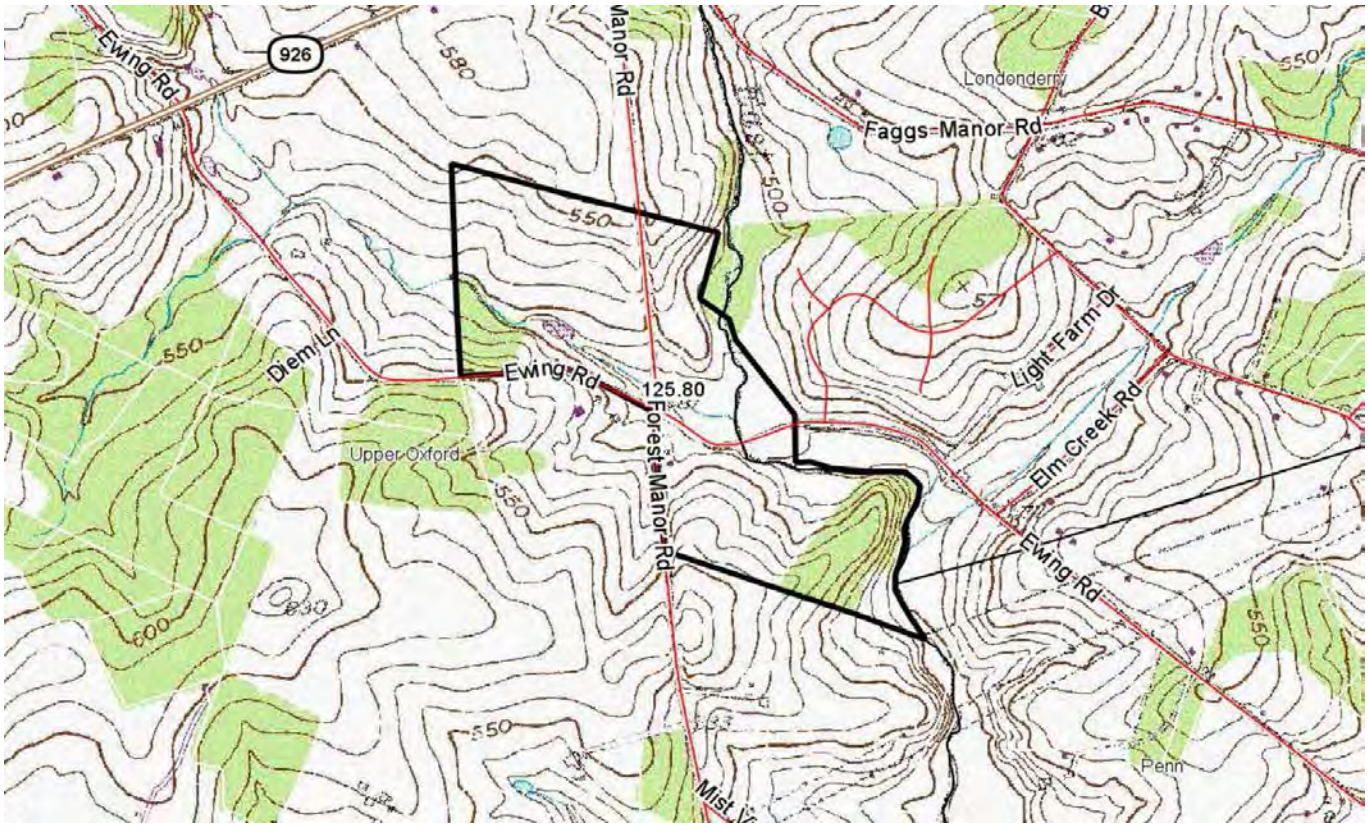


Sale # 2916307

Physical Analysis

Soil Type		Acres	Slope	Class	Hydric	Prime Farmland	Yield
BaB	Baile Silt Loam	19.61	3-8%	5w	Y	--	0
Co	Codorus Silt Loam	2.54	--	2w	N	Prime	130
GgB	Glenelg Silt Loam	3.29	3-8%	2e	N	Prime	170
GlA	Glenville Silt Loam	3.86	0-3%	2w	N	Prime	100
Ha	Hatboro Silt Loam	16.70	--	4w	Y	--	115
MaB	Manor Loam	43.95	3-8%	2e	N	Prime	115
MaC	Manor Loam	28.98	8-15%	3e	N	State	105
MaD	Manor Loam	4.89	15-25%	4e	N	--	95
MbB	Manor Loam, Very Stony	1.98	0-8%	6s	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0

Road Frontage: 8,263 Feet
Proximity to UGB/VGB: N/A Miles
Topography: Rolling
Environmental Issues: None
Flood Plain: 5-10%
Est % of Acres w/ Dev Limitations: 29%
Hydric Soils: 29%
Physical Limits to Development: Hydric Soils
Utilities : On-Site
Easements: Typical ROWs
% of Prime Farmlands and State Importance: 66%
Cons Easements: None
Residential Subdivisions: (12) 1 to 2 acre lots
 # Additional Dwellings Allowed under Conservation Easement: N/A
Subdivision allowed under Conservation Easement: N/A



Sales Analysis

Property Identification

Sale #	2915466	Date Sold	July-15	Deed Reference	9156-0601
Tax Parcel ID	44-4-29&28	Sale Price	$1,300,000	Zoning	Ag
Municipal Code	44	Total Acres	75.40	Type of Operation	Bareland
Seller (Grantor)	Miller Invmt Assoc	Price Per Acre	$17,241	Specialty Code	9.0
Buyer (Grantee)	Matthew Walton	% Tillable	94%	Highest & Best Use	Cropland
Street Address	40 Thompson Rd.			County Zone	I
County	Chester	Financing		Zip Code	19330
Township	West Fallowfield	Type of Lender	Bank	Previous Sale Date	7/5/89
School District	Octorara	Amount Financed	$1,040,000		
Nearest Town	Cochranville	Rate		Verified:	PR/Insp/Buyer
Distance From	1 mile northwest	Term	yrs.	Terms	Arms Length
Road Frontage	Good	Cash Equivalency	$1,300,000	Cap Rate	0.00%
Utilities:	None	Flood Plain	None	Environmental Issues:	None
Cons Easement	None	Easement Issues	Typical ROWs	Rights Transferred	Fee Simple

Land Analysis

	Unit Size		$/Unit		Total Land Value	Ratio
Tillable	71.16	Acres X	$17,840	/Acre =	$1,269,528	100%
Permanent Pasture	0.00	Acres X	14,272	/Acre =	0	80%
Woodland	2.44	Acres X	12,488	/Acre =	30,472	70%
Farmstead	0.00	Acres X	17,840	/Acre =	0	100%
Roads & Waste	1.80	Acres X	0	/Acre =	0	0%
Total Land Value	75.40	Acres X	$17,241	/Acre =	$1,300,000	

Pasture Soil Types: None

Woodland Soil Types: GgB, MaC

Tillable Soil Types	%	Yield
GgB	83%	170
GgC	2%	160
GlA	5%	100
GlB	2%	100
MaB	1%	115
MaC	4%	105
MaD	2%	95
--	0%	0
--	0%	0

Soil Classifications	
Class I	0%
Class II	91%
Class III	6%
Class IV	2%
Class V	0%
Class VI	0%
Class VII	0%
Yield	160

Improvement Analysis

	Impr. #1	Impr. #2	Impr. #3	Impr. #4	Impr. #5	Impr. #6	Impr. #7	Impr. #8	Impr. #9	Impr. #10
Improvement Name	None									
Size - Width	0	0	0	0	0	0	0	0	0	0
- Length	0	0	0	0	0	0	0	0	0	0
- Stories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Total	0	0	0	0	0	0	0	0	0	0
Unit	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft
Condition										
Utility										
Construction - Exterior										
- Foundation										
- Floor										
- Roof										
Total Economic Life	0	0	0	0	0	0	0	0	0	0
Effective Age	0	0	0	0	0	0	0	0	0	0
Remaining Economic Life	0	0	0	0	0	0	0	0	0	0
RCN/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
RCN - $	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Physical Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Phys. Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% Functional Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Func Depr. RCN	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
% External Depr.	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Improvement CV	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Contribution $/Unit	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Total Improvement Contribution $0 Total % of Depreciation 0.0% Improvement /Acre $0

Fixtures Included None

SA - (8-11) ver 9 Date Inspected : 1/11/2016 k **Sale # 2915466**

Sale # 2915466

Income Analysis

Basis of Income Estimate

___ Cash Rent ___ Contract Grower ___ Owner Operator

Income Source	Acres/ Quantity	Rental Rate &/or Price	Income	% Share	Gross Income
Tillable Acres	71.16	$0	$0	100%	$0
Pasture Acres	0.00	$0	0	100%	0
Buildings	12	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
	0	$0	0	100%	0
			Total Gross Income		**$0**

Expense Items:	
Real Estate Taxes	$0
Insurance - Buildings	0
Maintenance	0
Management Fee	0
	0
	0
	0
	0
	0
Gross Total Expense	**$0**

Land	$46,210
Building	$0
Tax Assessment	$46,210

Act 319	None
Millage	42.49400

Net Income **$0**

Cap Rate **0.00%**

Sales Comments

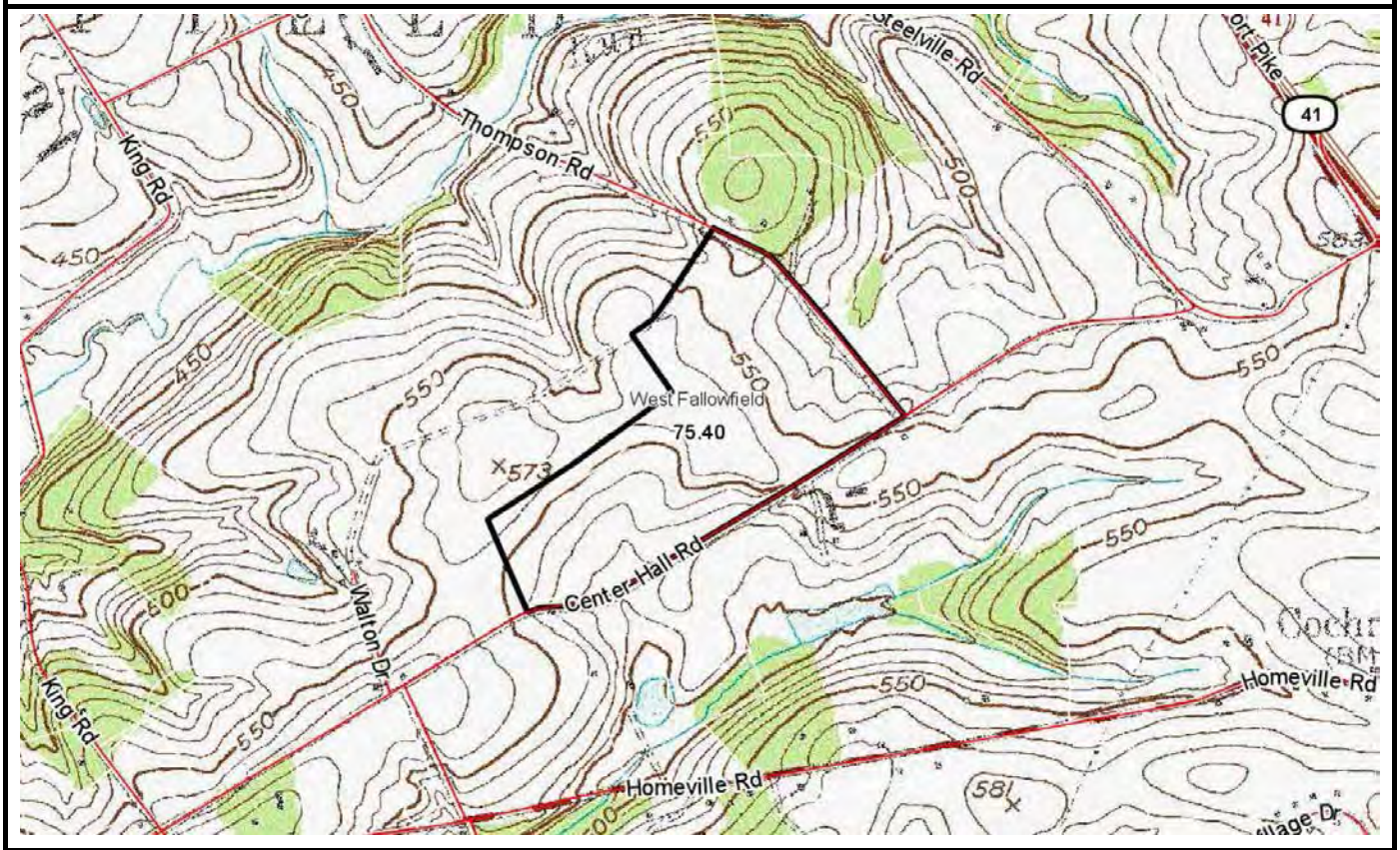
Bareland tract with majority of the land being tillable. Purchased by adjoining dairy farmer.

Sales Photos/Map

Physical Analysis

Soil Type		Acres	Slope	Class	Hydric	Prime Farmland	Yield
GgB	Glenelg Silt Loam	62.79	3-8%	2e	N	Prime	170
GgC	Glenelg Silt Loam	1.69	8-15%	3e	N	State	160
GlA	Glenville Silt Loam	4.01	0-3%	2w	N	Prime	100
GlB	Glenville Silt Loam	1.62	3-8%	2e	N	Prime	100
MaB	Manor Loam	0.44	3-8%	2e	N	Prime	115
MaC	Manor Loam	3.15	8-15%	3e	N	State	105
MaD	Manor Loam	1.70	15-25%	4e	N	--	95
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0
--		0.00	--	--	N	--	0

Road Frontage: 4,744 Feet
Proximity to UGB/VGB: N/A Miles
Topography: Rolling
Environmental Issues: None
Flood Plain: None
Est % of Acres w/ Dev Limitations: 0%
Hydric Soils: 0%
Physical Limits to Development: None
Utilities : None
Easements: Typical ROWs
% of Prime Farmlands and State Importance: 98%
Cons Easements: None
Residential Subdivisions: 1 - 3 A lot every 3 years
 # Additional Dwellings Allowed under Conservation Easement: N/A
Subdivision allowed under Conservation Easement: N/A



ARTICLE VI
R-2 AGRICULTURAL RESIDENTIAL DISTRICT

SECTION 600. PURPOSE.

The R-2 Agricultural Residential District has been established to achieve the following purposes:

A. To implement the Township Comprehensive Plan goal of preserving agricultural lands and the continued prosperity of the agriculture industry in the Township.

B. To support the preservation of sensitive environmental features, such as streams, floodplains, wetlands, areas of steep slopes, and areas of soils conditional, for on-lot sewage disposal/systems and variable groundwater yields.

C. To provide opportunities for housing types at a density and in a cluster configuration that preserve and protect the rural character of Elk Township and preserve permanent open space areas large enough to support continued agricultural use.

D. To limit haphazard and strip development of agricultural lands by providing an opportunity for non-agricultural uses in a planning setting as would be compatible with the rural character of the Township.

E. Provide farmers with a variety of agriculture related use opportunities to help supplement farm income.

SECTION 601. USE REGULATIONS.

In the R-2 Agricultural Residential District, the following regulations shall apply:

A. **By Right Uses**. A building may be erected, altered or used, and a lot may be used or occupied for any of the following purposes, and no other:

1. Non-intensive agricultural uses and related buildings and structures in accordance with the provisions of Section 1202.

2. Woodland preserve, game farm and preserve, wildlife sanctuary or other conservation purpose in accordance with the provisions of Section 1233.

3. Horticultural uses relating to the raising, propagating and selling of trees, shrubs, flowers and other vegetative materials.

4. Tenant house.

5. Business associated with agriculture, including but not limited to the sale of farm products, farm machinery, equipment and supplies.

6. Single family detached dwellings, in accordance with the provisions of the Cluster Development Option in Section 605.

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.

Addendum J

7. Minor home occupations in accordance with the provisions of Section 1215.

8. Bed and breakfast facilities in accordance with the provisions of Section 1206.

9. Accessory agricultural dwelling in accordance with the provisions of Section 1202.

10. Forestry in accordance with the provisions of Section 1103.E.5.

11. One (1) single-family detached dwelling in accordance with the Conventional Development in Section 606, subject to the following conditions and limitations:

    a. The parcel from which the lot is created must have been a lot of record as of the date of the adoption of Ordinance No. 2006-02 May 1, 2006.

    b. The lot, created for use under this Section, must be less than four (4) acres in size. No subsequent division of this created lot may occur, and all transfers must include a restriction, running with the land, that this parcel may not be further divided, or the area reduced by any means.

B. **Special Exception Uses.** Any one of the following uses when authorized as a special exception by the Zoning Hearing Board:

1. Public utility operating facilities.

2. Municipal, county, state or federal uses, excluding dumps and corrective or penal institutions.

3. Fraternal institution, or non-profit club, or swimming pool, provided that a particular activity shall not be one which is customarily carried on as a business, and provided that all services shall be for members and their guests.

4. Institutional use.

5. Cemetery in accordance with the provisions of Section 1207.

6. Kennel in accordance with the provisions of Section 1232.

7. Conversion of single family detached dwelling in accordance with the provisions of Section 1228.

8. Group homes in accordance with the provisions of Section 1214.

C. **Conditional Uses.** The following uses shall be permitted when granted by conditional use by the Board of Supervisors:

1. Single family detached dwellings, in accordance with the Conventional Development Option in of Section 606 on parcels smaller than 30 acres in size.

2. Golf course or other recreational activity customarily located in natural woodland and agricultural areas, including country club and lodges in accordance with the provisions of Sections 1225 and 1226, but excluding miniature golf courses and motor cross facilities.

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.

Addendum J

3. Major home occupations in accordance with the provisions of Section 1215.

4. Communication antennas, towers, and equipment in accordance with the provisions of Section 1203.

5. Intensive agricultural uses in accordance with the provisions of Section 1202.

6. Composting operations in accordance with the provisions of Section 1202.

D. **Accessory Uses**. Any of the following accessory uses shall be permitted:

1. Customary accessory agricultural and residential uses and buildings, when in accordance with the provisions of Section 1201.

2. Swimming pool, provided that it is located in the rear or side yard of the dwelling to which it is an accessory use, in accordance with the provisions of Section 1231.

3. The sale of farm products, in accordance with the provisions of Section 1202.

4. Signs in accordance with the provisions of Article XIV.

SECTION 602. HEIGHT RESTRICTIONS.

The maximum height of buildings erected or enlarged shall be thirty-five (35) feet.

SECTION 603. AGRICULTURAL AREA AND BULK REGULATIONS.

A. The following agricultural area and bulk regulations shall apply in the R-2 Agricultural Residential District:

1. A minimum lot area of ten (10) acres shall be required to qualify as an agricultural use.

2. No compost or manure storage shall be established closer than two hundred (200) feet from an abutting residential use, and in no case closer than one hundred (100) feet from any property line.

3. No new outdoor feed lot shall be constructed closer than twenty-five (25) feet from any property line.

B. Residential accessory buildings may be erected in side and rear yards, provided that there remains side or rear yards of at least ten (10) feet from the accessory building to the side or rear lot lines.

SECTION 604. DENSITY DETERMINATION FOR RESIDENTIAL USES.

A. **Density Calculation**. To determine the number of lots/dwellings permitted, the applicant shall perform the following calculation and submit evidence in the form of plans and data to verify the

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.
Addendum J

accuracy of the calculation in accordance with the provisions of this Section and the Township Subdivision and Land Development Ordinance.

From the gross acreage of the site (___acres), subtract 100% of the following:

Existing and Proposed road rights-of-way	_____ acres
Ponds and lakes	_____ acres
Wetlands	_____ acres
Floodplains	_____ acres
Prohibitive slopes	_____ acres

Subtract 25% of the following:

Class I, II, and III Agricultural Soils	_____ acres
Precautionary slopes	_____ acres

B. **Net Buildable Acreage**. The net buildable acreage is calculated by deducting natural resources and constraints from the gross tract acreage based on the percentages specified in Section 604.A. **See example below.**

C. **Permitted Base Density**. Determination of the maximum residential density or maximum number of units shall be based on the net buildable acreage, divided by two (2). **See example below.**

Example: An applicant owns a one hundred (100) acre parcel of land. Natural resources located on the tract include ten (10) acres of floodplain, five (5) acres of prohibitive slope, and ten (10) acres of Class, I, II, and III agricultural soils. In addition, there are two (2) acres of existing road right-of-way that bisect the parcel. Based on the calculation specified above, the following percentages of each resource or constraint are to be preserved:

Existing Road Right-of-Way	100%
Floodplain and Prohibitive Slopes	100%
Class I, II, and II Agricultural Soils	25%

Acres of resource/constraint to be preserved:

Existing Road Right-of-Way	2 acres
Floodplains and Slopes	15 acres
Agricultural Soils	2.5 acres
Resource/constraint acres to be deducted:	19.5 acres

Subtract the 19.5 acres to be preserved or net-out from the original (gross acreage) parcel size of 100 acres and the result is 80.5 acres. Round the resulting net acreage down to the nearest whole number, in this case 80. Divide eighty (80) by 2 (the density factor) and the result is 40. The resulting number of 40 represents the net density or permitted number of lots/units permitted on the original parcel.

SECTION 605. CLUSTER DEVELOPMENT

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.
Addendum J

Cluster Developments are mandatory on lots consisting of thirty (30) acres, or more, as of the date of the adoption of this Zoning Ordinance, on which a residential use shall serve as the principal use, unless the owner satisfies the requirements of Section 601.A.11.

A. **Permitted Density**. To determine the number of lots/dwelling units permitted in a cluster development, the applicant shall perform the calculation set forth in Section 604 and shall submit evidence in the form of plans and data to verify the accuracy of the calculations in accordance with the provision of Section 604 and the Township Subdivision and Land Development Ordinance.

B. **Area and Bulk Regulations**. The area and bulk regulations associated with the Cluster Development Option are organized according to a hierarchy of sewer and water facilities available. Table 6-1 organizes those sewer and water facilities, the associated area and bulk regulations, and open space requirement. No new dwelling shall be located closer than two hundred (200) feet from an existing outdoor feedlot, compost or manure storage or mushroom house.

C. **Required Information Prior to Development.** In addition to the information required for a Preliminary Plan in Section 501.K. of the Elk Township Subdivision and Land Development Ordinance, as amended, the applicant shall provide the following information for any proposed cluster subdivision in order to establish the number of lots permitted on a tract and the portions of the tract to be protected during the development process:

1. Delineation and the calculated area of all portions of the tract meeting the definition of precautionary or prohibitive slope;

2. Delineation and the calculated area of all portions of the tract meeting the definition of flood plain;

3. Delineation and the calculated area of all portions of the tract meeting the definition of wetland, not limited to those wetland areas which are proposed for earth disturbance;

4. Delineation and the calculated area of all Class I, II, and III agricultural soils, as established by the United States Department of Agriculture as Agricultural Capability Units I, II and III and described in the Soil Survey of Chester and Delaware Counties, Pennsylvania, 1959 published by the Soil Conservation Service of the United States Department of Agriculture, as updated;

5. The calculation of permitted number of lots/units per the requirements of Section 604;

6. The location(s) of barns, feedlots, and other areas of intensive agricultural use, both on the subject property and on adjacent properties (when located within one hundred (100) feet of the subject property);

7. The location(s) of permanent open space, either publicly owned or privately deed restricted, on all applicable adjacent properties;

8. Delineation of the portion of the tract designated as permanent open space, the percentage of the tract represented by this open space, and the percentages of this open space consisting of natural resources and class I, II, and III agricultural soils.

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.

Addendum J

D. **Open Space Density Bonus.** For every additional one (1%) percent of open space area provided above and beyond the applicable minimum open space requirement (as specified in Table 6-1), the Township shall permit one additional dwelling unit in accordance with the applicable area and bulk regulations up to a maximum of ten (10%) percent above the base net density, calculated in accordance with Section 604. In no case shall the required open space percentage be less than that specified in Table 6-1.

E. **Access Management.** A proposed cluster development on any parcel with frontage on Pennsylvania State Route 841 or Pennsylvania State Route 472 shall:

1. Gain access from other adjacent roads, if any, rather than either State Route 841 or State Route 472, unless the applicant demonstrates to the Township's satisfaction that the only feasible access to the property is from one of the aforementioned state routes; or

2. If no access is feasible from another lower functioning road, one access point on either of the aforementioned state routes shall be permitted per cluster development, except that for subdivisions of more than thirteen (13) lots, a second access point or emergency access point may be permitted, at the Township's discretion.

F. **Open Space Standards.**

1. Required Open Space. The minimum required open space percentage of the gross site area, designated in Table 6-1, shall be designated on the plan as common open space and held in a tract or tracts separate from the developable lots. Such open space parcel(s) shall be restricted from further subdivision or development by deed restriction, conservation easement, or other agreement or form acceptable to the Township and duly recorded in the office of the Recorder of Deeds of Chester County, Pennsylvania and shall be noted on the face of the subdivision plan.

2. Natural Resources. All natural resources (As defined in Section 201 – Definition of Terms) shall be included within the designated open space, however, no more than eighty (80%) percent of the total designated open space shall consist of natural resources.

3. Agricultural Soils. Any Class I, II, and III agricultural soils that are present on the site shall be included in the designated open space to the greatest extent feasible. The burden shall be on the applicant to justify the location of any such soils outside of the designated open space.

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.

Table 6-1 Cluster Development Option - Residential Water and Sewage Facility Options Area, Bulk, and Open Space Standards		
Water and Sewage Facility Options	Individual Sewage System and Individual On-lot Water Supply	Individual Sewage System and Community or Public Water Supply
Base Density	1 du/2 acres	1 du/2 acres
Minimum Net Lot Area	1 acre	30,000 square feet
Minimum Tract Open Space	45%	55%
Minimum Lot Width at Building Line	150 feet	125 feet
Minimum Lot Width at Street Line	50 feet	40 feet
Maximum Building Coverage	10%	15%
Maximum Lot Coverage	15%	20%
Individual Lot Front Setback	40 feet	40 feet
Individual Lot Side Setback	20 feet	15 feet
Individual Lot Rear Setback	50 feet	40 feet
Maximum Building Height	35 feet or 3 stories, whichever is less	35 feet or 3 stories, whichever is less

Addendum J

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.

4. Where common open space is designated as separate, noncontiguous parcels, no single parcel shall consist of less than one (1) acre in area. No single area or portion of an area designated as common open space shall be counted toward the minimum required open space wherever such area or portion is less than one hundred and fifty (150) feet in width except in the case of a trail corridor or other linkage between two larger, noncontiguous, open space areas. Any such trail corridor or linkage shall be a minimum of fifteen (15) feet in width.

5. Where adjacent parcels contain existing or proposed open space areas, either publicly owned or otherwise deed restricted as permanent open space, common open space shall be located contiguously to this adjacent open space whenever possible to create larger open space networks. The burden shall be on the applicant to either locate the common open space contiguous to this adjacent open space or to demonstrate, to the Township's satisfaction, that there is no feasible way to so locate said common open space.

6. Open Space Ownership / Management Standards are set forth in Section 1301.A.

G. Any proposed full cluster subdivision for a tract from which lots have previously been subdivided shall:

1. Calculate the ultimate number of permitted lots/units per the requirements of Section 604 based on the entire tract from which those lot(s) had been subdivided. Any lots subdivided in the interim shall count toward the total number of lots permitted in the full subdivision.

2. Determine the amount and configuration of required open space per the requirements of Section 604 and included in Table 6-1 based on the entire tract from which those lot(s) had been subdivided. No portion of any lots subdivided in the interim may count toward the total designated open space required for the full cluster development.

SECTION 606. CONVENTIONAL DEVELOPMENT OPTION.

A. **Density Determination**. To determine the number of lots/ dwelling units permitted in a conventional development, the applicant shall perform the calculation set forth in Section 604 and shall submit evidence in the form of plans and data to verify the accuracy of the calculations in accordance with the provisions of Section 604 and the Township Subdivision and Land Development Ordinance.

B. **Area and Bulk**. The following area and bulk standards shall apply to parcels consisting of less than thirty (30) acres, as of the date of the adoption of this Zoning Ordinance, and parcels created under the provisions of Section 601.A.11, on which a residential use serves as the principal use:

1.	Minimum lot size	2 acres
2.	Minimum lot width	
	Building line	200 feet
	Street line	50 feet
3.	Minimum building setback	50 feet
4.	Minimum side yard	
	Individual	20 feet
	Aggregate	50 feet

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.

Addendum J

5.	Minimum rear yard	50 feet
6.	Maximum building coverage	8%
7.	Maximum paved area	12%
8.	Maximum building height	35 feet
9.	Minimum setback for accessory structures	10 feet

10. No new dwelling shall be located closer than two hundred (200) feet from an existing outdoor feedlot, compost or manure storage or mushroom house.

SECTION 607. GENERAL DESIGN STANDARDS.

The following design standards shall apply to all uses, as applicable, in this zoning district:

A. Natural Resource Protection Standards shall be in accordance with Article XI.

B. Supplemental Regulations shall be in accordance with Article XII.

C. General Regulations shall be in accordance with Article XIII.

D. Signage Regulations shall be in accordance with Article XIV.

E. Nonconforming Uses shall be in accordance with Article XVI.

This document is provided for planning purposes.
Please obtain official Township Ordinances from the Township office.

Addendum J

Chapter 27. Zoning

Part 4. AR AGRICULTURAL - RESIDENTIAL DISTRICT

§ 27-401. Purpose.

[Ord. 95-07, 12/14/1995, § 400; as amended by Ord. 2003-02, 4/17/2003; and by Ord. 2008-04, 11/19/2008, § 1]
The Agricultural/Residential District (AR) has been created to encourage the use of prime agricultural soils for cultivation and to conserve critical environmental areas by maintaining a relatively low density. The AR District has been located along roads which cannot accommodate high traffic volumes. The use of on-site domestic waste disposal systems shall be provided in order to help replenish the supply of ground water.

§ 27-402. Use Regulations.

[Ord. 95-07, 12/14/1995, § 401; as amended by Ord. 2001-07, 12/27/2001, § III; by Ord. 2002-01, 2/21/2002, § III; by Ord. 2003-02, 4/17/2003; by Ord. 2006-02, 3/15/2006, §§ 1, 2; by Ord. 2006-05, 10/18/2006, §§ 1, 2; and by Ord. 2008-04, 11/19/2008, § 1]

1. Uses Permitted by Right.

    A. Agriculture and buildings related to agriculture.
    [Amended by Ord. 2016-02, 4/20/2016]

    B. Single-family detached dwellings.

    C. Nonprofit public or private park, nature center or arboretum.

    D. Cemeteries.

    E. The clustering of single-family detached residential lots on tracts of 15 acres or larger is mandatory, subject to the provisions of § **27-1611**, except where open space conservation conventional development (§ **27-1615**) is proposed. Sites of less than 15 acres may consider the provisions of § **27-1611** as an optional design approach.

    F. Open space conservation conventional development subject to the provisions of § **27-1615**.

    G. Equestrian uses.

2. Permitted Accessory Uses.

    A. Customary accessory agricultural.

    B. Customary accessory residential use and buildings.

    C. Private swimming pool, subject to the provisions of § **27-1713**.

    D. Home occupations, subject to the provisions of § **27-1709**.

    E. The sale of farm products, subject to the provisions of § **27-1716**.

    F. Signs, subject to the provisions of Part 20.

G. No-impact home-based business.

3. Conditional Use.

A. Golf course and golf club uses, subject to the provisions of § **27-1715**.

B. Municipal, county, state and federal uses, excluding dumps, sanitary landfills and corrections or penal institutions.

C. Private club, lodge or nonprofit recreational use, subject to the provisions of § **22-611** of the Franklin Township Subdivision and Land Development Ordinance [Chapter **22**], and § **27-1610**.

D. Retirement homes and facilities subject to the provisions of Part **17**. Maximum gross density is subject to the underlying zoning district standards as specified in § **27-1611**.

E. Conventional single-family design for tracts larger than 15 acres.

4. Uses by Special Exception.

A. Cultural, educational or religious uses.

B. Residential conversions of a single-family detached dwelling, subject to the provisions of § **27-1712**.

§ 27-403. Height Regulations.

[Ord. 95-07, 12/14/1995, § 402; as amended by Ord. 2003-02, 4/17/2003]
The maximum height of structures or uses erected or enlarged shall be 35 feet.

§ 27-404. Area and Bulk Provisions.

[Ord. 95-07, 12/14/1995, § 403; as amended by Ord. 2003-02, 4/17/2003; and by Ord. 2015-02, 6/17/2015]

1. The following area and bulk regulations shall apply to all uses and structures permitted within the AR District:

Provisions	**Residential Use Requirements**			**Other Use Requirements**
	Conventional	**Open Space Design**		
		Individual Sewer	**Community Sewer**	
Minimum lot area (square feet)	80,000	30,000	18,000	80,000
Maximum coverage:				
Building	8%	15%	20%	15%
Lot	15%	25%	35%	30%
Minimum landscaped or open space	20% for tracts > 15 acres	55%	55%	70%
Minimum lot width (feet):				
Building line	150	120	100	150
Street line	50	50	50	75
Minimum front yard setbacks (feet):				
State roads	75	50	50	75
All other roads	50	40	35	50

Provisions	Residential Use Requirements			Other Use Requirements
	Conventional	Open Space Design		
		Individual Sewer	Community Sewer	
Minimum side yard setbacks (feet)				
Individual	20	15	10	20
Aggregate	50	30	30	50
Minimum rear yard setbacks (feet)	50	30	25	50
Accessory structure				
Maximum allowable	N/A	2	1	N/A
Minimum setbacks (feet)				
Front yard	Not permitted	Not permitted	Not permitted	
Side yard	10	5	5	10
Rear yard	15	5	5	15
Parking lot[1] setback from all roads and adjoining property lines (feet)	50	50	50	50

NOTES:

[1] Exclusive of parking associated with individual dwelling units.

2. All barns or areas for the deposit, curing, or storage of mushroom substrate, compost or manure shall be located the greater of:
[Added by Ord. 2016-02, 4/20/2016]

   A. The distance required under an approved mushroom farm environmenal management plan ("MFEMP"), manure management plan, or nutrient management plan, as applicable to an operation; or

   B. One hundred feet from any property lines, unless the owner of the adjacent property has provided a written waiver consenting to the barn or area being closer than 100 feet.

§ 27-405. Design Standards.

[Ord. 95-07, 12/14/1995, § 404; as amended by Ord. 2003-02, 4/17/2003]

1. The following design standards shall apply:

   A. Residential Uses.

      (1) Refer to regulations established in Part 16.

      (2) Refer to regulations established in Part 15.

   B. All Other Uses Permitted in the District.

      (1) Refer to regulations established in Part 16.

      (2) Refer to regulations established in Part 15.

Part 4

R-1 Low Density Residential Districts

§1-401. Purpose.

The R-1 Low Density Residential District has been created to accommodate housing types which typify the rural residential character of the Township. Properties in the R-1 District may be served by individual on-lot water supply and individual on-lot sewage systems. They may utilize the lot-averaging option to achieve some site design flexibility.

(*Ord. 2003-9-1*, 9/4/2003; as amended by *Ord. 2004-03*, 11/18/2004, §II(a); and by *Ord. 2008-2*, 7/16/2008, §4)

§1-402. Use Regulations.

1. *Uses Permitted by Right*. Any one of the following uses is permitted by right on a parcel in this district:

A. Lot averaging of residential lots, on tracts with a minimum area not less than 5 contiguous acres and not more than 25 contiguous acres, subject to the provisions of §1-1313, "Residential Lot Averaging Design Options."

B. Single-family detached dwelling on an existing lot, or single-family detached dwellings on lots proposed to be created through subdivision of a tract into not more than three lots and not utilizing the lot averaging option.

C. Agriculture.

D. Municipal, County, State and Federal uses excluding dumps, sanitary landfills and correctional or penal institutions.

E. Forestry in accordance with the terms of §1-1430 of this Chapter. [*Ord. 2010-02*]

2. *Permitted Accessory Uses*.

A. Customary accessory residential uses and buildings exclusive of the raising and boarding of farm animals except where the provisions of §1-304.A, are met.

B. Customary accessory agricultural uses and buildings.

C. Private swimming pool, provided it is located in the rear yard or side yard of the dwelling lot, subject to the provisions of §1-1418, "Swimming Pools."

D. No-impact home occupations, subject to the provisions of §1-1413, "Home Occupation." [*Ord. 2004-03*]

E. The sale of farm products, subject to the provisions of §1-1406, "Sale of Farm Products."

F. Signs, subject to the provisions of Part 17 of this Chapter.

G. Keeping of large animals in accordance with §1-1422, "Keeping of Large Animals on Residential Lots."

3. *Conditional Uses*.

A. Single-family detached dwellings on a tract to be subdivided into more than three lots not utilizing lot averaging option, subject to the standards in §1-406.1 of this Part and requirements of §1-2013, "Conditional Use."

Home Back Addendum J Next

B. Lot averaging of residential lots, on tracts with a minimum area greater than 25 contiguous acres, subject to the standards in §1-406.1 of this Part and the provisions of §§1-1313 and 1-2013 of this Chapter.

C. Residential conversion of single-family detached dwellings, subject to the provisions of §1-1417.

D. Cultural, educational or religious use.

E. Private club, lodge or nonprofit recreational uses, provided that a particular activity shall not be one which is customarily carried on as a business, and provided that all services shall be for members and their guests.

F. Public utility structures or facilities provided that non exterior storage of equipment, housing of construction or repair crews, or above ground storage of gaseous or liquid fuels shall be permitted.

G. Cemeteries.

H. Single access residential developments subject to the provisions of §1-1316.

4. *Uses by Special Exception*.

A. Convalescent or nursing home.

B. Residential conversion of a single-family dwelling, subject to the provisions of §1-1417. [*Ord. 2004-03*]

C. Major home occupations, subject to the provisions of §1-1413, "Home Occupations." [*Ord. 2004-03*]

(*Ord. 2003-9-1*, 9/4/2003; as amended by *Ord. 2004-03*, 11/18/2004, §§IX(a), X(b); by *Ord. 2008-2*, 7/16/2008, §4; and by *Ord. 2010-02*, 7/1/2010, §2)

§1-403. Height Restrictions.

The maximum height of all buildings erected or enlarged shall be 35 feet.

(*Ord. 2003-9-1*, 9/4/2003; as amended by *Ord. 2008-2*, 7/16/2008, §4)

§1-404. Area and Bulk. Regulations.

The following area and bulk regulations shall apply to all uses permitted within the district, with the exception of the residential lot average design option, which shall be governed by §§1-1314 and 1-1313, respectively:

A. *Residential and Nonresidential Use Requirements*.

(1)	Lot area	2 acre minimum
(2)	Lot width at building line	150 feet minimum
(3)	Lot width at street line	50 feet minimum
(4)	Building coverage	15% maximum
(5)	Total lot coverage	25% maximum
(6)	Building setback line	50 feet minimum
(7)	Side yard	25 feet minimum

Home Back Addendum I Next

(8) Rear yard 50 feet minimum

(9) Accessory structure setback 10 feet minimum

B. *Agricultural Use Regulations*.

(1) Agricultural use shall comply with the provisions established under §1-304.A.

(*Ord. 2003-9-1*, 9/4/2003; as amended by *Ord. 2004-03*, 11/18/2004, §II(b); and by *Ord. 2008-2*, 7/16/2008, §4)

§1-405. Design Standards.

The following design standards shall apply:

A. *Residential Use Regulations*.

(1) Off street parking regulations as established in §1-1311.

B. *Nonresidential Use Regulations*.

(1) Other uses permitted in this district may be subject to additional design standards in Part 13, where applicable.

(*Ord. 2003-9-1*, 9/4/2003; as amended by *Ord. 2008-2*, 7/16/2008, §4)

§1-406. Standards for Criteria for Conditional Uses.

1. Specific review criteria and application requirements for conditional uses, as permitted in §1-402.3:

A. Any application for conditional use approval for (1) single-family detached dwellings on a tract to be subdivided into more than three lots and not utilizing the lot averaging option, or (2) lot averaging of residential lots on a tract greater than 25 acres, shall be evaluated and decided upon by the Board of Supervisors in relation to the requirements of this Section and the standards and procedure of §1-2013.

B. The application for conditional use approval shall include a proposed plan, as required by §1-2013.2 of this Chapter. Prior to the public hearing on the application, the applicant is strongly encouraged to meet with the Planning Commission to discuss the proposed plan's relationship to the Township's community development objectives and to matters of recreation, open space, resource conservation, traffic and access management, agricultural preservation, and/or visual quality and rural character. In its subsequent recommendation to the Board of Supervisors concerning the application for a conditional use permit, the Planning Commission will note any issues raised during its review of the proposed plan and the degree to which the application has addressed and resolved these issues.

C. In reviewing any application for conditional use approval, the Board shall examine and weigh the degree to which it furthers or hinders the specific purposes and site design and development objective that are inherent in the provisions in Part 13 for lot averaging of residential lots.

D. The Board also shall review any such application in relation to the following factors:

Home Back Addendum I Next

(1) *Protection of Natural, Historic, and Scenic Resources; Mitigation of Potential Impacts*. The applicant shall submit for the Board's review a preliminary resource impact and conservation plan as prescribed in §2-403.F of the New London Township Subdivision and Land Development Ordinance [Chapter 2]. This plan must demonstrate, to the Board's satisfaction, how the proposed design and development of the site will protect, to the maximum extent practical, the identified site resources.

(2) *Compatibility with Adjacent Properties and Uses*. The applicant shall demonstrate how the proposed site design will produce a residential development that is consistent with permitted and existing uses on adjacent tracts. In particular, any she plan will be evaluated in terms of:

(a) How well the siting of new dwelling units protects existing farm land and open space resources on adjacent tracts from the impacts of development.

(b) How the retention of existing vegetation and the installation of new landscaping materials protects traditional views of and across the proposed tract.

(c) How the size, configuration, and location of the proposed lots achieves compatibility with adjoining residential development. As a condition of approval, the Board may require deeper front or side yard setback dimensions, the installation of vegetation or other screening material, or other measures to protect the visual quality of existing road frontages that it deems an essential component of the Township traditional landscape character.

(3) *Ability to Utilize Alternative Design Options*. The applicant shall document the absence of site characteristics that make use of the lot averaging option infeasible or inappropriate.

(*Ord. 2003-9-1*, 9/4/2003; as amended by *Ord. 2008-2*, 7/16/2008, §4)

Home Back Addendum I Next

Gregory L. Snyder, ARA

Accredited Rural Appraiser

Pennsylvania General Certified Appraiser (GA-001309-L)
Delaware General Certified Appraiser (XI-0000514)
Maryland General Certified Appraiser (31821)

3004 Hempland Road, Suite 3
Lancaster, PA 17601
717.435.9560
greg@snyderassociates.us
www.snyderassociates.us

Professional Experience:

30+ years of agricultural and conservation real estate valuation experience.

Present: President/Owner
Snyder Appraisal Associates, LLC
3004 Hempland Road
Lancaster, PA 17601

Prior: Principal Appraiser
Keystone Farm Credit, ACA
PO Box 7327
Lancaster, PA 17604

Snyder Appraisal Associates, LLC is an independent fee appraisal company founded in February 2000. We complete 150+ conservation and agricultural type property appraisals annually.

14 years with Keystone Farm Credit includes 8 years lending experience with real estate valuation as a portion of duties. 6 years as staff appraiser responsible for all appraisals in Lancaster, Lebanon, Dauphin and Schuylkill Counties.

Earned Designation:

Accredited Rural Appraiser (ARA)

The ARA designation is conferred on Members of the American Society of Farm Managers and Rural Appraisers (ASFMRA). The experience and education required to become an ARA are significantly more stringent than that required for state certification.

ASFMRA Approved Instructor

Professional Affiliations:

Accredited Member - American Society of Farm Managers and Rural Appraisers
District 1 Vice President– American Society of Farm Managers and Rural Appraisers
Past President & Secretary/Treasurer – Northeast Chapter of the ASFMRA
Affiliate Member - Pennsylvania Farm Bureau
Associate Member - Pennsylvania Land Trust Association
Professional Partner Member - Land Trust Alliance

Education:

Bachelor of Science in Animal Industries, Penn State University

Biannually complete more than 100 hours of Continuing Education (State minimum requirement is 28 hours).

Relevant Coursework:

ASFMRA

A-10 Fundamentals of Rural Appraisal	Timber & Timberland Evaluation
A-12 - Ethics	Oil, Gas & Mineral Valuation
A-20 Principals of Rural Appraisal	Wind Power
A-25 Eminent Domain	Intro to Appraisal Review
A-29 Highest and Best Use	Appraisal Review under USPAP
A-30 Advanced Rural Appraisal	Environmental Regulations
Large Farm Expansion Seminar	Vineyard & Winery Valuation
Large Dairy Facility Appraisal	Greenhouse Valuation
Swine Facility Appraisal	Identifying Intangible Assets
Poultry Facility Appraisal	Property Rights
Valuation of Conservation Easements and other Partial Interest	Yellow Book – Uniform Appraisal Standards of Federal Land Acquisitions
IRS Seminar – Valuation of Donated RE	Permanent Plantings Valuation

McKissock	American Society of Appraisers
PA RE Appraisers Certification & Regulations	Income Producing Property Methodology
DE RE Appraisers Certification & Regulations	Appraisal Report Writing

Appraisal Institute	Lancaster Co Assoc. of Realtors
Subdivision Valuation	Introduction to Commercial Valuation

Appraisals Completed for:

- General crop, livestock, swine, poultry and lifestyle farms.
- Agri-Business – grain centers, greenhouses, mushroom plants, livestock sale facilities, feed mills, orchards, vineyards, permanent plantings, soybean processing, chicken hatchery, chicken processing, rendering plant, cheese plant.
- Natural Resources - timber, minerals, water rights
- Recreational properties, trails, greenways, fish and boat access, PA Game Commission park land. Completed appraisals under PA DCNR, UASFLA, LWCF 6F regulations.
- Land Acquisitions
- Estate Planning and Settlement
- Partial Interests- minority, leasehold, life estates, scenic and conservation easements
- Eminent Domain - compensation including value of land taken plus severance damages
- Expert testimony given in Bankruptcy Court, Board of View and Assessment Hearing Boards
- 2032A – Special Use Appraisals
- FRPP/ALE – NRCS Farm and Ranch Protection Program/Agricultural Land Easement.
- Charitable Contribution or Sale of Rights associated with a Conservation Easement.
- UASFLA compliant appraisals (Yellow Book).

Licenses

DISPLAY THIS CERTIFICATE PROMINENTLY • NOTIFY AGENCY WITHIN 10 DAYS OF ANY CHANGE

Commonwealth of Pennsylvania
Department of State
Bureau of Professional and Occupational Affairs
PO Box 2649 Harrisburg PA 17105-2649

18 0021829

Certificate Type
Certified General Appraiser

Certificate Status
Active

Initial Certification Date
10/20/1994

GREGORY LEE SNYDER
SNYDER APPRAISAL ASSOCIATES
3004 HEMPLAND ROAD SUITE 3
LANCASTER PA 17601

Certificate Number
GA001309L

Expiration Date
06/30/2019

Commissioner of Professional and Occupational Affairs

Signature

ALTERATION OF THIS DOCUMENT IS A CRIMINAL OFFENSE UNDER 18 PA.C.S.S. 4911

LICENSE NO. X1-0000514

STATE OF DELAWARE
DIVISION OF PROFESSIONAL REGULATION
861 Silver Lake Blvd.
Cannon Building, Suite 203
Dover, DE 19904-2467

NOT TRANSFERABLE

PROFESSION: Certified General Real Property Appraiser

EXPIRATION DATE: 10/31/2019

ISSUED TO: Gregory Lee Snyder

MAILING ADDRESS

Gregory Lee Snyder
3004 Hempland Rd
Suite 3
3004 Hempland Rd, Suite 3
Lancaster PA 17601

PROFESSIONAL LICENSE

THIS CERTIFIES THAT THE PERSON NAMED IS HEREBY LICENSED TO CONDUCT OR ENGAGE IN THE PROFESSION INDICATED ABOVE THIS DOCUMENT IS DULY ISSUED UNDER THE LAWS OF THE STATE OF DELAWARE

LICENSEE SIGNATURE

549325

THIS DOCUMENT IS VOID WITHOUT BLUE BACKGROUND. CONTAINS COPY VOID FEATURE & ARTIFICIAL WATERMARK ON THE BACK.

State of Maryland
DLLR
Department of Labor, Licensing and Regulation

LICENSE * REGISTRATION * CERTIFICATION * PERMIT

STATE OF MARYLAND
DEPARTMENT OF LABOR, LICENSING AND REGULATION

Lawrence J. Hogan, Jr.
Governor
Boyd K. Rutherford
Lt. Governor
Kelly M. Schulz
Secretary

COMMISSION OF RE APPRAISERS & HOME INSPECTORS
CERTIFIES THAT:
GREGORY L SNYDER

IS AN AUTHORIZED: 04- CERTIFIED GENERAL

LIC/REG/CERT	EXPIRATION	EFFECTIVE	CONTROL NO
31821	08-20-2019	07-25-2016	4882615

Signature of Bearer

Secretary DLLR

WHERE REQUIRED BY LAW THIS MUST BE CONSPICUOUSLY DISPLAYED IN OFFICE TO WHICH IT APPLIES

Katie A. Yoder

Licensed Appraiser Trainee

Pennsylvania Licensed Trainee (LAT000731)

3004 Hempland Road, Suite 3
Lancaster, PA 17601
717.435.9560
katie@snyderassociates.us
www.snyderassociates.us

***Professional Experience*:**

Present: Licensed Appraiser Trainee
Snyder Appraisal Associates, LLC
3004 Hempland Road
Lancaster, PA 17601

Prior: Financial Specialist
AgChoice Farm Credit
3301 W. Market Street
York, PA 17404

Snyder Appraisal Associates, LLC is an independent fee appraisal company founded in February 2000. We complete 150+ conservation and agricultural type property appraisals annually.

***Professional Affiliations*:**

Associate Member - American Society of Farm Managers and Rural Appraisers

***Education*:**

Bachelor of Science in Animal Science, Penn State University

Relevant Coursework:

ASFMRA

A101 Basic Appraisal Principles

A102 Basic Appraisal Procedures

A301 Cost Approach for General Appraisers

A302 Sales Comparison Approach for General Appraisers

General Market Analysis and Highest & Best Use

McKissock

PA RE Appraisers Certification & Regulations

Appraisal Institute

Real Estate Finance, Statistics & Valuation Modeling

Income Approach for General Appraisers, Part 1

Income Approach for General Appraisers, Part 2

Experience

Assisted with a wide range of appraisals including:

- Agri-Business – greenhouses, livestock sale facilities, orchards, mushroom plants
- Dairy Farms, Crop Farms, Lifestyle Farms, Horse Farms
- Poultry Construction, Dairy Construction, Hog Construction

Licenses

DISPLAY THIS CERTIFICATE PROMINENTLY • NOTIFY AGENCY WITHIN 10 DAYS OF ANY CHANGE

Commonwealth of Pennsylvania
Department of State
Bureau of Professional and Occupational Affairs
PO Box 2649 Harrisburg PA 17105-2649

18 0307285

License Type
Licensed Appraiser Trainee

License Status
Active

Initial License Date
09/14/2015

KATIE A YODER
3004 HEMPLAND ROAD SUITE 3
LANCASTER PA 17601

License Number
LAT000731

Expiration Date
06/30/2019

Commissioner of Professional and Occupational Affairs

Katie A. Yoder
Signature

ALTERATION OF THIS DOCUMENT IS A CRIMINAL OFFENSE UNDER 18 PA.C.S.§. 4911

PENNSYLVANIA STATE BOARD OF CERTIFIED REAL ESTATE APPRAISERS
REQUIRED CHECKLIST FOR LICENSED APPRAISAL TRAINEE

THE BOARD REQUIRES THIS CHECKLIST BE USED WHEN A LICENSED APPRAISAL TRAINEE IS UTILIZED IN THE PERFORMANCE OF AN APPRAISAL. THIS CHECKLIST MUST BE SIGNED BY THE CERTIFIED APPRAISER AND MADE PART OF THE APPRAISAL REPORT THAT IS SUBMITTED TO THE CLIENT AND RETAINED IN THE APPRAISAL WORKFILE.

BY COMPLETING THIS CHECKLIST AND MAKING IT PART OF THE APPRAISAL REPORT SUBMITTED TO THE CLIENT, THE TRAINEE AND SUPERVISORY APPRAISER HAVE MET APPLICABLE USPAP REQUIREMENTS FOR ACKNOWLEDGMENT AND DISCLOSURE OF SIGNIFICANT REAL PROPERTY APPRAISAL ASSISTANCE.

THE BOARD CANNOT GRANT EXPERIENCE HOURS FOR APPRAISAL ASSIGNMENTS IN WHICH THE LICENSED APPRAISAL TRAINEE IS NOT PROPERLY ACKNOWLEDGED IN THE REPORT.

SUBJECT PROPERTY ADDRESS: Chesterville Rd, Landenberg, PA

The licensed appraisal trainee to the certified real estate appraiser has contributed significant real property appraisal assistance in this appraisal assignment. Specifically, the licensed appraisal trainee:

Yes	No	N/A	
X			Assisted in the preparation of the workfile with all forms and general information for the appraisal.
X			Assisted in determining the scope of work of the appraisal.
X			Assisted in gathering and entering data as follows: tax assessment information and map, flood hazard information and map, zoning information and map, location map and similar information.
X			Inspected the subject property. If yes, accompanied by supervisor? Yes (yes/no) Type of inspection (check one): ____ interior X exterior
	X		Assisted in analyzing the highest and best use of the subject property.
X			Assisted in gathering information for comparable land sales data, verified and analyzed the comparable land sales data.
		X	Assisted in gathering data for the cost approach, including estimates of cost new and accrued depreciation.
		X	Assisted in data and analysis for the income approach, including estimates of market rent, vacancy/expense analysis, and development of GRM or capitalization rate.
X			Assisted in gathering and verifying comparable sales data, and analysis of the comparable sales.
X			Assisted in the exterior inspection of the sales, rentals, land and/or other comparables.
		X	Assisted in sketch drawing.
	X		Assisted in entering subject and comparable data on the form and in the comment areas.
	X		Assisted in reconciliation and final opinion of value for the subject property.
	X		Assisted in the final review of this report.
			Other_____

SIGNATURE OF THE APPRAISAL TRAINEE Katie A. Yoder

PRINT/TYPE NAME: Katie A. Yoder

The supervising certified real estate appraiser certifies that the named individual did assist with the items checked above, and also certifies that he/she reviewed all work done by the trainee. The supervising appraiser further certifies that the person signing this report as trainee understands the concepts and processes associated with the appraisal process.

SIGNATURE OF SUPERVISING CERTIFIED REAL ESTATE APPRAISER:

Appraisal Review Specialists, LLC
3058 Mount Vernon Road
Suite 12
Hurricane, WV 25526
appraisalreview@frontier.com
304.760.2156 office
304.760.2158 fax

Appraisal Review Specialists
appraisalreviewspecialists.com

APPRAISAL REVIEW REPORT

Prepared By:

Philip J. Swartz, AI-GRS
Pennsylvania State Certified
General Real Estate Appraiser
#GA001298-L
Phone: (304) 760-2156
Phone: (570) 412-0043
Email: pswartz@appraisalreviewspecialists.com

January 6, 2019

Ms. Ashley D. Rebert
Chief, Land Conservation & Stewardship Section
Department of Conservation and Natural Resources
Bureau of Recreation and Conservation
Community Parks and Conservation Division
5th Floor, 400 Market Street, Harrisburg, PA 17101-2301

Re: Proposed Fee Simple Land Replacement
Strawbridge Property
Elk, Franklin & New London Townships
Chester County, Pennsylvania
Appraisal Report Prepared by Mr. Gregory L. Snyder, ARA

Ms. Rebert:

Pursuant to our agreement, I have had the opportunity to perform a desk technical review (as defined herein) of the 364 Page appraisal report submitted in conjunction with the proposed transfer of land as a replacement property for the creation of an excess bank with the National Park Service. As of the effective date, the property was owned by The Conservation Fund, George Strawbridge Jr. & BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, Successor Trustees under the Deed Trust of George Strawbridge Jr. The property includes a 982.60 Acre tract of unimproved, wooded and tillable land located outside of Lewisville, PA and is further identified as Chester County Tax Map Parcels 70-5-6, 70-5-7, 71-4-32.3, 72-6-1, 72-6-10, 70-5-8 & 72-6-4 as described in Chester County Deed Books W53-873, B64-175 & 9653-523 (see Addendum A of appraisal report). The property is situated north of Stricklersville Road in Elk, Franklin & New London Townships, Chester County. There are no building improvements and no site improvements of any consequence. The property apparently includes about 443 Acres of woodland; a timber report was provided to the appraiser and the report has been incorporated into the analysis (See Addendum G of appraisal report). The submitted appraisal report was prepared by Gregory L. Snyder, ARA, PA State Certified General Real Estate Appraiser #GA 001309-L.

The purpose of this appraisal review is to provide an opinion of the completeness of the report, the apparent accuracy, adequacy and relevance of data utilized in the report, the appropriateness of the appraisal methods and techniques relied upon, and to ultimately provide an opinion as to whether the analysis, opinions, and conclusions are appropriate and reasonable given the data provided and whether the appraisal has been developed and reported in compliance with the Uniform Standards of Professional Appraisal Practice (USPAP) and the assignment conditions noted within the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). No hypothetical conditions or jurisdictional exceptions were employed in this review.

As part of performing the appraisal review assignment, I have personally read and evaluated the appraisal report and have analyzed information necessary to arrive at a conclusion. In that respect, I have inspected public records and other readily available data in an attempt to verify subject-specific and sale-specific information. As per prior arrangement, I have not personally visited the subject site and have not visited any of the comparable market data identified within the report.

After a thorough review in accordance with the Scope of Work identified, it is my conclusion that the report is prepared and presented in accordance with the requirements of the Uniform Standards of Professional Appraisal Practice (USPAP) and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). Overall, I believe that the value opinions offered within the submitted appraisal report are adequately supported by the data presented and that the content, analyses and conclusions stated in the report under review are within reasonable compliance with the applicable standards and requirements as described herein. While a few minor typographical errors and inconsistencies may have been noted during the review process, these errors and inconsistencies would have no impact upon the valuation of the property or the overall credibility of the report. Finally, as a result of my review, **I RECOMMEND** the appraisal report for use by the agency in establishing Market Value. Explanation of, and support for, my conclusions is provided within the following report.

Should you have any questions or comments, of if you require additional information, please feel free to contact me personally.

Respectfully Submitted,

Philip J. Swartz, AI-GRS
Review Appraiser, Appraisal Review Specialists, LLC.
Pennsylvania State Certified General Real Estate Appraiser #GA001298-L
West Virginia State Certified General Real Estate Appraiser #CG 371
Virginia State Certified General Real Estate Appraiser #4001-012244
Georgia State Certified General Real Estate Appraiser #365609
South Carolina Certified General Real Estate Appraiser #7266
Kentucky State Certified General Real Estate Appraiser #004786
Tennessee State Certified General Real Estate Appraiser #5288 (Expired)
Phone: (304) 760-2156 (office)
Phone: (570) 412-0043 (direct)
Email: pswartz@appraisalreviewspecialists.com
www.appraisalreviewspecialists.com

APPRAISAL REVIEW REPORT

The Uniform Standards of Professional Appraisal Practice (USPAP) defines appraisal review as *"(noun) the act or process of developing an opinion about the quality of another appraiser's work that was performed as part of an appraisal or appraisal review assignment; (adjective) of or pertaining to an opinion about the quality of another appraiser's work that was performed as part of an appraisal or appraisal review assignment."* Regarding federal-aid projects, the Code of Federal Regulations, 49 CFR 24.104 indicates the following: *"A qualified review appraiser shall examine the presentation and analysis of market information in all appraisals to assure that they meet the definition of appraisal found in 49 CFR 24.2(a)(3), appraisal requirements found in 49 CFR 24.103 and other applicable requirements, including, to the extent appropriate, the UASFLA (Uniform Appraisal Standards for Federal Land Acquisitions), and support the appraiser's opinion of value"*. Along the same lines, Section 3.1.1 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) indicates that "*The review of appraisal reports by a qualified reviewing appraiser is required*" while Section 3.1.1(a) suggests that "*A qualified review appraiser shall examine the presentation and analysis of market information in all appraisals to ensure that they meet all applicable appraisal requirements and support the appraiser's opinion of value*."

The Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) indicates that there are two generally recognized types of reviews that can be performed; technical reviews and administrative reviews. An administrative review may be performed by an appraiser or a non-appraiser and is sometimes referred to as a compliance review. The content and scope of an administrative review will vary with the intended use and intended user of the administrative review. Some federal agencies have specific policies regarding the development and use of administrative reviews. An administrative review may include confirmation that the appraisal report conforms to contract/assignment letter requirements and to applicable federal law for federal land acquisition appraisals, and/ or that the report includes a signed certification stating that the report has been prepared in compliance with the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). The administrative reviewer may also verify if the correct subject property has been appraised, if photographs of the subject property and comparable market data are included, if the analyses reflect the government's most recent project plans, and if the factual data and the mathematics presented in the appraisal report are correct. The administrative reviewer shall not, however, form an opinion regarding the quality of the analysis, judgment, or opinion(s) of value contained within the appraisal report under review. As such, administrative reviews do not meet the requirements of 49 C.F.R. §24.104. Administrative reviewers often use a checklist as a guide in making their determinations.

A technical review is developed and reported by an appraiser in accordance with the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA), which require conformity with USPAP and with agency polices, rules, and regulations. As per Section 3.2 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA), in completing a technical review, the review appraiser renders opinions on the quality of an appraisal report and whether the opinion(s) of value are adequately supported and in compliance with all appropriate standards, laws, and regulations relating to the appraisal of property for federal acquisition purposes. In addition, as a part of a technical review, the review appraiser may reach a conclusion regarding whether to approve (or recommend approval of), modify, or not accept or modify the conclusions presented in the appraisal report under review. If appropriate to the assignment, the agency review appraiser performing a technical review may render a separate opinion of value. However, if the review appraiser renders a separate opinion of value, the value opinion must be developed and reported in accordance with the appraisal development and content requirements for the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). The development of such opinions and further review of the initial reviewer's opinion of value and the support therefore may also be subject to the pertinent agency's policies, rules, and/or regulations.

Technical reviews may be conducted as either desk reviews or field reviews. A desk review involves, in addition to confirmation that the report was prepared in accordance with the requirements of USPAP and other applicable assignment conditions, a thorough review and analysis of the information and analysis contained in the appraisal report under review and a careful examination of the internal logic and consistency offered within the appraisal report. In a desk review, the appraisal reviewer limits the examination to the information and analysis presented within the appraisal report. The data contained within the appraisal report may or may not be confirmed and the reviewer may or may not identify additional comparative market data. A field review involves at least an exterior field inspection of the subject of the work under review and often involves an inspection (generally from the street) of the properties used as comparable data in the appraisal report. In addition, the data contained in the appraisal report is usually independently confirmed during the review process. A field review may be used to obtain additional market data beyond that provided by the appraiser or to resolve factual differences between two appraisals with divergent market value estimates. The field review represents the highest level of due diligence within the appraisal review practice.

This appraisal review serves as a "*desk technical review*" as described in Section 3 of UASFLA and was developed and reported in accordance with Standards 3 & 4 of the 2018-2019 Edition of the Uniform Standards of Professional Appraisal Practice (USPAP) and Section 3 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). The specific details of discussion contained in this report are specific to the needs of the client and are for the intended use and users stated below. The review appraiser is not responsible for any unauthorized use of this report, and personal responsibilities do not extend to any unauthorized third party.

Summary of Salient Facts and Conclusions:

Client:	PA Department of Conservation and Natural Resources Bureau of Recreation and Conservation Community Parks and Conservation Division 5th Floor, 400 Market Street, Harrisburg, PA 17101-2301
Contact:	Ms. Ashley D. Rebert Chief, Land Conservation & Stewardship Section
Intended Users of Review:	Department of Conservation and Natural Resources Bureau of Recreation and Conservation Community Parks and Conservation Division (client), and National Park Service
Intended Use of Review:	To assist the client and the intended users in determining if the appraisal report that is the subject of this review was prepared in compliance with the Uniform Standards of Professional Appraisal Practice (USPAP) and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) as well as other laws, regulations and policies applicable to the overall scope of the appraisal assignment
Purpose of the Review:	The purpose of this appraisal review is to provide an opinion of the completeness of the report, the apparent accuracy, adequacy and relevance of data utilized in the report, the appropriateness of the appraisal methods and techniques relied upon, and to ultimately provide an opinion as to whether the analysis, opinions, and conclusions are appropriate and reasonable given the data provided and whether the appraisal has been developed and reported in compliance with the Uniform Standards of Professional Appraisal Practice (USPAP) and the assignment conditions noted within the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA)
Type of Appraisal Review:	Desk Technical Review, as described herein
Opinion of Value By Reviewer:	None Required
Appraiser Who Completed the Work under Review:	Gregory L. Snyder, ARA, PA State Certified General Real Estate Appraiser GA 001309-L
Effective Date of Work Under Review:	June 5, 2018 (Retrospective Analysis)
Date of the Work under Review:	The letter of transmittal is dated January 3, 2019 and is addressed to Mr. Thomas Ford of the PA Department of Conservation and Natural Resources, Bureau of Recreation and Conservation, Community Parks and Conservation Division, 5th Floor, 400 Market Street, Harrisburg, PA 17101-2301
Date of the Review Report:	January 6, 2019

Summary of Salient Facts and Conclusions: **(Continued)**

Subject of the Work Under Review:	The subject property (larger parcel) described in the work under review includes a 982.60 Acre tract of unimproved, wooded and tillable land located outside of Lewisville, PA, further identified as Chester County Tax Map Parcels 70-5-6, 70-5-7, 71-4-32.3, 72-6-1, 72-6-10, 70-5-8 & 72-6-4 as described in Chester County Deed Books W53-873, B64-175 & 9653-523 (see Addendum A of appraisal report). The property is situated north of Stricklersville Road in Elk, Franklin & New London Townships, Chester County. There are no building improvements and no site improvements of any consequence. The property apparently includes about 443 Acres of woodland; a timber report was provided to the appraiser and the report has been incorporated into the analysis (See Addendum G of appraisal report). There are reportedly no fixtures on site and no personal property was included in the analyses. No commercially viable minerals are said to exist on the subject property. As of the effective date of value, the property is owned by The Conservation Fund, George Strawbridge Jr. & BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, Successor Trustees under the Deed Trust of George Strawbridge Jr.
Zoning:	Per the report, the property is located in the following zoning districts: 47% Agricultural Residential (R-2) – Elk Township 51% Agricultural/Residential (AR) – Franklin Township 2% Low Density Residential (R-1) - New London Township
Public Utilities Available:	Electricity and telephone – the report suggests that public water and sewer services are not readily available as of the date of valuation
Property Rights Valued in the Work Under Review:	Fee Simple Interest
Appraisal Report Type:	Appraisal Report
Extraordinary Assumptions Relied Upon in the Appraisal:	Per the report, "*Extraordinary Assumption #1 states that the deeded acreage is not able to be calculated or confirmed by a plat because of missing deed calls in the original deed (W53-873). Therefore, the acreage assumed in this report is based on the tax assessment acreages totaling 982.60 acres*."

Summary of Salient Facts and Conclusions: **(Continued)**

Hypothetical Conditions Relied Upon in the Appraisal:

Per the report, "*Hypothetical Condition #1 states that the subject is being appraised as one tract even though it is under two different ownerships. The property is under agreement of sale between George Strawbridge Jr., BNY Mellon, N.A., George Baxter and R. Stewart Strawbridge, Successor Trustees under the Deed of Trust of George Strawbridge Jr. and The Conservation Fund. The agreement is dated March 22, 2017 and the property is to be transferred in three phases. Phase I and II have been completed. It is reasonable to assume the remaining phase will be completed over the next year*."

Jurisdictional Exceptions Invoked During Appraisal and/or Review:

The Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) indicate that estimates of market value shall not be linked to a specific market exposure time. This assignment condition is contrary to the requirements of the "*Comment*" to 1-2(c) of USPAP (2018-2019 Edition). Therefore, as suggested in Section 1.2.7.2 of the 2016 Edition of UASFLA, the appraiser has not developed and/or reported an estimate of reasonable exposure time (reference Page 2 of the report).

Source and Definition of Value Relied Upon In Appraisal and Review:

Per Page 6 of the work under review, the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) defines "*Market Value*" as *"the amount in cash, or terms reasonable equivalent to cash, for which in all probability the property would have sold on the effective date of the appraisal, after a reasonable exposure time on the open competitive market, from a willing and reasonably knowledgeable seller to a willing and reasonably knowledgeable buyer, with neither acting under any compulsion to buy or sell, giving due consideration to all available economic uses of the property at the time of the appraisal."*

Appraiser's Larger Parcel Determination:

Page 7 of the work under review indicates the following: "*The larger parcel is the 982.60 acre tract described in this report. The landowner owns no other real estate contiguous to this tract and this is a LWCF 6F replacement tract*."

Appraiser's Determination of Highest & Best Use, As Vacant – Before Acquisition:

"*Agricultural with future subdivision potential*"

Summary of Salient Facts and Conclusions: **(Continued)**

Conclusion of Value – Before Acquisition – Cost Approach:	Not Developed	
Conclusion of Value – Before Acquisition – Direct Sales Comparison Approach:	$13,756,000	
Conclusion of Value – Before Acquisition – Income Approach:	Not Developed	
Overall Conclusion of Value – Before Acquisition - Reconciled:	$13,756,000	
Overall Value Allocation – Before Acquisition:	Land:	$13,756,000
	Improvements:	$0
	TOTAL:	$13,756,000
Review Report Conclusion:	Recommended for Use by Agency in Estimating Market Value	
Extraordinary Assumptions and/or Hypothetical Conditions Relied Upon in the Review:	None	

Assumptions and Limiting Conditions:

This review report is made contingent upon and subject to the following assumptions and limiting conditions:

1.) As per prior arrangement with the client, the review appraiser has not made a personal inspection of the subject property described in the work under review and has not made a personal inspection of the comparable market data presented within the work under review. To that end, my scope of work has been limited to an examination and review of the data and analysis presented within the submitted appraisal report. As part of the investigation and research process, data specific to the subject of the work under review and the comparables was verified through public records available online. However, my scope was otherwise limited to a thorough review of the facts and data presented in the appraisal report, an analysis of the statements, opinions and conclusions set forth in the report and an examination of the internal logic and consistency in the appraisal report.

2.) The review appraiser is not responsible for matters of a legal nature that affect either the property being appraised or the title to the property. The review appraiser assumes that the title is good and marketable and does not render any opinions about the title. Responsible ownership and competent property management are assumed unless otherwise stated.

3.) The review appraiser has relied upon data presented in the work under review relative to flood zoning at the subject property. The review appraiser has NOT independently examined available flood maps provided by the Federal Emergency Management Agency (or other data sources). Because the review appraiser is not a surveyor, he makes no guarantees, express or implied, regarding the determination regarding flood zoning at the subject property.

4.) The review appraiser will not give testimony or appear in court because he has made a review report relative to the subject property in question unless specific arrangements to do so have been made.

5.) The appraiser has noted in the appraisal report under review any adverse conditions (such as the presence of hazardous wastes, toxic substances, etc.) that were observed during the inspection of the subject property or that became apparent while conducting the normal research involved in performing an appraisal. In this case, no such items were noted, and the reviewer has relied upon the statements made by the appraiser in the work under review as being accurate. Since the review appraiser has NOT made a personal inspection of the subject property, and has performed only limited verification of the data presented within the report, the reviewer obviously has no knowledge of any hidden or unapparent conditions of the property or any adverse environmental conditions (including the presence of hazardous wastes, toxic substances, etc.) that would make the property more or less valuable and has assumed that there are no such conditions but makes no guarantees or warranties, express or implied, regarding the condition of the property. The reviewer will not be responsible for any such conditions that do exist or for any engineering or testing that might be required to discover whether such conditions exist. Because the reviewer is not an expert in the field of environmental hazards, the review report must not be considered as an environmental assessment of the property. The reviewer is not qualified to detect hazardous waste and/or toxic materials.

6.) The reviewer obtained the information and opinions that were expressed in the report from sources that he considers reliable and are believed to be true and correct. However, no warranty is given for its accuracy.

Assumptions and Limiting Conditions: **(Continued)**

7.) The reviewer will not disclose the contents of the appraisal report except as provided for in the Uniform Standards of Professional Appraisal Practice or as required by professional appraisal peer review.

8.) It is assumed that all applicable zoning and other land use regulations and restrictions have been complied with unless non-conformity has been stated, defined and considered within the review report.

9.) It is assumed that all required licenses, certificates of occupancy or other legislative or administrative authority from any local, state or national governmental or private entity or organization have been or can be obtained or renewed for any use on which the value estimates contained in this report are based.

10.) It is assumed that the utilization of the land is within the boundaries of the property lines of the property described and that there is no encroachment or trespass unless otherwise stated in this report.

11.) It is assumed that there is full compliance with all applicable federal, state and local environmental regulations and laws unless otherwise stated in this report.

12.) All engineering plans, maps, etc. provided within the appraisal report and relied upon by the appraiser are assumed to be accurate. All plans, maps, etc. referenced in this report are intended to assist the reader with visualizing the property or the project.

13.) The review appraiser has stated his understanding of both the intended use and the intended user of this report. The data contained and presented in the report are appropriate for the stated use and for the stated user(s) only. The review appraiser is not responsible for the unauthorized use of the report.

Certification of the Appraiser, Consistent with Standards Rule 4-3 of USPAP and Section 3.8 of UASFLA:

I certify that, to the best of my knowledge and belief:

1. the facts and data reported by the reviewer and used in the review process are true and correct;

2. the reported analyses, opinions, and conclusions in this review report are limited only by the assumptions and limiting conditions stated in this review report and are my personal, impartial, and unbiased professional analyses, opinions, and conclusions;

3. I have no present or prospective interest in the property that is the subject of the work under review and no personal interest with respect to the parties involved;

4. I have performed no valuation (or other) services, as an appraiser, a review appraiser or in any other capacity, regarding the property that is the subject of the work under review, within the three-year period immediately preceding acceptance of this assignment;

5. I have no bias with respect to the property that is the subject of the work under review or to the parties involved with this assignment;

6. my engagement in this assignment was not contingent upon developing or reporting predetermined results or assignment results that favor the cause of the client, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal review;

7. my compensation is not contingent on an action or event resulting from the analyses, opinions, or conclusions in this review report or from its use;

8. my compensation is not contingent upon the analyses, opinions or conclusions reached or reported;

9. the analyses, opinions, and conclusions were developed, and this review report was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA);

10. the analyses, opinions, and conclusions were developed, and this review report was prepared in conformity with the Appraisal Foundation's Uniform Standards of Professional Appraisal Practice (USPAP), except to the extent that the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) required invocation of USPAP's Jurisdictional Exception Rule, as described in Section 1.2.7.2 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA);

11. as per prior arrangement with my client, I have not made a personal inspection of the property that is the subject of the work under review and have not made a personal inspection of the comparable market sales presented within the work under review;

12. to the best of my knowledge and belief, the report analyses, opinions and conclusions, were developed and this report has been prepared, in conformity with the requirements of the Code of Professional Ethics and the Standards or Professional Appraisal Practice of the Appraisal Institute;

Certification of the Appraiser, Consistent with Standard Rule 4-3 of USPAP and Section 3.8 of UASFLA: (Continued)

13. that the use of this report is subject to the requirements of the Appraisal Institute relating to review by its duly authorized representatives;

14. as of the date of this report, I, Philip J. Swartz, have completed the Standards and Ethics Education Requirement of the Appraisal Institute for Designated Members;

15. no one provided significant appraisal, appraisal review, or appraisal consulting assistance to the person signing this certification.

Signature:_____

Philip J. Swartz, AI-GRS
Review Appraiser, Appraisal Review Specialists, LLC.
Pennsylvania State Certified General Real Estate Appraiser #GA001298-L
West Virginia State Certified General Real Estate Appraiser #CG 371
Virginia State Certified General Real Estate Appraiser #4001-012244
Georgia State Certified General Real Estate Appraiser #365609
South Carolina Certified General Real Estate Appraiser #7266
Kentucky State Certified General Real Estate Appraiser #004786
Tennessee State Certified General Real Estate Appraiser #5288 (Expired)

DATE OF SIGNATURE: January 6, 2019

Scope of Work of the Appraisal Review:

At the request of the client, and as part of performing an appraisal review assignment within the context of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA), the review appraiser is required to prepare an appraisal review report in accordance with Standards 3 and 4 of the Uniform Standards of Professional Appraisal Practice and Section 3 of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA).

The appraisal review process included an examination of the appraisal report as well as an examination of the pertinent rules and regulations offered within the Uniform Standards of Professional Appraisal Practice (USPAP) and the applicable assignment conditions included in the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA). This was done in order to develop opinions as to the completeness of the work under review, the accuracy, adequacy and relevance of the data provided within the work under review, the propriety of any adjustments to the data within the work under review, the appropriateness of the appraisal methods and techniques used in the work under review, and whether the analyses, opinions, and conclusions in the submitted report are appropriate and reasonable given the data presented. The scope of work in this instance did not include a personal exterior inspection of the subject property or the comparable market data referenced in the report. I have therefore limited my scope to include an examination and review of the data and analysis presented within the submitted appraisal report. However, as a part of the investigation and research process, data specific to the subject of the work under review and the comparables was verified through public records available online. My scope of work involves a thorough review of the facts and data presented in the appraisal report, an analysis of the statements, opinions and conclusions set forth in the report and an examination of the internal logic and consistency within the report.

The scope of this appraisal review assignment did not include a personal visit to the subject site or the comparable sales presented within the appraisal report. However, subject-specific and sale-specific data presented within the report was verified, to the extent possible, through sources deemed reliable. The factual data provided for the subject and the comparable sales was verified, to the extent possible, also through public sources available online. Data available online via the Chester and Lancaster County Assessment Offices as well as the online records of the respective local municipalities was examined in an effort to further verify the reported factual data; local MLS data (including TREND MLS) was examined when applicable.

During my review process, and in accordance with the requirements of Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) and 49 CFR §24.104, I contacted the appraiser via e-mail on October 15, 2018 and other occasions (via both phone and email) in an effort to address a few minor shortcomings and/or inconsistencies noted during the initial review of the submitted report. I identified several issues that required further attention and/or explanation by the appraiser. The appraiser recognized the issues that were raised, and in an effort to address the items identified, he provided revised appraisal reports received by me on December 18, 2018, January 2, 2019 and January 3, 2019. After review of the January 3, 2019 revised report, and once all of the items had been successfully addressed, I informed the appraiser of the obligation to provide his client (PA Department of Conservation and Natural Resources) with a copy of the January 3, 2019 revised report for their use. Copies of all appraisal reports are retained in my office file although a copy of the January 3, 2019 revised report will also be submitted along with my review report at the completion of the assignment. This final review report sets forth my opinions and conclusions which have been developed as a result of the technical review process.

Scope of Work of the Appraisal Review: **Continued**

I performed the following eight basic steps in developing and reporting my review:

1. thoroughly read and considered the appraisal report under review;

2. attempted to verify data pertaining to the subject and the comparable land sales through the review of public records available online;

3. evaluated the report and considered the appraiser's utilization of and reliance upon recognized appraisal methods and techniques;

4. considered tests of reasonableness in evaluating the overall appropriateness of the analyses, opinions, and conclusions;

5. considered overall development and reporting compliance with USPAP Standard 1 and USPAP Standard 2 and the guidelines set forth within the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA);

6. communicated with the appraiser via email on October 15, 2018 and other occasions (via both email and phone) with regard to shortcomings, errors and/or inconsistencies that required further attention, explanation and/or revision;

7. reviewed and examined revised appraisal reports (received on December 18, 2018, January 2, 2019 and January 3, 2019) submitted in response to my email memos to the appraiser;

8. formed conclusions regarding the salient issues relevant to the overall appraisal review and issued a final review report in accordance with USPAP Standards 3 and 4, 49 CFR §24.104(c) and Section 3.7 of UASFLA.

As noted earlier, the scope of work for this review assignment ***did not*** include the development of my own independent opinion of value.

Completeness of the Work under Review:

Revised appraisal reports were received on December 18, 2018, January 2, 2019 and January 3, 2019 in response to the review process. After review of the January 3, 2019 revised appraisal report, it appears that the report and its communication are complete as presented and appear to meet the requirements mandated by the Uniform Standard of Professional Appraisal Practice 2018-2019 Edition, the requirements of 49 CFR Part §24.103 and the guidelines set forth within the Uniform Appraisal Standards for Federal Land Acquisitions.

The effective date of value (June 5, 2018) represents the date of the physical inspection of the subject property by the appraiser. The report clearly indicates that the owner(s) of the property (or a designee) was given the opportunity to accompany the appraiser during the inspection of the property (see Page i and ii of the report). The report includes a rather thorough identification of the scope of work undertaken by the appraiser during the appraisal process. The scope of work is adequately described throughout the report as well as in a specific section labeled "*Scope of Work*" (see Pages 1 and 2 of the report). Based upon the appraiser's inspection of the subject property and the data gathered during the development of the appraisal, the report provides a thorough and complete analysis of the subject property including the relevant physical, economic and legal characteristics of the property. The property interests appraised are the fee simple rights in the real property; no personal property has been included in the valuation. The report indicates that a title report was provided for the appraiser's consideration; a copy of the title report has been excerpted into the appraisal report (see Addendum B of the appraisal report). Pages 28 & 29 discuss easements, encumbrances and other items noted in the title report; existing easements and encumbrances have been considered in the analysis of highest and best use and the subsequent valuation.

The appraisal report includes no hypothetical conditions and no extraordinary assumptions. The report includes a rather standard set of assumptions and limiting conditions (see Pages 2 thru 4 of the report). No unusual limiting conditions are noted within the report and the report contains no significant conditions limiting the use or distribution of the report. One extraordinary assumption has been identified. Per the report, "*Extraordinary Assumption #1 states that the deeded acreage is not able to be calculated or confirmed by a plat because of missing deed calls in the original deed (W53-873). Therefore, the acreage assumed in this report is based on the tax assessment acreages totaling 982.60 acres*." This extraordinary assumption is clearly necessary for the purposes of valuation and has been clearly and conspicuously identified within the report in a manner consistent with both USPAP and UASFLA. One hypothetical condition has also been identified. Per the report, "*Hypothetical Condition #1 states that the subject is being appraised as one tract even though it is under two different ownerships. The property is under agreement of sale between George Strawbridge Jr., BNY Mellon, N.A., George Baxter and R. Stewart Strawbridge, Successor Trustees under the Deed of Trust of George Strawbridge Jr. and The Conservation Fund. The agreement is dated March 22, 2017 and the property is to be transferred in three phases. Phase I and II have been completed. It is reasonable to assume the remaining phase will be completed over the year*." This hypothetical condition also appears to be necessary for the purposes of valuation (in order to provide a value for the Larger Parcel) and has been clearly and conspicuously identified within the report in a manner consistent with both USPAP and UASFLA. As suggested in Section 1.2.7.2 of UASFLA, the appraiser has not developed and/or reported an estimate of reasonable exposure time. The reliance on the jurisdictional exception appears to be properly employed and properly disclosed within the report, as per Standards 1 and 2 of USPAP and Section 1.2.7.2 of UASFLA. The report also properly recognizes the requirements of the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA) as applicable assignment conditions as discussed within the "*Problem Identification*" section of the "*Scope of Work Rule*" of USPAP.

Completeness of the Work under Review: **(Continued)**

The report includes an adequate analysis of the highest and best use of the subject; given the scope of the proposed acquisition, the analysis seems to be adequately supported. The stated highest and best use ("*agricultural with future subdivision potential*") is consistent with the current and historic uses of the property and appear to be adequately supported by the data provided within the report. The determination as to highest and best use appears to be legally permissible (permissible via local zoning), physically possible (given physical characteristics and existence of similar properties in the immediate area), financially feasible (relatively active market for such uses evidenced by the existence of comparable sales, albeit of much smaller size) and appropriately supported (similar surrounding land uses). No speculative uses are relied upon and no unusual local approvals would be necessary to utilize the property to the stated highest and best use. The comparable land sales provided in the subsequent valuations of the property appear to offer similar levels of development potential, potential timber value, functional utility, market appeal and highest and best use, given the data provided. With this, the level of development potential and functional utility available at the subject appears to have been sufficiently captured within the application of the Sales Comparison Approach to Value.

A timber valuation was provided to the appraiser and the report has been properly incorporated into the analysis (See Addendum G of appraisal report). The timber analysis, a one page report made by Shannon Henry of Silvix, Inc. (dated August 1, 2018), suggests that "*we estimate the range of value for merchantable trees on the property to be approximately $300,000.00 - $500,000.00*." The findings of the timber expert have been considered in the analysis of the highest and best use of the property, as well as the subsequent valuation and reconciliation processes.

The report also appropriately includes the following:

- an identification of the client, intended uses and intended users of the report,
- the appropriate definition of market value and a citation of the appropriate source of the definition of market value,
- an indication that commercially viable minerals do not exist at the property and mineral extraction is not a concern in the subject's market area,
- consideration of the impacts of existing land use regulations in the area. The report includes a thorough discussion of municipal zoning including excerpts from the pertinent sections of the local zoning ordinances. While additional data regarding comprehensive plans, subdivision and land development ordinances or other plans impacting land use could have been discussed (if they exist), I believe that the level of data and analysis provided is applicable to the appraisal problem,
- a summary of the appraisal problem (See Page 7 of the report) including an identification of the challenges encountered during the search for comparable data and the overall valuation of the property,
- sufficient photography and mapping to assist the reader in the visualization of the property,
- a larger parcel discussion indicating that the 982.60 Acres appraised represents the Larger Parcel,
- a sales history for the subject that meets the requirements set forth within Standards Rule 1-5(b) of USPAP and Section 2.3.2.3.5 of the Uniform Appraisal Standards for Federal Land Acquisitions (USFLA). The report indicates that the "*property is presently a part of an agreement of sale dated March 22, 2017, which is attached as Addendum C*." The property is to be transferred in three phased transactions, two of which have occurred as of the date of the report. The most recent sales of the property (occurring in 2017 and 2018) have been sufficiently analyzed within the report. The report provides reconciliation of the most recent sales of the property and the current valuations, indicating that the "*agreed sales price was based on appraisals completed for the Conservation Fund. Copies of those appraisals were not provided to the appraiser. This appraisal indicates that the buyer is paying above market price*." The two most recent sales involving portions of the Larger Parcel were also analyzed on Page 47 of the report in a test of reasonableness.

Completeness of the Work under Review: **(Continued)**

- a use history and rental history for the subject that meet the requirements set forth within Sections 2.3.2.3.4 and 2.3.2.3.6 of the Uniform Appraisal Standards for Federal Land Acquisitions (USFLA),
- the assessment and annual tax load for the property under PA Act 319 Preferential Assessment Program ($147,120 & $5,244, respectively) and the market value assessment and annual tax load for the property ($3,779,170 & $120,208, respectively),
- a signed certification statement that appears to be consistent with the requirements of Standards Rule 2-3 of USPAP and Section 2.3.1.4 of the Uniform Appraisal Standards for Federal Land Acquisitions (USFLA).

Overall, I believe the report submitted for review to be complete. The level of description provided appears to meet the minimum development and reporting levels outlined in USPAP Standard 1 and Standards Rule 2-2(a) for Appraisal Reports. As well, the report submitted for review appears to contain sufficient data to meet the definition of "*appraisal*" as set forth in 49 CFR §24.103 and appears to be consistent with the requirements of Uniform Appraisal Standards for Federal Land Acquisitions (USFLA).

Apparent Adequacy and Relevance of the Data and the Propriety of any Adjustments in the Work under Review:

In my opinion, the report appears to demonstrate an effective collection and analysis of data sufficient and appropriate to solve the appraisal problem in accordance with the requirements mandated by the Uniform Standard of Professional Appraisal Practice 2018-2019 Edition, 49 CFR Part §24.103 and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA).

A total of six comparable land sales are presented within the report (data regarding additional sales that were considered but not necessarily analyzed is also presented within the report – See "*Database*" section on Pages 36 & 37 of the report)). The comparable land sales selected for direct comparison to the subject property range in size from 75.40 Acres to 125.80 Acres, all being much smaller than the size of the subject property (982.60 Acres). However, regarding the large discrepancy in land areas, the report suggests that there are no tracts similar in size; and the sales provided represent the typical size of agricultural/residential tracts in the market area as well as the size parcels in which the subject could potentially be subdivided. The report acknowledges that "*there are elements of risk associated with buying a large tract like the subject*" (size) but also that due to the limited number of land tracts of the subject's size, "*a potential buyer desiring this large a land mass would look favorably on the opportunity to buy this large a tract*." Therefore, despite the obvious incongruencies in gross land area, the report indicates that the land sales presented are the most similar sales available and the sales which most accurately represent the value and appeal of the subject property in the marketplace. The six land sales occurred between July 2015 and December 2017 thus all are fairly recent, as of the effective date. Five of the six sales (Sales #2 thru #6) are located in adjacent Chester County, with one sale (Sale #1) located in adjacent Lancaster County. All six sales appear to be generally similar to the subject with respect to general location, development pressures and/or overall physical features (including potential timber quality/quantity, with adjustments considered, when and where applicable) thus all seem to be fairly similar with respect to overall highest and best use.

Sales data provided includes photographs of each of the comparables, assessment mapping, USGS mapping, and a general map which depicts the location of each sale property in relation to the subject property. Data relative to all six of the comparable sales has been properly verified with a party to the transaction or other knowledgeable party (participating broker). The unit of comparison selected for the analysis was the overall gross sales price per Acre of land area. From my experience, this represents an appropriate and recognized unit of comparison for large acreage tracts such as the subject.

The report includes a quantitative adjustment process which is presented in grid format on Page 48 of the report. Few adjustments were applied to the comparables. In fact, the only adjustments applied to any of the six sales were for variations in "*Land Use*"; all other physical and economic factors were deemed similar enough that no adjustments were applied. The magnitude of the cumulative adjustment levels ranges from -18 to -1%. None of the sales required total gross adjustments of greater than 18%; only two sales (Sales #3 and #6) received adjustments of greater than 10% however this adjustment represents one line item ("*Land Use*") which is based upon specific land pairings shown in the report. The items considered for adjustment seem relevant to the appraisal problem. The adjustment process is appropriately explained, and the adjustments seem reasonable given the data provided. The adjustments (or lack of adjustments) are supported with comprehensive explanation and direct sales pairings. As a result of the high level of support and the low number of adjustments required, the conclusion of value is well supported by the adjusted and unadjusted unit rates of the land comparables. Given the number of adjustments applied and the high level of support for the adjustments applied, the value conclusion offered in the report can be generally supported, even without consideration for the overall adjustment process that is presented.

Apparent Adequacy and Relevance of the Data and the Propriety of any Adjustments in the Work under Review: (Continued)

The concluded unit value for the subject land ($14,000/Acre) is adequately supported by the overall unit prices indicated by the six comparable land sales presented, both as adjusted ($10,988/Acre to $15,254/Acre) and as unadjusted ($11,614/Acre to $17,241/Acre). The concluded unit value for the subject land ($14,000/Acre) falls within the middle portion of the unadjusted range and within the middle to upper portion of the adjusted range, as indicated by the sales. All six of the sales received net negative adjustment. Two of the six sales (Sales #2 and #6) indicate unit rates above the selected rate of $14,000/Acre ($14,807/Acre & $15,254/Acre, respectively), two sales (Sales #1 & #5) indicate unit rates nearly equal to the selected rate of $14,000/Acre ($13,927/Acre & $14,097/Acre, respectively) and the remaining two sales (Sales #3 & #4) indicate unit rates below the selected rate of $14,000/Acre ($12,189/Acre & $10,988/Acre, respectively). The report includes a properly explained and reasonably supportable reconciliation of the Sales Comparison Approach to value. The rationale for the reconciliation process employed has been explained within the report. Per the report, Sale #1 ($13,927/Acre) is the most recent sale (December 2017), is one of the two largest sales (116.30 Acres), required minimal adjustment (-2%) and was therefore deemed worthy of the most emphasis. However, the rate indicated by Sale #1 ($13,927/Acre) is also closely supported by the rates indicated by the remaining five sales ($10,988/Acre to $15,254/Acre). Application of the concluded unit value of $14,000/Acre to the area of the Larger Parcel (982.60 Acres) yields an overall land value of $13,756,400 which was rounded to $13,756,000 in keeping with standard market practice.

As a test of reasonableness, the overall sales prices of the comparables can be examined. The gross sales prices for the six land sales presented range from $1,000,000 to $1,787,000. At $13,756,000, the reconciled value for the subject is well above this range. However, considering the gross physical size of the subject, one would anticipate a value conclusion above the range indicated by the comparables. The two of the three smallest sales (Sales #2 at 77+ Acres and Sale #4 at 86+Acres) indicated the two lowest sales prices while the highest sales price ($1,787,000) was indicated by the largest of the six sales (Sale #5 at 125.80 Acres). This suggests that smaller properties garner lower sales prices, and vice-versa. Overall, I believe the value conclusion offered appears to be reasonable given the data, adjustment process and reconciliation provided, and is reasonably supported by the test of reasonableness.

Appropriateness of the Appraisal Methods and Techniques Used in the Work under Review:

Overall, it appears as though the report includes appropriate appraisal methodology and techniques. Indications of market value were estimated by development of only the Sales Comparison Approach to Value. The report indicates that the Income and Cost Approaches to Value were not applicable in this case and the exclusion of the Income and Cost Approaches to Value has been properly explained within the report. Given the type of property involved (vacant land) and the data set forth within the report, this assertion seems reasonably appropriate. Therefore, in the overall reconciliation, the Sales Comparison Approach to Value was afforded sole emphasis. The reconciled value conclusion is $13,756,000.

Overall Appropriateness of the Analyses, Opinions, and Conclusions Developed and Presented in the Work under Review:

It is my opinion that the analyses, opinions and conclusions are adequately supported by the overall summary of information and analysis provided. As well, it is my conclusion that the report is prepared and presented in accordance with Uniform Standard of Professional Appraisal Practice 2018-2019 Edition, 49 CFR Part §24.103 and the Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA).

After a through desk technical review in accordance with the scope of work identified in this review report, it is my conclusion that the report is prepared and presented in accordance with 49 CFR Part §24.103, the Uniform Standards of Professional Appraisal Practice and the Uniform Appraisal Standards for Federal Land Acquisitions. Overall, I believe that the value opinion offered within the submitted appraisal report is adequately supported by the data presented and that the content, analyses and conclusions stated in the report under review are in compliance with the applicable standards and requirements as described herein. Further, as a result of my review, **I RECOMMEND** the appraisal report for use by the agency in establishing Market Value.

Philip J. Swartz, AI-GRS

Review Appraiser ♦ State Certified General Real Estate Appraiser – Pennsylvania, Virginia, South Carolina, West Virginia, Kentucky and Georgia

Notable Experience

2007 – Present – Review Appraiser/Partner – Appraisal Review Specialists, LLC, Hurricane, West Virginia

2007 – 2013 – Review Appraiser – ARROW Land Solutions, LLC (formerly Overland, Pacific & Cutler Northeast, LLC), Northumberland & Lewisburg, PA

2002 – 2007 – Real Estate Appraisal Reviewer – Commonwealth of Pennsylvania, Department of Transportation, Harrisburg, PA

2001 – 2002 – Real Estate Appraiser – Commonwealth of Pennsylvania, Department of Transportation, Montoursville, PA

1999 – 2001 – Real Estate Appraisal – Appraisal & Marketing Associates, Inc., Sunbury, PA

1992 – 1999 – Real Estate Sales & Appraisals – Coldwell Banker Penn One Real, Lewisburg, PA
(Partner in subsidiary of Penn One Appraisal Services 94-99)

Full time real estate appraiser performing and reviewing real estate appraisals of varying type in the Commonwealth of Pennsylvania since 1992. Background experience covers full time work in real estate profession since 1992 including sales of real estate and appraising. Property types appraised include residential, commercial, multi-family, industrial, and agricultural as well as valuation of sewer easements, highway easements, conservation easements and the appraisal of numerous properties involved in public acquisition and/or condemnation. Qualified expert witness in Berks, Schuylkill, Tioga, Bradford, Lycoming and Northumberland Counties in PA and Wood, Tucker, Grant and Berkeley Counties in WV.

Advanced and complex technical work involving the independent appraisal and appraisal review of real estate for public use. Responsible for right-of-way appraisal and appraisal review in various locations of PA, GA, WV and VA. Preparing, and reviewing appraisals of all types of real estate, machinery & equipment. Determinations of compensable elements of damage are normally made along with, before and after values, and estimates of damages. Duties involve appraisal and appraisal review assignments ranging from the basic to the most complex. Assignments are received in broad outline and completed work is reviewed in order to insure the results obtained adhere to established policies and procedures.

Reviews real estate and machinery & equipment appraisals submitted by others in various locations in PA, WV, GA and VA. Provides technical guidance in assuring conformance to accepted appraisal techniques and requirements.

Provide expert advice and assistance to local, state and federal agencies in matters of eminent domain valuation and provides expert valuation support for various financial institutions.

Dedicated Review Appraiser with advanced appraisal and appraisal review experience for more than 24 years. More than 14 years in the specialized field of eminent domain appraisal and appraisal review. Highly motivated and willing to assist on valuation issues ranging from simple to the most complex. History of leadership in solving the most complicated of appraisal and appraisal review issues under seemingly unrealistic timeframes. Knowledge of Federal, State, and Local regulations dealing with public acquisitions and property valuation including the Uniform Act, PA Eminent Domain Code, Uniform Appraisal Standards for Federal Land Acquisitions, USPAP and WVDOT, PennDOT and VADOT Right-of-Way Manuals. Proven ability to work independently or as a part of a team. Past participation in development and implementation of policy and operational procedure specific to property valuation for PennDOT. Team member in the development of the Appraisal Section of the Right-of-Way Office database currently utilized by PennDOT. Also participated in the update and revision of the PennDOT Appraisal Invitation to Qualify (ITQ) contact and the update and revision to Right-of-Way Appraisal forms. Qualified expert review appraiser for NRCS/USDA Easement Program covering all 50 states in US. Qualified expert witness in litigation cases for eminent domain and tax assessment appeals in various counties in Pennsylvania. Qualified review appraiser for PennDOT, GA DOT, VADOT, WV DOH, USDA/NRCS and West Virginia Appraiser Certification Board and local financial institutions.

Professional Credentials

PA Licensed Real Estate Salesperson #RS 199524-L (Escrowed)
PA Certified General Real Estate Appraiser #GA-00-1298-L
VA Certified General Real Estate Appraiser #4001-012244
WV Certified General Real Estate Appraiser #CG371
KY Certified General Real Estate Appraiser #004786
SC Certified General Real Estate Appraiser #7266
GA Certified General Real Estate Appraiser #365609
TN Certified General Real Estate Appraiser #5288 (Expired)

Education

B.S. Degree, Business Administration, Clarion University of Pennsylvania Concentration: Real Estate

Professional Associations

Designated Member of Appraisal Institute #35423 (AI-GRS)

Related & Continuing Education

Accounting I & II (Clarion University)
Financial Management (Clarion University)
Legal Environment I & II (Clarion University)
Basic Income Capitalization, Course 310 (Appraisal Institute)
USPAP and PA state Appraisal Law Update (Appraisal Institute)
Appraisal of Non-Conforming Uses (Appraisal Institute)
Residential Design & Functional Utility Seminar (Appraisal Institute)
Land Titles (International Right of Way Association)

Develops special appraisal techniques when necessary to resolve unusual or difficult appraisal problems. Assists and advises agency and fee appraisers and attorneys on any questions pertaining to appraisals during the course of litigation.

Inspects the subject properties in the field and also the comparable sales utilized by the appraisers, when and where applicable.

Checks local zoning and building codes, spot checks title deed information to assure that information contained in the appraisals is authentic.

Appraisal Procedures, Course 120 (Appraisal Institute)
Appraisal Principles, Course 110 (Appraisal Institute)
Litigation Skills for Appraisers (Appraisal Institute)
Eminent Domain & Condemnation Appraising (Appraisal Institute)
Data Confirmation & Verification Techniques (Appraisal Institute)
FHA Appraisal Seminar (Polley Associates)
Tax Assessment & Tax Appeals (DPS Real Estate School)
Appraisal Historic Properties (Lee & Grant Institute)
Easement Valuation (Appraisal Institute)
Valuation of Partial Interests (Appraisal Institute)
Appraisal Review in Eminent Domain (International Right-of-Way Association)
Eminent Domain Modules I, II & III (Corporate Educators, Inc. for PennDOT)
General Applications, Course 320 (Appraisal Institute)
Eminent Domain Appraisal Principles (Appraisal Institute)
7-Hr National USPAP Update Course (Appraisal Institute)
Avoiding USPAP Violations and PA State Appraisal Law (DPS Real Estate School)
Appraisal & Appraisal Review for Federal-Aid Highway Projects (PennDOT for The Federal Highway Administration and the National Highway Institute)
Uniform Appraisal Standards for Federal Land Acquisitions (Appraisal Institute)
Introduction to Machinery & Equipment Valuation (American Society of Appraisers)
Avoiding USPAP Violations & Disciplinary Actions (DPS Real Estate School
2-Hour Delaware State Law Update (McKissock Education)
Eminent Domain and Condemnation (Appraisal Institute)
Business Practice & Ethics (Appraisal Institute)
Oil & Gas Valuation Seminar (American Society of Farm Managers and Rural Appraisers
VDOT Appraisal Workshop & Eminent Domain Trial Tactics (Virginia Department of Transportation)
Valuation of Conservation Easements (Appraisal Institute, Certificate Program)
General Appraiser Market Analysis & Highest & Best Use (Appraisal Institute)
Appraising the Appraisal, Review General (Appraisal Institute)
Mandatory Delaware Appraisal Meeting (DelDOT)
The Appraiser as an Expert Witness: Preparation & Testimony (Appraisal Institute)
Avoiding USPAP Violations and State Disciplinary Actions, PA State Appraiser Law Update (DPS Real Estate School)
VDOT Appraisal Review Workshop (Virginia Department of Transportation)
Valuation of Conservation Easements (American Society of Farm Managers and Rural Appraisers)
Litigation Appraising (Appraisal Institute)
7-Hour National USPAP Update Course (Appraisal Institute)
Review Theory – General (Appraisal Institute)
Marketability Analysis: A 6-Step Process (Appraisal Institute)
Review Case Studies – General (Appraisal Institute)
7-Hour National USPAP Update Course & PA State Law (Appraisal Institute) 2016
Appraisal of Self-Storage Facilities (McKissock Education)
Review Theory – Residential (Appraisal Institute)
Advanced Residential Case Studies, Part I (Appraisal Institute)
Review Case Studies – Residential (Appraisal Institute) Uniform Appraisal Standards for Federal Land Acquisitions: Practical Applications (Appraisal Institute)
IRWA 409 - Integrating Appraisal Standards (International Right-of-Way Association)
Real Estate Statistics, Finance and Valuation Modeling (Appraisal Institute)
Solving Land Puzzles (Appraisal Institute)

APPENDIX C
Recreational Usefulness Table

White Clay Creek Preserve Addition (Strawbridge 2 Replacement Property) – Recreational Usefulness and Excess Value Table			
Conversion of Use	**Acreage**	**Recreation Lost**	**Strawbridge 2 - Replacement Property**
			The 982.6-acre Strawbridge property located in Elk, Franklin and New London Townships, Chester County, Pennsylvania, is adjacent to the Commonwealth's publicly accessible 739-acre White Clay Creek Preserve which extends 2.1 miles along the Pennsylvania/Maryland border and is in turn adjacent to the 5,300-acre Fair Hill Natural Resource Management Area in Maryland. The property is also adjacent to the publicly accessible 222-acre Natural Lands Trust Peacedale Preserve to the northeast. The property is 3.5 miles from the White Clay Creek State Park along the Pennsylvania/Delaware border and 2.5 miles from the City of Newark. The protection of the Strawbridge property is consistent with local and county comprehensive plans and offers a unique opportunity to preserve a large, important area of open space in a rapidly developing southeastern Pennsylvania. Chester County remains one of the fastest growing counties in the state, and the threat of development is a concern for residents of Chester County. The *Constitution of the Commonwealth of Pennsylvania* states, "Pennsylvania's public natural resources are the common property of all the people, including generations yet to come." (Pa Const. Art. I, sec. 27) As such, the Strawbridge property will provide recreation opportunities for all Commonwealth citizens as part of the Pennsylvania State Park system and will satisfy the recreational usefulness and value as replacement land for the following Land and Water Conservation Fund conversions of use.
PA Department of Conservation and Natural Resources, Bureau of State Parks, Two Bridge Conversions and Three Projects for the Excess Value and Recreational Usefulness Bundle			
SR 233 Caledonia State Park Bridge Replacement (Franklin County) **42-00157, 42-00580, and 42-01019**	0.12	The bridge replacement resulted in increased shoulder widths and the installation of new guiderail resulting in a sliver take of the LWCF area having no direct impact on existing or future recreation at the Park. The sliver take area supported roadside habitat where people may have observed wildlife while driving or supported recreational pleasure driving. The remaining acreage equals 1,124.88 acres.	The Strawbridge property will be owned and operated by the Bureau of State Parks for public recreation similar to amenities at Caledonia State Park which includes hunting, hiking, wildlife watching, fishing, etc. The property includes more than 7 miles of the Big Elk Creek and its tributaries which will be protected through the acquisition. The Springlawn Trail runs through the property. The Strawbridge property is about 105 miles from Caledonia State Park.
SR 4011 Caledonia State Park Bridge Replacement (Adams County) **42-00157, 42-00580, and 42-01019**	0.04	The bridge replacement resulted in increased shoulder widths and the installation of new guiderail resulting in a sliver take of the LWCF area having no direct impact on existing or future recreation at the Park. The sliver take area supported roadside habitat where people may have observed wildlife while driving or supported recreational pleasure driving. The remaining acreage equals 1,124.84 acres.	The Strawbridge property will be owned and operated by the Bureau of State Parks for public recreation similar to amenities at Caledonia State Park which includes hunting, hiking, wildlife watching, fishing, etc. The property includes more than 7 miles of the Big Elk Creek and its tributaries which will be protected through the acquisition. The Springlawn Trail runs through the property. The Strawbridge property is about 105 miles from Caledonia State Park.
SR 30 Caledonia State Park Bridge Replacement (Franklin County) **42-00157, 42-00580, and 42-01019** *(Future excess value and recreational usefulness)*	0.34	The bridge replacement will result in increased shoulder widths and the installation of new guiderail resulting in a sliver take of the LWCF area having no direct impact on existing or future recreation at the Park. The sliver take area supported roadside habitat where people may have observed wildlife while driving or supported recreational pleasure driving.	The Strawbridge property will be owned and operated by the Bureau of State Parks for public recreation similar to amenities at Caledonia State Park which includes hunting, hiking, wildlife watching, fishing, etc. The property includes more than 7 miles of the Big Elk Creek and its tributaries which will be protected through the acquisition. The Springlawn Trail runs through the property. The Department requests to use the excess value and recreational usefulness at Strawbridge to mitigate the impacts at Caledonia State Park. The Strawbridge property is about 105 miles from Caledonia State Park.
SR 381 Ohiopyle State Park (Fayette County) **42-00469, 42-00521, and 42-01464** *(Future excess value and recreational usefulness)*	0.37	SR 381 Multimodal Gateway Project, improve safety and recreational access within and around Ohiopyle State Park. A TNCU for the project development and a swap of land between PennDOT and DCNR is taking place; in addition, PennDOT is paying for the development of a boater changing station and staging area, pedestrian walkways, parking lot and landscaping. PennDOT will take 0.37 acres for the improvements in exchange for 1.82 acres gained by DCNR.	The Strawbridge property will be owned and operated by the Bureau of State Parks for public recreation similar to amenities at Ohiopyle State Park which includes hunting, hiking, wildlife watching, fishing, etc. The property includes more than 7 miles of the Big Elk Creek and its tributaries which will be protected through the acquisition. The Springlawn Trail runs through the property. The Department requests to use the excess value and recreational usefulness at Strawbridge to mitigate the impacts at Ohiopyle State Park. The Strawbridge property is about 240 miles from Ohiopyle State Park.

SR 381 Ohiopyle State Park (Fayette County) **42-00469, 42-00521, and 42-01464** *(Future excess value and recreational usefulness)*	2.65	A potential land swap of 2.65 acres between DCNR and the Ohiopyle Borough would result in a conversion of use. The Borough land, also 2.65 acres, proposed for exchange may or may not meet NPS requirements due to a sewage treatment plant which services the Park and Borough being onsite. The desirability of the Borough Property to DCNR is the 720 feet of Youghiogheny River frontage.	The Strawbridge property will be owned and operated by the Bureau of State Parks for public recreation similar to amenities at Ohiopyle State Park which includes hunting, hiking, wildlife watching, fishing, etc. The property includes more than 7 miles of the Big Elk Creek and its tributaries which will be protected through the acquisition. The Springlawn Trail runs through the property. The Department requests to use the excess value and recreational usefulness at Strawbridge to mitigate the impacts at Ohiopyle State Park. The Strawbridge property is about 240 miles from Ohiopyle State Park.
PA Department of Conservation and Natural Resources, Bureau of Forestry, Well Pad Conversions			
Tract 324 Pad A, Moshannon State Forest **42-00580, 42-01235, 42-01351**	6.25	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted access to the area of well pad construction. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Moshannon State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 212 miles from Moshannon State Forest.
Tract 259 Pad B, Sproul State Forest **42-00580, 42-01235, 42-01351**	3.88	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted access to the area of well pad construction. Permanent impacts include gated access on the road leading to the well pad and loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Sproul State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 212 miles from Sproul State Forest.
Tract 706 Pad 10, Sproul State Forest **42-00580, 42-01235, 42-01351**	8.07	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted access to the area of well pad construction. Permanent impacts include gated access on the road leading to the well pad and loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Sproul State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 212 miles from Sproul State Forest.
Tract 284 Pad A, Sproul State Forest **42-00580, 42-01235, 42-01351**	4.44	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Sproul State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 212 miles from Sproul State Forest.
Tract 100 Pad N, Loyalsock State Forest **42-00580, 42-01235, 42-01351**	7.54	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail

		the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Neuman Field Compressor and Pond, Loyalsock State Forest 42-00580, 42-01235, 42-01351	9.06	Vegetation was cleared to build the compressor and pond. Temporary impacts included restricted roads and access to the area where the compressor station and supporting facilities for the station and the gas development efforts were being constructed. Permanent impacts resulted in the loss of land in and around the compressor that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Pad G, Loyalsock State Forest 42-00580, 42-01235, 42-01351	5.22	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Pad P, Loyalsock State Forest 42-00580, 42-01235, 42-01351	12.39	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Pad T, Loyalsock State Forest 42-00580, 42-01235, 42-01351	20.13	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 100 Pad R, Loyalsock State Forest 42-00580, 42-01235, 42-01351	8.65	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Loyalsock State Forest. The Springlawn Trail runs through the property providing hiking opportunities Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities

		is and will continue to be available for hunting, hiking and wildlife watching.	for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 203 miles from Loyalsock State Forest.
Tract 154 Pine Hill Impoundment, Susquehannock 42-00580, 42-01235, 42-01351	0.48	Vegetation was cleared to build the impoundment. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Susquehannock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Susquehannock State Forest.
Tract 154 Pine Hill Pad A, Susquehannock 42-00580, 42-01235, 42-01351	1.47	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Susquehannock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Susquehannock State Forest.
Tract 154 Pine Hill Impoundment A, Susquehannock 42-00580, 42-01235, 42-01351	2.05	Vegetation was cleared to build the impoundment. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Susquehannock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Susquehannock State Forest.
Tract 997 Pine Hill Compressor, Susquehannock 42-00580, 42-01235, 42-01351	0.77	Vegetation was cleared to build the compressor. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Susquehannock State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 215 miles from Susquehannock State Forest.
Tract 594 Pad 3, Tioga State Forest 42-00580, 42-01235, 42-01351	9.32	Vegetation was cleared to build the well pad. Temporary impacts resulted in restricted roads and access to certain areas of the forest where gas development was occurring. Permanent impacts resulted in the loss of land that was previously accessible for hunting, hiking and wildlife watching; although the remaining surrounding State Forest land is and will continue to be available for hunting, hiking and wildlife watching.	The Strawbridge property contains important forested riparian buffers along Big Elk Creek and over 353 acres of mature and young woodlands. The recreational use of Strawbridge will be very similar to the recreational area impacted at Tioga State Forest. The Springlawn Trail runs through the property providing hiking opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The property will have a greater service area, providing opportunities for residents who live in the fastest growing region of the state. The property also meets a need and priority identified in PA's SCORP for acquisition of critical wildlife habitat, forested

			watershed, wetlands and riparian corridors for nature-based recreation. The Strawbridge property is about 221 miles from Tioga State Forest.
Municipal Conversions – Excess Value and in some cases Recreational Usefulness			
Rochester Borough, Pearson Park, aka Clay Street Park (Beaver County) **42-01333**	0.16	Pearson Park, aka Clay Street Park, was sold by the borough to the neighboring church in 2007 to be used as open space area. The park had a small playground on the site; the only remaining feature is the pavilion, the remaining space is grass. Rochester Borough is a small borough that is completely built out. Other than a contaminated lot, the only open space/lots available are used for existing recreation activities. DCNR advised Rochester Borough to approach neighboring political subdivisions for the opportunity to acquire a parcel of land for replacement of Pearson Park, aka Clay Street Park. The neighboring municipalities either had nothing to offer or did not want to lose tax generating property. Later efforts in approaching Beaver County for purchase of replacement land also failed.	Since DCNR is the sponsor agency responsible to remedy conversions, we see no other option than to propose the use of the Strawbridge property as a means to resolve the conversion issue since it is not possible locally. The Strawbridge property will be entirely accessible public open space, mostly passive. Visitors will be able to hunt, hike, fish, view wildlife, etc. The Strawbridge property would satisfy the replacement land acreage and market value of Pearson Park. The Strawbridge property is about 300 miles from Rochester Borough.
Aston Borough, Eagle Field (Delaware County) **42-00499**	0.11	The original project involved the acquisition of approximately 19 acres of land located in Aston Borough between the West Branch of the Chester Creek and Mount Road. The site has an active recreation area of about 2.0 acres originally called Eagle Field Park, now named Lewis H. Fisher Park. This area has a basketball court, parking and approximately two acres maintained as open field for varied recreation. The remainder of the park is wooded and contains passive recreation and riparian buffer along the creek. A parcel of the property had approximately 4,800 square feet and was utilized to construct a pumping station for the Sewer Authority. The converted area contained riparian buffer and passive recreation. The converted area is located within the FEMA Flood Zone and is valued at $384.00.	The Strawbridge property has ample acreage containing riparian areas along Elk Creek and its tributaries for replacement of the converted parcel. The riparian buffer and passive recreational usefulness at Strawbridge would be equivalent to the converted parcel. The Springlawn Trail runs through the property providing already exiting passive recreation opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The excess value at Strawbridge could also be applied to Eagle Field. The Strawbridge property is about 32 miles from Aston Borough.
City of Reading, Angelica Park (Berks County) **42-00011 and 42-00129**	18.4	The City of Reading has leased portions of Angelica Park to Alvernia College for Softball/Baseball and to Berks Nature for habitat improvements and a nature center (which used an existing building that preexisted LWCF).	The area of Angelica Park, particularly where the Nature Center building was rehabed could be replaced with similar recreational usefulness at Strawbridge due to the approximately 353 acres of forestland containing the Springlawn Trail providing passive recreation opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. The active portions may still need to be replaced locally. The excess value at Strawbridge could also be applied to Angelica Park. Strawbridge is about 49 miles from the City of Reading.
West Reading Borough, Bicentennial House Park/Recreation Park Flood Project (Berks County) **42-00303 and 42-00718**	0.65	Bicentennial Park consists of approximately 4 acres within the 23.6-acre property utilized for flood control. The funds associated with the flood control project also involved repair and rehabilitation of pre-flood active recreation areas. The borough built a fire station on an elevated area that did not impact any flood control structures located on the eastern portion of the Flood Control Project/Park. The conversion resulted in the loss of a Tot Lot which was replaced across the street and grass areas suitable for passive recreation (frisbee golf and free play).	West Reading Borough is built out and does not have suitable replacement land to resolve the conversion at Bicentennial House Park. The passive recreation at the Strawbridge property will provide suitable replacement land for the loss of open space in the borough. Visitors will be able to hunt, hike, fish, view wildlife, etc. We request that the excess value and recreational usefulness at Strawbridge be applied to resolve the conversion. Strawbridge is about 48 miles from West Reading.

Chester Township, 12th Street Park (Delaware County) **42-01374**	0.42	The LWCF area has been completely developed into residential housing. The former park included a playground and open space area.	The excess value at Strawbridge could use used to resolve the value of the parkland lost; however, the recreational usefulness at Strawbridge cannot replace the recreation lost at 12th Street Park. The playground and open space will need to be replaced. The Strawbridge property is about 32 miles from Chester Township. **NOTE WE ONLY WANT TO APPLY EXCESS VALUE FOR THIS CONVERSION.**
Folcroft Borough, Four Sites (Delaware County) **42-01389**	3.56	Of the four sites funded with this grant, two have conversions. 1. Llanwellyn Park: A recent site inspection revealed a business on the southwest side of the park. That portion of the park was originally utilized for passive recreation and riparian buffer. 2. Folcroft Tot Lot – A recent site inspection revealed the construction of a small municipal building on the north side of the park. The converted area was used for passive recreation and open play.	1. The Strawbridge property has ample acreage of riparian area along the 7 miles of Big Elk Creek and its tributaries that traverse the property. The Strawbridge property will replace the recreational use and acreage of the converted riparian buffer and passive recreation area lost at Llanwellyn Park. Visitors will be able to hunt, hike, fish, view wildlife, etc. 2. The Strawbridge property is suitable for replacement of the sliver of open space lost at Folcroft Tot Lot which will replace the recreational use and acreage. Strawbridge is about 46 miles from Folcroft Borough.
Darby Borough, Community Park (Delaware County) **42-00313**	0.09	The site contains passive recreation and serves as a riparian buffer along Darby Creek; the majority of the park is public green space. A cell tower and storage unit have been constructed within the 6(f)-protected area.	The Strawbridge property can be viewed as replacement of the very small passive recreation lost at the park due to the cell tower and storage unit development. About 7 miles of Big Elk Creek flow through the Strawbridge property providing ample riparian areas and opportunities for passive recreation. The Springlawn Trail runs through the property providing already existing passive recreation opportunities. Visitors will be able to hunt, hike, fish, view wildlife, etc. Strawbridge is about 44 miles from Darby Borough.
Upland Borough, Two Sites – Kent Lane and 8th and Mulberry (Delaware County) **42-01399**	0.68	This grant was for development of two Street Hockey Courts in Upland Borough located at Kent and Fourth Streets and Eighth and Mulberry Streets. Both sites have been converted to non-recreational uses. The site at Eighth and Mulberry was sold in 2008 and is now a commercial storage unit complex. The Kent Lane site is still owned by the borough but is now a fenced storage yard and contains a cell tower.	Strawbridge does not have suitable recreational usefulness as replacement land for the Eighth and Mulberry Streets or Kent Lane sites as they were both active recreation areas. The excess value at Strawbridge could be applied to these two conversions. Strawbridge is about 40 miles from Upland Borough. **NOTE WE ONLY WANT TO APPLY EXCESS VALUE FOR THIS CONVERSION.**

APPENDIX D
PDESF for the Strawbridge 2 Property (Replacement Land)

OMB Control No. 1024-0031
Expiration Date 01/31/2020

PROPOSAL DESCRIPTION AND ENVIRONMENTAL SCREENING FORM
Land and Water Conservation Fund

The purpose of this Proposal Description and Environmental Screening Form (PD/ESF) is to provide descriptive and environmental information about a variety of Land and Water Conservation Fund (LWCF) state assistance proposals submitted for National Park Service (NPS) review and decision. The completed PD/ESF becomes part of the "federal administrative record" in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. The PD portion of the form captures administrative and descriptive details enabling the NPS to understand the proposal. The ESF portion is designed for States and/or project sponsors to use while the LWCF proposal is under development. Upon completion, the ESF will indicate the resources that could be impacted by the proposal enabling States and/or project sponsors to more accurately follow an appropriate pathway for NEPA analysis: 1) a recommendation for a Categorical Exclusion (CE), 2) production of an Environmental Assessment (EA), or 3) production of an Environmental Impact Statement (EIS). The ESF should also be used to document any previously conducted yet still viable environmental analysis if used for this federal proposal. The completed PD/ESF must be submitted as part of the State's LWCF proposal to NPS.

Except for the proposals listed below, the PD/ESF **must** be completed, including the appropriate NEPA document, signed by the State, and submitted with each new federal application for LWCF assistance and amendments for: scope changes that alter or add facilities and/or acres; conversions; public facility exceptions; sheltering outdoor facilities; and changing the original intended use of an area from that which was approved in an earlier LWCF agreement. Consult the LWCF Program Manual (www.nps.gov/lwcf) for detailed guidance for your type of proposal and on how to comply with NEPA.

For the following types of proposals only this Cover Page is required because these types of proposals are administrative in nature and are categorically excluded from further NEPA environmental analysis. NPS will complete the NEPA CE Form. Simply check the applicable box below, and complete and submit only this **Cover Page** to NPS along with the other items required for your type of proposal as instructed in the LWCF Program Manual.

- ☐ SCORP planning proposal
- ☐ Time extension with no change in project scope or with a reduction in project scope
- ☐ To delete work and no other work is added back into the project scope
- ☐ To change project cost with no change in project scope or with a reduction in project scope
- ☐ To make an administrative change that does not change project scope

<table>
<tr><td colspan="3">Name of LWCF Proposal:
Strawbridge 2 Property (replacement land) Acquisition</td><td colspan="3">Date Submitted to NPS:</td></tr>
<tr><td>LWCF Project Number:
N/A</td><td colspan="5">Prior LWCF Project Number(s) and Park Name(s) Associated with the Assisted Site(s):
N/A</td></tr>
<tr><td colspan="6">Local or State Project Sponsoring Agency (recipient, or sub-recipient in case of pass-through grants)
PA DCNR</td></tr>
<tr><td colspan="3">Name of Local or State Sponsor Contact:
Alex L. Tatanish</td><td colspan="3">Title
LWCF Alternate State Liaison Officer</td></tr>
<tr><td colspan="3">Address
400 Market St., Fifth Floor</td><td>City
Harrisburg</td><td>State
PA</td><td>Zip Code
17105</td></tr>
<tr><td>Phone
717.783.4735</td><td>Fax
717.787.9577</td><td colspan="4">Email Address
atatanish@pa.gov</td></tr>
</table>

Using a separate sheet for narrative descriptions and explanations, address each item and question in the order it is presented, and identify each response with its item number such as Step 1-A1, A2; Step 3-B1; Step 6-A1, A29; etc.

Step 1. Type of LWCF Proposal

____ **New Project Application**

☐ **Acquisition** *Go to Step A*

☐ **Development** *Go to Step 2B*

☐ **Combination (Acquisition and *Development*** *Go to Step 2C*

x **New Project Application**

☐ **Increase in scope or change in scope from original agreement.** *Complete Steps 3A, and 5 through 7.*

☒ **6(f) conversion proposal.** *Complete Steps 3B, and 5 through 7.*

☐ **Request for public facility in a Section 6(f) area.** *Complete Steps 3C, and 5 through 7.*

____ **Request for temporary non-conforming use in a Section 6(f) area.** *Complete Steps 4A, and 5 through 7.*

____ **Request for significant change in use/intent of original LWCF application.** *Complete Steps 4B, and 5 through 7.*

____ **Request to shelter existing/new facility within a Section 6(f) area regardless of funding source.** *Complete Steps 4C, and 5 through 7.*

Step 2. New Project Application (See LWCF Manual for guidance)

A. For an Acquisition Project

1. Provide a brief narrative about the proposal that provides the reasons for the acquisition, the number of acres to be acquired with LWCF assistance, and a description of the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.).
2. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
3. Describe development plans for the proposal for the site(s) for public outdoor recreation use within the next three (3) years.
4. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
5. Address each item in "D" below.

B. For a Development Project

1. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.
2. When will the project be completed and open for public outdoor recreation use?
3. Address each item in "D" below.

C. For a Combination Project

1. For the acquisition part of the proposal:
   a. Provide a brief narrative about the proposal that provides the reasons for the acquisition, number of acres to be acquired with LWCF assistance, and describes the property. Describe and quantify the types of existing resources and features on the site (for example, 50 acres wetland, 2,000 feet beachfront, 200 acres forest, scenic views, 100 acres riparian, vacant lot, special habitat, any unique or special features, recreation amenities, historic/cultural resources, hazardous materials/ contamination history, restrictions, institutional controls, easements, rights-of-way, above ground/underground utilities, including wires, towers, etc.)
   b. How and when will the site be made open and accessible for public outdoor recreation use (signage, entries, parking, site improvements, allowable activities, etc.)?
   c. Describe development plans for the proposed for the site(s) for public outdoor recreation use within the next three (3) years.
   d. SLO must complete the State Appraisal/Waiver Valuation Review form in Step 7 certifying that the appraisal(s) has been reviewed and meets the "Uniform Appraisal Standards for Federal Land Acquisitions" or a waiver valuation was approved per 49 CFR 24.102(c)(2)(ii). State should retain copies of the appraisals and make them available if needed.
2. For the development part of the proposal:

a. Describe the physical improvements and/or facilities that will be developed with federal LWCF assistance, including a site sketch depicting improvements, where and how the public will access the site, parking, etc. Indicate entrances on 6(f) map. Indicate to what extent the project involves new development, rehabilitation, and/or replacement of existing facilities.

b. When will the project be completed and open for public outdoor recreation use?

3. Address each item in "D" below.

D. For a Combination Project

1. Will this proposal create a new public park/recreation area where none previously existed and is not an addition to an existing public park/recreation area? Yes ☐ (go to #3) No ☐ (go to #2)

2. a. What is the name of the pre-existing public area that this new site will be added to?

b. Is the pre-existing public park/recreation area already protected under Section 6(f)? Yes ☐ No ☐
If no, will it now be included in the 6(f) boundary? Yes ☐ No ☐

3. What will be the name of this new public park/recreation area?

4. a. Who will hold title to the property assisted by LWCF? Who will manage and operate the site(s)?

b. What is the sponsor's type of ownership and control of the property?

_____ Fee simple ownership

_____ Less than fee simple. Explain:

_____ Lease. Describe lease terms including renewable clauses, # of years remaining on lease, etc.
Who will lease area? Submit copy of lease with this PD/ESF. (See LWCF Manual for **program restrictions** for leases and further guidance)

5. Describe the nature of any rights-of-way, easements, reversionary interests, etc. to the Section 6(f) park area? Indicate the location on 6(f) map. Do parties understand that a Section 6(f) conversion may occur if private or non-recreation activities occur on any pre-existing right-of-way, easement, leased area?

6. Are overhead utility lines present, and if so, explain how they will be treated per LWCF Manual.

7. As a result of this project, describe **new** types of outdoor recreation opportunities and capacities, and short and long term public benefits.

8. Explain any existing non-recreation and non-public uses that will continue on the site(s) and/or proposed for the future within the 6(f) boundary.

9. Describe the planning process that led to the development of this proposal. Your narrative should address:

a. How was the interested and affected public notified and provided opportunity to be involved in planning for and developing your LWCF proposal? Who was involved and how were they able to review the **completed** proposal, including any state, local, federal agency professionals, subject matter experts, members of the public and Indian Tribes. Describe any public meetings held and/or formal public comment periods, including dates and length of time provided for the public to participate in the planning process and/or to provide comments on the completed proposal.

b. What information was made available to the public for review and comment? Did the sponsor provide written responses addressing the comments? If so, include responses with this PD/ESF submission.

10. How does this proposal implement statewide outdoor recreation goals as presented in the Statewide Comprehensive Outdoor Recreation Plan (SCORP) (include references), and explain why this proposal was selected using the State's Open Project Selection Process (OPSP).

11. List all source(s) and amounts of financial match to the LWCF federal share of the project. The value of the match can consist of cash, donation, and in-kind contributions. The federal LWCF share and financial matches must result in a viable outdoor recreation area and not rely on other funding not mentioned here. Other federal resources may be used as a match if specifically authorized by law.

Source	Type of Match	Amount

12. Is this LWCF project scope part of a larger effort not reflected on the SF-424 (Application for Federal Assistance) and grant agreement? If so, briefly describe the larger effort, funding amount(s) and source(s). This will capture information about partnerships and how LWCF plays a role in leveraging funding for projects beyond the scope of this federal grant.

13. List all required federal, state, and local permits/approvals needed for the proposal and explain their purpose and status.

Proceed to Steps 5 through 7

Step 3. Project Amendment (See LWCF Manual for guidance)

A. Increase/Change in Project Scope

1. **For Acquisition Projects:** To acquire additional property that was not described in the original project proposal and NEPA documentation, follow Step 2A-Acquisition Project and 2D.
2. **For Development Projects:** To change the project scope for a development project that alters work from the original project scope by adding elements or enlarging facilities, follow Step 2B-Development Project and 2D.
3. **For Combination Projects:** Follow Step 2C as appropriate.

B. Section 6(f)(3) Conversion Proposal

Prior to developing your Section 6(f)(3) conversion proposal, you must consult the LWCF Manual and 36 CFR 59.3 for complete guidance on conversions. Local sponsors must consult early with the State LWCF manager when a conversion is under consideration or has been discovered. States must consult with their NPS-LWCF manager as early as possible in the conversion process for guidance and to sort out and discuss details of the conversion proposal to avoid mid-course corrections and unnecessary delays. **A critical first step is for the State and NPS to agree on the size of the Section 6(f) park land impacted by any non-recreation, non-public use, especially prior to any appraisal activity.** Any previous LWCF project agreements and actions must be identified and understood to determine the actual Section 6(f) boundary.

The Section 6(f)(3) conversion proposal including the required NEPA environmental review documents (CE recommendation or an EA document) must focus on the loss of public outdoor recreation park land and recreational usefulness, and its replacement per 36 CFR 59, and not the activities precipitating the conversion or benefits thereof, such as the impacts of constructing a new school to relieve overcrowding or constructing a hotel/restaurant facility to stimulate the local economy. Rather, the environmental review must: 1) focus on "resource impacts" as indicated on the ESF (Step 6), including the loss of public park land and recreation opportunities (ESF A-15), and 2) the impacts of creating new replacement park land and replacement recreation opportunities. A separate ESF must be generated for the converted park area and each replacement site. Section 6(f)(3) conversions always have more than minor impacts to outdoor recreation (ESF A-15) as a result of loss of parkland requiring an EA, except for "small" conversions as defined in the LWCF Manual Chapter 8.

For NPS review and decision, the following elements are required to be included in the State's completed conversion proposal to be submitted to NPS:

1. A letter of transmittal from the SLO recommending the proposal.
2. A detailed explanation of the sponsor's need to convert the Section 6(f) parkland including all efforts to consider other practical alternatives to this conversion, how they were evaluated, and the reasons they were not pursued.
3. An explanation of how the conversion is in accord with the State Comprehensive Outdoor Recreation Plan (SCORP).
4. Completed "State Appraisal/Waiver Valuation Review form in Step 7 for each of the converted and replacement parcels certifying that the appraisals meet the "Uniform Appraisal Standards for Federal Land Acquisitions." States must retain copies of the appraisals/waiver valuations and make them available for review upon request.
5. For the park land proposed for conversion, a detailed description including the following:
   a. Specific geographic location on a map, 9-digit zip code, and name of park or recreation area proposed for conversion.
   b. Description of the area proposed for the conversion including the acreage to be converted and any acreage remaining. For determining the size of the conversion, consider not only the physical footprint of the activity precipitating the conversion, but how the precipitating activity will impact the entire 6(f) park area. In many cases the size of the converted area is larger than the physical footprint. Include a description of the recreation resources, facilities, and recreation opportunities that will be impacted, displaced or lost by the proposed conversion. For proposals to partially convert a Section 6(f) park area, the remaining 6(f) park land must remain recreationally viable and not be impacted by the activities that are precipitating the conversion. If it is anticipated that the precipitating activities impact the remaining Section 6(f) area, the proposed area for the conversion should be expanded to encompass all impacted park land.
   c. Description of the community and population served by the park, including users of the park and uses.
   d. For partial conversions, a revised 6(f) map clearly indicating both the portion that is being converted and the portion remaining intact under Section 6(f).
6. For each proposed replacement site:
   a. Specific geographic location on a map, 9-digit zip code, and geographical relationship of converted and replacement sites. If site will be added to an existing public park/outdoor recreation area, indicate on map.
   b. Description of the site's physical characteristics and resource attributes with number and types of resources and features on the site, for example, 15 acres wetland, 2,000 feet beachfront, 50 acres forest, scenic views, 75 acres riparian, vacant lot, special habitat, any unique or special features, structures, recreation amenities, historic/cultural resources, hazardous materials/contamination history, restrictions, institutional controls, easements, rights-of-way, overhead/underground utilities including overhead wires, towers, etc.
   c. Identification of the owner of the replacement site and its recent history of use/function up to the present.

d. Detailed explanation of how the proposed replacement site is of reasonably equivalent usefulness and location as the property being converted, including a description of the recreation needs that will be met by the new replacement parks, populations to be served, and new outdoor recreation resources, facilities, and opportunities to be provided.

e. Identification of owner and manager of the new replacement park?

f. Name of the new replacement park. If the replacement park is added to an existing public park area, will the existing area be included within the 6(f) boundary? What is the name of the existing public park area?

g. Timeframe for completing the new outdoor recreation area(s) to replace the recreation opportunity lost per the terms of conversion approval and the date replacement park(s) will be open to the public.

h. New Section 6(f) map for the new replacement park.

7. NEPA environmental review, including NHPA Section 106 review, for both the converted and replacement sites in the same document to analyze how the converted park land and recreational usefulness will be replaced. Except for "small" conversions (see LWCF Manual Chapter 8), conversions usually require an EA.

Proceed to Steps 5 through 7

C. Proposal for a Public Facility in a Section 6(f) Area

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. In summary, NPS must review and decide on requests to construct a public indoor and/or non-recreation facility within a Section 6(f) area. In certain cases NPS may approve the construction of public facilities within a Section 6(f) area where it can be shown that there will be a net gain in **outdoor recreation** benefits and enhancements for the entire park. In most cases, development of a non-recreation public facility within a Section 6(f) area constitutes a conversion. For NPS review, the State/sponsor must submit a proposal to NPS under a letter of transmittal from the SLO that:

1. Describes the purpose and all proposed uses of the public facility such as types of programming, recreation activities, and special events including intended users of the new facility and any agency, organization, or other party to occupy the facility. Describe the interior and exterior of the facility, such as office space, meeting rooms, food/beverage area, residential/lodging area, classrooms, gyms, etc. Explain how the facility will be compatible with the outdoor recreation area. Explain how the facility and associated uses will significantly support and enhance existing and planned outdoor recreation resources and uses of the site, and how outdoor recreation use will remain the primary function of the site. (The public's outdoor recreation use must continue to be greater than that expected for any indoor use, unless the site is a single facility, such as a swimming pool, which virtually occupies the entire site.)
2. Indicates the exact location of the proposed public facility and associated activities on the site's Section 6(f) map. Explain the design and location alternatives considered for the public facility and why they were not pursued.
3. Explains who will own and/or operate and maintain the facility? Attach any 3rd party leases and operation and management agreements. When will the facility be open to the public? Will the facility ever be used for private functions and closed to the public? Explain any user or other fees that will be instituted, including the fee structure.
4. Includes required documents as a result of a completed NEPA process (Steps 5 – 7).

Proceed to Steps 5 through 7

Step 4. Proposals for Temporary Non-Conforming Use, Significant Change in Use, and Sheltering Facilities
(See LWCF Manual for guidance)

A. Proposal for Temporary Non-Conforming Use

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decided on requests for temporary uses that do not meet the requirements of allowable activities within a Section 6(f) area. A temporary non-conforming use is limited to a period of six months (180 days) or less. Continued use beyond six-months will not be considered temporary, and may result in a Section 6(f)(3) conversion of use requiring the replacement of converted parkland. For NPS review, describe the temporary non-conforming use (activities other than public outdoor recreation) in detail including the following information:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe in detail the proposed temporary non-conforming use and all associated activities, why it is needed, and alternative locations that were considered and why they were not pursued.
3. Explain length of time needed for the temporary non-conforming use and why.
4. Describe the size of the Section 6(f) area affected by the temporary non-conforming use activities and expected impacts to public outdoor recreation areas, facilities and opportunities. Explain efforts to keep the size of the area impacted to a minimum. Indicate the location of the non-conforming use on the site's 6(f) map.
5. Describe any anticipated temporary/permanent impacts to the Section 6(f) area and how the sponsor will mitigate them during and after the non-conforming use ceases.
6. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

B. Proposal for Significant Change in Use

Prior to developing the proposal, you must consult the LWCF Manual for complete guidance. NPS approval must be obtained prior to any change from one eligible use to another when the proposed use would significantly contravene the original plans or intent for the area outlined in the original LWCF application for federal assistance. Consult with NPS for early determination on the need for a formal review. NPS approval is only required for proposals that will significantly change the use of a LWCF-assisted site (e.g., from passive to active recreation). The proposal must include and address the following items:

1. A letter of transmittal from the SLO recommending the proposal.
2. Description of the proposed changes and how they significantly contravene the original plans or intent of LWCF agreements.
3. Explanation of the need for change in use and how the change is consistent with local plans and the SCORP.
4. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

C. Proposal for Sheltering Facilities

Prior to developing this proposal, you must consult the LWCF Manual for complete guidance. NPS must review and decide on all proposals to shelter an existing outdoor recreation facility or construct a new sheltered recreation facility within a Section 6(f) area regardless of funding source. The proposal must demonstrate that there is an increased benefit to public recreation opportunity. Describe the sheltering proposal in detail, including the following:

1. A letter of transmittal from the SLO recommending the proposal.
2. Describe the proposed sheltered facility, how it would operate, how the sheltered facility will include recreation uses that could typically occur outdoors, and how the primary purpose of the sheltered facility is recreation.
3. Explain how the sheltered facility would not substantially diminish the outdoor recreation values of the site including how the sheltered facility will be compatible and significantly supportive of the outdoor recreation resources present and/or planned.
4. Explain how the sheltered facility will benefit the total park's outdoor recreation use.
5. Describe efforts provided to the public to review the proposal to shelter the facility and has local support.
6. Document that the sheltered facility will be under the control and tenure of the public agency which sponsors and administers the original park area.
7. Consult the LWCF Manual for additional requirements and guidelines before developing the proposal.

Proceed to Steps 5 through 7

Step 5. Summary of Previous Environmental Review (including E.O. 12372 - Intergovernmental Review)

To avoid duplication of effort and unnecessary delays, describe any prior environmental review undertaken at any time and still viable for this proposal or related efforts that could be useful for understanding potential environmental impacts. Consider previous local, state, federal (e.g. HUD, EPA, USFWS, FHWA, DOT) and any other environmental reviews. At a minimum, address the following:

1. Date of environmental review(s), purpose for the environmental review(s) and for whom they were conducted.
2. Description of the proposed action and alternatives.
3. Who was involved in identifying resource impact issues and developing the proposal including the interested and affected public, government agencies, and Indian tribes?
4. Environmental resources analyzed and determination of impacts for proposed actions and alternatives.
5. Any mitigation measures to be part of the proposed action.
6. Intergovernmental Review Process (Executive Order 12372):
   Does the State have an Intergovernmental Review Process? Yes ☐ No ☒. If "Yes", has the LWCF Program been selected for review under the State Intergovernmental Review Process? Yes ☐ No ☐. If "Yes", was this proposal reviewed by the appropriate State, metropolitan, regional and local agencies, and if so, attach any information and comments received about this proposal. If proposal was not reviewed, explain why not.
7. Public comment periods (how long, when in the process, who was invited to comment) and agency response.
8. Any formal decision and supporting reasons regarding degree of potential impacts to the human environment.
9. Was this proposed LWCF federal action and/or any other federal actions analyzed/reviewed in any of the previous environmental reviews? If so, what was analyzed and what impacts were identified? Provide specific environmental review document references.

Use resource impact information generated during previous environmental reviews described above and from recently conducted site inspections to complete the Environmental Screening Form (ESF) portion of this PD/ESF under Step 6. Your ESF responses should indicate your proposal's potential for impacting each resource as determined in the previous environmental review(s), and include a reference to where the analysis can be found in an earlier environmental review document. If the previous environmental review documents contain proposed actions to mitigate impacts, briefly summarize the mitigation for each resource as appropriate. The appropriate references for previous environmental review document(s) must be documented on the ESF, and the actual document(s)

along with this PD/ESF must be included in the submission for NPS review.

Proceed to Steps 6 through 7

Step 6. Environmental Screening Form (ESF)

This portion of the PD/ESF is a working tool used to identify the level of environmental documentation which must accompany the proposal submission to the NPS. By completing the ESF, the project sponsor is providing support for its recommendation in Step 7 that the proposal either:

1. meets criteria to be categorically excluded (CE) from further NEPA review and no additional environmental documentation is necessary; or

2. requires further analysis through an environmental assessment (EA) or an environmental impact statement (EIS).

An ESF alone does not constitute adequate environmental documentation unless a CE is recommended. If an EA is required, the EA process and resulting documents must be included in the proposal submission to the NPS. If an EIS may be required, the State must request NPS guidance on how to proceed.

The scope of the required environmental analysis will vary according to the type of LWCF proposal. For example, the scope for a new LWCF project will differ from the scope for a conversion. Consult the LWCF Manual for guidance on defining the scope or extent of environmental analysis needed for your LWCF proposal. As early as possible in your planning process, consider how your proposal/project may have direct, indirect and cumulative impacts on the human environment for your type of LWCF action so planners have an opportunity to design alternatives to lessen impacts on resources, if appropriate. When used as a planning tool in this way, the ESF responses may change as the proposal is revised until it is ready for submission for federal review. Initiating or completing environmental analysis after a decision has been made is contrary to both the spirit and letter of the law of the NEPA.

The ESF should be completed with input from resource experts and in consultation with relevant local, state, tribal and federal governments, as applicable. The interested and affected public should be notified of the proposal and be invited to participate in scoping out the proposal (see LWCF Manual Chapter 4). At a minimum, a site inspection of the affected area must be conducted by individuals who are familiar with the type of affected resources, possess the ability to identify potential resource impacts, and to know when to seek additional data when needed.

At the time of proposal submission to NPS for federal review, the completed ESF must justify the NEPA pathway that was followed: CE recommendation, production of an EA, or production of an EIS. The resource topics and issues identified on the ESF for this proposal must be presented and analyzed in an attached EA/EIS. Consult the LWCF Manual for further guidance on LWCF and NEPA.
The ESF contains two parts that must be completed:

Part A. Environmental Resources **Part B. Mandatory Criteria**

Part A: For each environmental resource topic, choose an impact estimate level (none, negligible, minor, exceeds minor) that describes the degree of potential negative impact for each listed resource that may occur directly, indirectly and cumulatively as a result of federal approval of your proposal. For each impacted resource provide a brief explanation of how the resource might be affected, how the impact level was determined, and why the chosen impact level is appropriate. If an environmental review has already been conducted on your proposal and is still viable, include the citation including any planned mitigation for each applicable resource, and choose an impact level as mitigated. If the resource does not apply to your proposal, mark NA in the first column. Add any relevant resources (see A.24 on the ESF) if not included in the list.

Use a separate sheet to briefly clarify how each resource could be adversely impacted; any direct, indirect, and cumulative impacts that may occur; and any additional data that still needs to be determined. Also explain any planned mitigation already addressed in previous environmental reviews.

Part B: This is a list of mandatory impact criteria that preclude the use of categorical exclusions. If you answer "yes" or "maybe" for any of the mandatory criteria, you must develop an EA or EIS regardless of your answers in Part A. Explain all "yes" and "maybe" answers on a separate sheet.

A. ENVIRONMENTAL RESOURCES Indicate potential for adverse impacts. Use a separate sheet to clarify responses per instructions for Part A on page 9.	**Not Applicable** - Resource does not exist	**No/Negligible Impacts** - Exists but no or negligible impacts	**Minor Impacts**	**Impacts Exceed Minor** EA/EIS required	**More Data Needed to Determine Degree of Impact** EA/EIS required
1. Geological resources: soils, bedrock, slopes, streambeds, landforms, etc.		X			
2. Air quality		X			
3. Sound (noise impacts)		X			
4. Water quality/quantity		X			
5. Stream flow characteristics		X			
6. Marine/estuarine	X				
7. Floodplains/wetlands		X			
8. Land use/ownership patterns; property values; community livability		X			
9. Circulation, transportation	X				
10. Plant/animal/fish species of special concern and habitat; state/federal listed or proposed for listing		X			
11. Unique ecosystems, such as biosphere reserves, World Heritage sites, old growth forests, etc.	X				
12. Unique or important wildlife/ wildlife habitat	X				
13. Unique or important fish/habitat	X				
14. Introduce or promote invasive species (plant or animal)	X				
15. Recreation resources, land, parks, open space, conservation areas, rec. trails, facilities, services, opportunities, public access, etc. *Most conversions exceed minor impacts. See Step 3.B*		X			
16. Accessibility for populations with disabilities	X				
17. Overall aesthetics, special characteristics/ features		X			
18. Historical/cultural resources, including landscapes, ethnographic, archeological, structures, etc. Attach SHPO/THPO determination.	X				
19. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure		X			
20. Minority and low-income populations	X				
21. Energy resources (geothermal, fossil fuels, etc.)	X				
22. Other agency or tribal land use plans or policies	X				
23. Land/structures with history of contamination/hazardous materials even if remediated	X				
24. Other important environmental resources to address.	X				

B. Mandatory Criterial *If your LWCF proposal is approved, would it…*	Yes	No	To Be Determined
1. Have significant impacts on public health or safety?		X	
2. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands, wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (E.O. 11990); floodplains (E.O 11988); and other ecologically significant or critical areas.		X	
3. Have highly controversial environmental effects or involve unresolved conflicts concerning alternative uses of available resources [NEPA section 102(2)(E)]?		X	
4. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		X	
5. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		X	
6. Have a direct relationship to other actions with individually insignificant, but cumulatively significant, environmental effects?		X	
7. Have significant impacts on properties listed or eligible for listing on the National Register of Historic Places, as determined by either the bureau or office. (Attach SHPO/THPO Comments)		X	
8. Have significant impacts on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species.		X	
9. Violate a federal law, or a state, local, or tribal law or requirement imposed for the protection of the environment?		X	
10. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?		X	
11. Limit access to and ceremonial use of Indian sacred sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?		X	
12. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area, or actions that may promote the introduction, growth, or expansion of the range of		X	

Environmental Reviewers

The following individual(s) provided input in the completion of the environmental screening form. List all reviewers including name, title, agency, field of expertise. Keep all environmental review records and data on this proposal in state compliance file for any future program review and/or audit. The ESF may be completed as part of a LWCF pre-award site inspection if conducted in time to contribute to the environmental review process for the proposal.

1. Eric Bruggeman, Environmental and Land Conversion Specialist, PA DCNR, NEPA Compliance
2. Alyssa Lynd, Environmental and Land Conversion Specialist, PA DCNR, NEPA Compliance
3.

The following individuals conducted a site inspection to verify field conditions.
List name of inspector(s), title, agency, and date(s) of inspection.

1. Eric Bruggeman, Environmental and Land Conversion Specialist, PA DCNR, NEPA Compliance – 8/29/18
2. Alyssa Lynd, Environmental and Land Conversion Specialist, PA DCNR, NEPA Compliance – 8/29/18
3.

State may require signature of LWCF sub-recipient applicant here: K. Mike Ruddy **Date:** 9-27-2018

Step 7. Recommended NEPA Pathway and State Appraisal/Waiver Valuation

First, consult the NPS list of Categorical Exclusions (CEs). If you find your action in the CE list and you have determined in Step 6A that impacts will be minor or less for each applicable environmental resource on the ESF and you answered "no" to all of the "Mandatory Criteria" questions in Step 6B, the proposal qualifies for a CE. Complete the following "State LWCF Environmental Recommendations" box indicating the CE recommendation.

If you find your action in the CE list and you have determined in Step 6A that impacts will be greater than minor or that more data is needed for any of the resources and you answered "no" to all of the "Mandatory Criteria" questions, your environmental review team may choose to do additional analysis to determine the context, duration, and intensity of the impacts of your project or may wish to revise the proposal to minimize impacts to meet the CE criteria. If impacts remain at the greater than minor level, the State/sponsor must prepare an EA for the proposal. Complete the following "State Environmental Recommendations" box indicating the need for an EA.

If you do not find your action in the CE list, regardless of your answers in Step 6, you must prepare an EA or EIS. Complete the following "State Environmental Recommendations" box indicating the need for an EA or EIS.

State NEPA Pathway Recommendation

☒ *I certify that a site inspection was conducted for each site involved in this proposal and to the best of my knowledge, the information provided in this LWCF Proposal Description and Environmental Screening Form (PD/ESF) is accurate based on available resource data. All resulting notes, reports and inspector signatures are stored in the state's NEPA file for this proposal and are available upon request. On the basis of the environmental impact information for this LWCF proposal as documented in this LWCF PD/ESF with which I am familiar, I recommend the following LWCF NEPA pathway:*

☐ This proposal qualifies for a Categorical Exclusion (CE).

- CE Item #:
- Explanation:

☒ This proposal requires an Environmental Assessment (EA) which is attached and has been produced by the State/sponsor in accordance with the LWCF Program Manual.

☐ This proposal may require an Environmental Impact Statement (EIS). NPS guidance is requested per the LWCF Program Manual.

Reproduce this certificate as necessary. Complete for each LWCF appraisal or waiver valuation.

State Appraisal/Waiver Valuation Review

Property Address: N. of Strickersville Road
Landenberg, PA 19350

Date of appraisal transmittal letter/waiver: August 3, 2018

Real property value: $13,756,000

Effective date of value: June 5, 2018

I certify that:

☒ *A State-certified Review Appraiser has reviewed the appraisal and has determined that it was prepared in conformity with the Uniform Appraisal Standards for Federal Land Acquisitions.*

OR

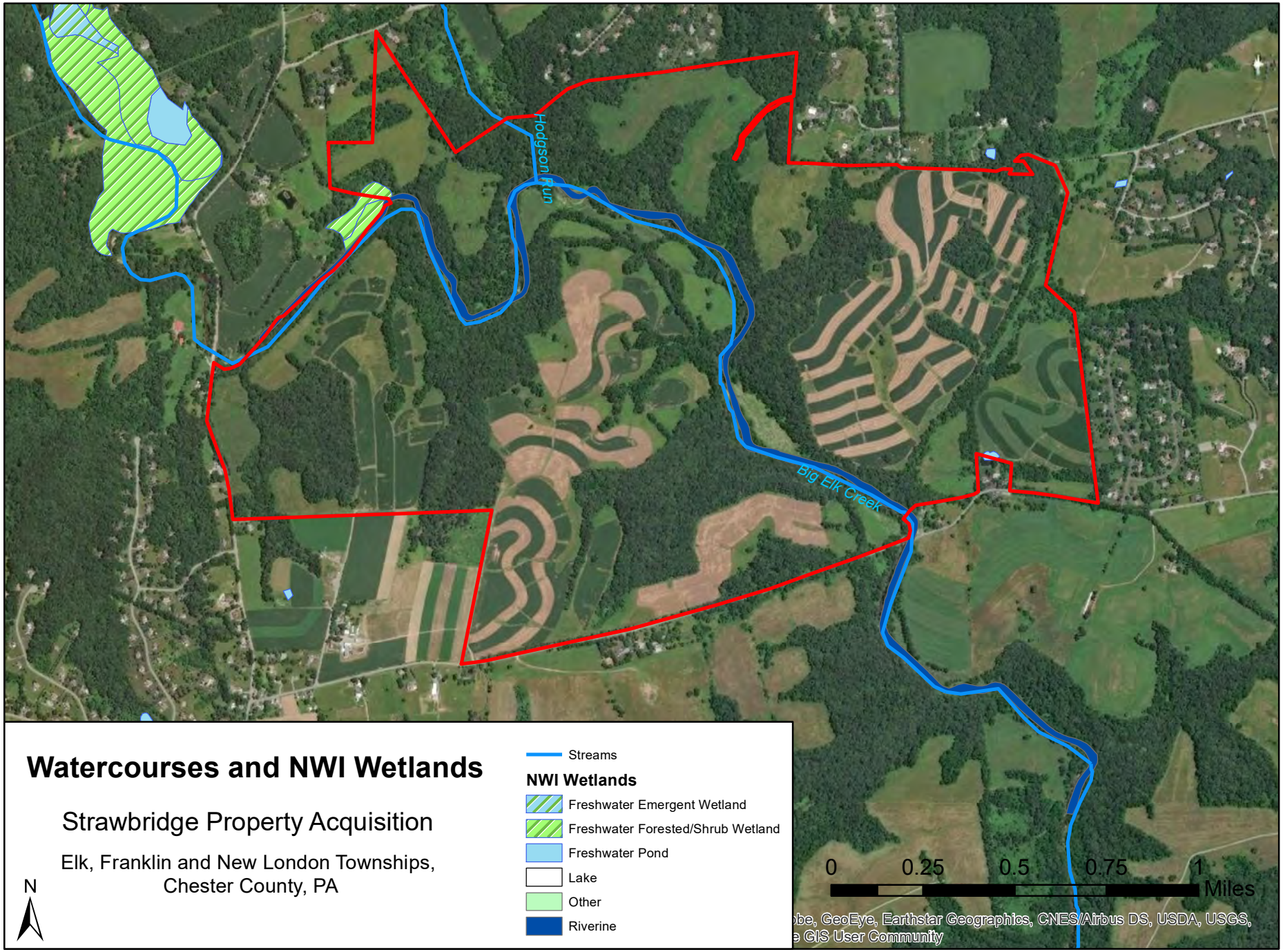
☐ *The State has reviewed and approved a waiver valuation for this property per 49 CFR 24.102(c)(2)(ii).*

SLO/ASLO Original Signature: Alex L Tatanish Date: 3/21/19

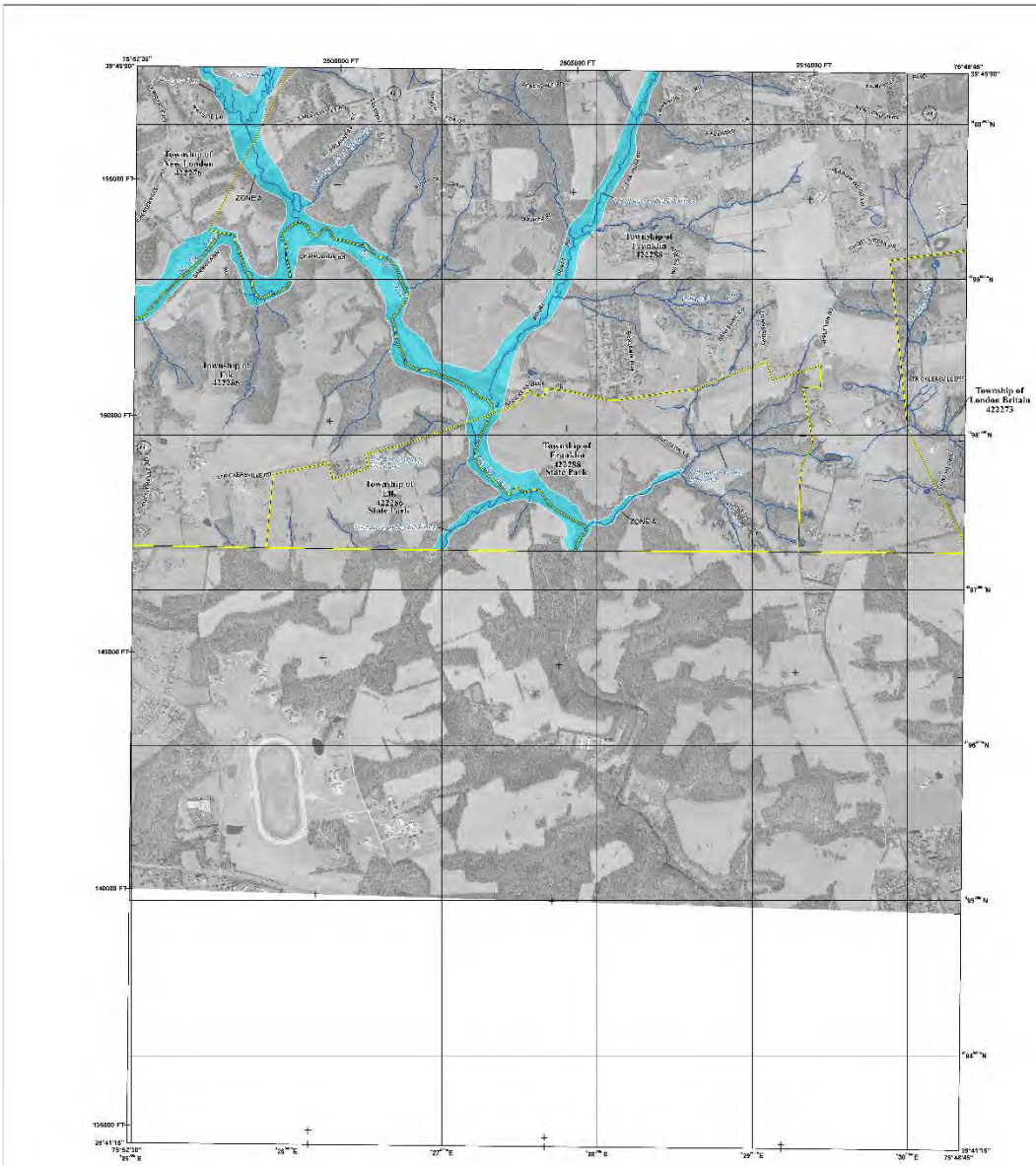
Typed Name	Title	Agency
Alex L. Tatanish	Alternate State Liaison Officer	PA-DCNR

*A state-certified Review Appraiser has been contracted to review the appraisal prepared by Snyder Appraisal Associates. Upon receipt of the review appraisal report we will certify that the appraisal is in conformity with the Uniform Appraisal Standards for federal land acquisitions.

APPENDIX E
Wetlands and Watercourses Mapping


Hodgson Run
Big Elk Creek
Watercourses and NWI Wetlands
Strawbridge Property Acquisition
Elk, Franklin and New London Townships,
Chester County, PA
N
Streams
NWI Wetlands
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine
0
0.25
0.5
0.75
1
Miles
be, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,
e GIS User Community

APPENDIX F
FEMA Floodplain Map



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR REMOVAL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee See Notes Zone X

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard Zone X
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- 17.5 / 16.2 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For more detailed information about this FIRM, available products associated with this FIRM, including digital versions of this map, please visit the FEMA Map Service Center (MSC) website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For communities with multiple panels, see the separate Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was derived from multiple sources. Data was provided in digital format by Chester County GIS Department. The digital data was compiled by the NFIP Program at a scale of 1:2,000 and published by the Pennsylvania Department of Conservation and Natural Resources.

SCALE

Map Projection:
Universal Transverse Mercator zone 18N, North American Datum 1983
Western Hemisphere Vertical Datum: NAVD 88

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 Feet

0 255 510 1,020 Meters

PANEL LOCATOR

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

CHESTER COUNTY, PENNSYLVANIA
(All Jurisdictions)

PANEL 375 OF 380

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
[illegible]	422258	0375	G
[illegible]	422273	0375	G
[illegible]	422276	0375	G
[illegible]	422278	0375	G
[illegible]	422280	0375	G

VERSION NUMBER
2.3.2.3

MAP NUMBER
42029C0375G

MAP REVISED
SEPTEMBER 29, 2017

APPENDIX G
Threatened and Endangered Species Coordination

1. PROJECT INFORMATION

Project Name: **Strawbridge Excess Value Bank**
Date of Review: **3/14/2018 02:17:22 PM**
Project Category: **Habitat Conservation and Restoration, Land acquisition**
Project Area: **973.05 acres**
County(s): **Chester**
Township/Municipality(s): **ELK; FRANKLIN; NEW LONDON**
ZIP Code: **19350; 19352**
Quadrangle Name(s): **BAY VIEW; NEWARK WEST**
Watersheds HUC 8: **Chester-Sassafras**
Watersheds HUC 12: **Big Elk Creek**
Decimal Degrees: **39.735777, -75.857685**
Degrees Minutes Seconds: **39° 44' 8.7970" N, 75° 51' 27.6665" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	**Conservation Measure**	**No Further Review Required, See Agency Comments**
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 must comply with the bog turtle habitat screening requirements of the PASPGP.

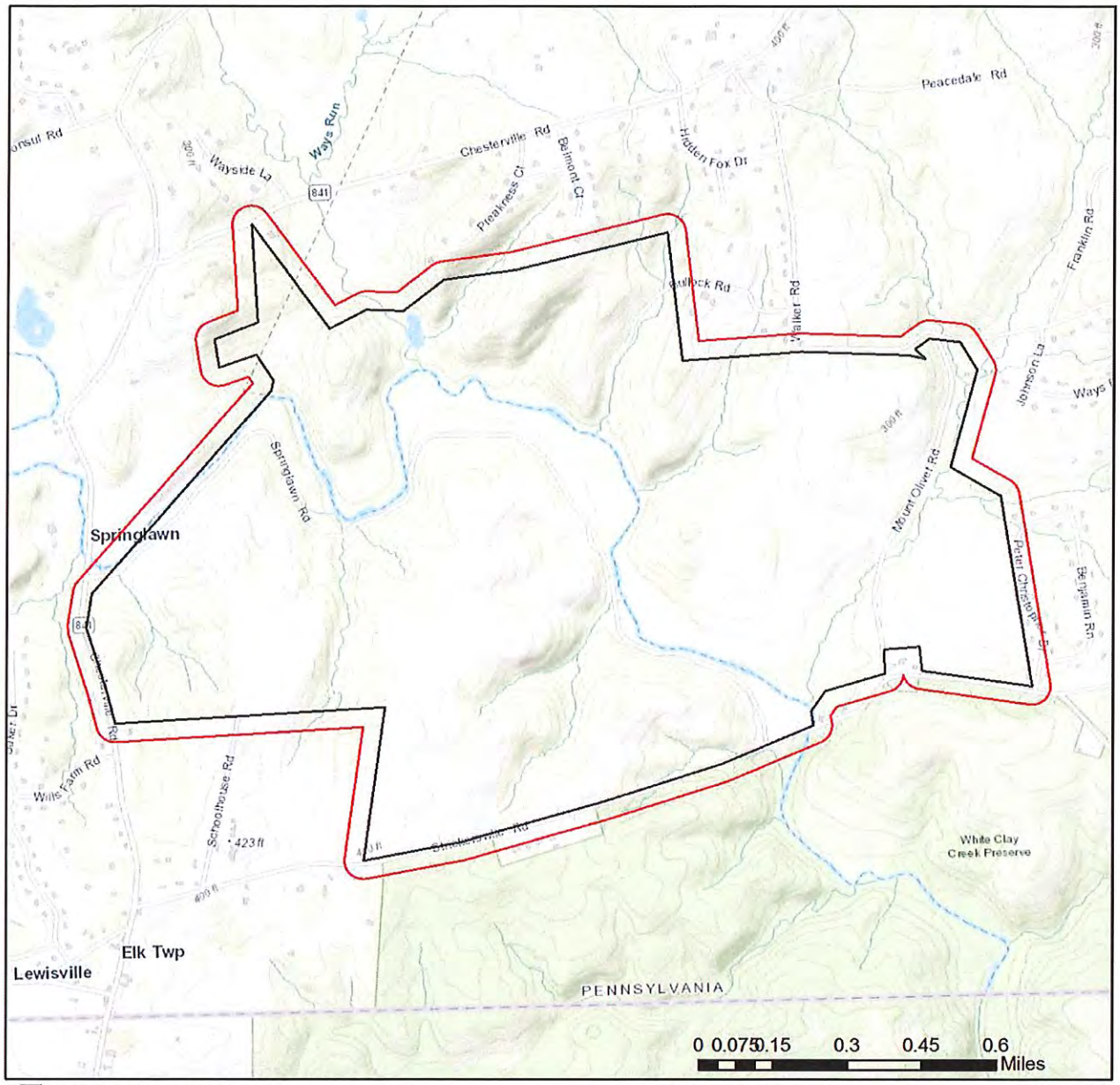
Strawbridge Excess Value Bank

Project Boundary

Buffered Project Boundary

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community

Strawbridge Excess Value Bank



Project Boundary

Buffered Project Boundary

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS,

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources
RESPONSE:

Conservation Measure: One or more terrestrial species of special concern is known on or near your site. Since your project type does not involve any immediate disturbance, we are suggesting that you contact the PA Bureau of Forestry for more information on the species and species-specific conservation recommendations. You may have the potential to augment or restore habitat for species of special concern and PA Bureau of Forestry would be happy to guide you. Any on-site construction, earth disturbance, or habitat management does have the potential to harm species of special concern and, therefore, we request coordination with PA Bureau of Forestry prior to any disturbance.

DCNR Species: (Note: The Pennsylvania Conservation Explorer tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below. After desktop review, if a botanical survey is required by DCNR, we recommend the DCNR Botanical Survey Protocols, available here: https://conservationexplorer.dcnr.pa.gov/content/survey-protocols)

Scientific Name	Common Name	Current Status	Proposed Status	Survey Window
Andropogon gyrans	Elliott's Beardgrass	Special Concern Species*	Special Concern Species*	Flowers September - October; flower structure September - May
Chionanthus virginicus	Fringe-tree	Special Concern Species*	Threatened	Flowers May; purple / black fruit in fall
Chrysopsis mariana	Maryland Golden-aster	Threatened	Endangered	Flowers July - October
Cirsium horridulum	Horrible Thistle	Endangered	Endangered	Flowers May - July
Clematis viorna	Vase-vine Leather-flower	Endangered	Endangered	Flowers May - July
Dichanthelium oligosanthes	Heller's Witchgrass	Special Concern Species*	Threatened	Vernal terminal panicles May - early July, or late summer or early fall
Prenanthes serpentaria	Lion's-foot	Special Concern Species*	Threatened	Flowers August - early October
Sensitive Species**		Special Concern Species*	Threatened	Flowers April - May

PA Fish and Boat Commission
RESPONSE:

Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

U.S. Fish and Wildlife Service
RESPONSE:

Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictional agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, upload* or email* the following information to the agency(s). Instructions for uploading project materials can be found here. This option provides the applicant with the convenience of sending project materials to a single location accessible to all three state agencies. Alternatively, applicants may email or mail their project materials (see AGENCY CONTACT INFORMATION).
***Note:** U.S.Fish and Wildlife Service requires applicants to mail project materials to the USFWS PA field office (see AGENCY CONTACT INFORMATION). USFWS will not accept project materials submitted electronically (by upload or email).

Check-list of Minimum Materials to be submitted:
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____A map with the project boundary and/or a basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
In addition to the materials listed above, USFWS REQUIRES the following
____**SIGNED** copy of a Final Project Environmental Review Receipt

The inclusion of the following information may expedite the review process.
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. Two review options are available to permit applicants for handling PNDI coordination in conjunction with DEP's permit review process involving either T&E Species or species of special concern. Under sequential review, the permit applicant performs a PNDI screening and completes all coordination with the appropriate jurisdictional agencies prior to submitting the permit application. The applicant will include with its application, both a PNDI receipt and/or a clearance letter from the jurisdictional agency if the PNDI Receipt shows a Potential Impact to a species or the applicant chooses to obtain letters directly from the jurisdictional agencies. Under concurrent review, DEP, where feasible, will allow technical review of the permit to occur concurrently with the T&E species consultation with the jurisdictional agency. The applicant must still supply a copy of the PNDI Receipt with its permit application. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. The applicant and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at https://conservationexplorer.dcnr.pa.gov/content/resources.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552
Email: RA-HeritageReview@pa.gov

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
NO Faxes Please

PA Fish and Boat Commission
Division of Environmental Services
595 E. Rolling Ridge Dr., Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
Email: RA-PGC_PNDI@pa.gov
NO Faxes Please

7. PROJECT CONTACT INFORMATION

Name: Alyssa Lynd
Company/Business Name: PA DCNR
Address: 400 Market St.
City, State, Zip: Harrisburg, PA 17101
Phone: (717) 783-5877 Fax: (717) 787-9577
Email: c-alynd@pa.gov

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature date

Pennsylvania Fish & Boat Commission
established 1866

Division of Environmental Services
Natural Diversity Section
595 E Rolling Ridge Dr.
Bellefonte, PA 16823
814-359-5237

April 3, 2018

IN REPLY REFER TO
SIR# 49205

PA DCNR
Eric Bruggeman
400 Market Street
Harrisburg, Pennsylvania 17110

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 652461_1
Strawbridge Excess Value Bank
CHESTER County: Elk Township, Franklin Township, New London Township

Dear Eric Bruggeman:

This responds to your inquiry about a Pennsylvania Natural Diversity Inventory (PNDI) Internet Database search "potential conflict" or a threatened and endangered species impact review. These projects are screened for potential conflicts with rare, candidate, threatened or endangered species under Pennsylvania Fish & Boat Commission jurisdiction (fish, reptiles, amphibians, aquatic invertebrates only) using the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files. These species of special concern are listed under the Endangered Species Act of 1973, the Wild Resource Conservation Act, and the Pennsylvania Fish & Boat Code (Chapter 75), or the Wildlife Code.

An element occurrence of a rare, candidate, threatened, or endangered species under our jurisdiction is known from the vicinity of the proposed project. However, given the nature of the proposed project, the immediate location, or the current status of the nearby element occurrence(s), no adverse impacts are expected to the species of special concern.

This response represents the most up-to-date summary of the PNDI data and our files and is valid for two (2) years from the date of this letter. An absence of recorded species information does not necessarily imply species absence. Our data files and the PNDI system are continuously being updated with species occurrence information. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered, and consultation shall be re-initiated.

If you have any questions regarding this review, please contact Kathy Gipe at 814-359-5186 and refer to the SIR # 49205. Thank you for your cooperation and attention to this important matter of species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/dn

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pennsylvania Field Office
110 Radnor Road, Suite 101
State College, Pennsylvania 16801-4850

July 13, 2018

Ashley Rebert
Pennsylvania Department of
Conservation and Natural Resources
P.O. Box 8475
Harrisburg, PA 17105-8475

RE: USFWS Project #2018-1012
PNDI Receipt #652461

Dear Ms. Rebert:

This responds to your letter of May 9, 2018, requesting information about federally listed and proposed endangered and threatened species found on the 973-acre Strawbridge land acquisition, which is being considered by your agency. This property is located in Elk, Franklin, and New London Townships, Chester County, Pennsylvania. The proposed project is located within the range of the Indiana bat (*Myotis sodalis*), a species that is federally listed as endangered and the bog turtle (*Clemmys muhlenbergii*) and northern long-eared bat (*Myotis septentrionalis*), species that are listed as threatened. The following comments are provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) to ensure the protection of endangered and threatened species.

Bog turtle

The northern population of the bog turtle occurs in the States of Connecticut, New York, Pennsylvania, Maryland, New Jersey, Delaware and Massachusetts. Bog turtles inhabit shallow, spring-fed fens, sphagnum bogs, swamps, marshy meadows, and pastures characterized by soft, muddy bottoms; clear, cool, slow-flowing water, often forming a network of rivulets; high humidity; and an open canopy. Bog turtles usually occur in small, discrete populations occupying suitable wetland habitat dispersed along a watershed. The occupied "intermediate successional stage" wetland habitat is usually a mosaic of micro-habitats ranging from dry pockets, to areas that are saturated with water, to areas that are periodically flooded. Some wetlands occupied by bog turtles are located in agricultural areas and are subject to grazing by livestock.

Guideline for Bog Turtle Surveys, describes how to identify potential bog turtle habitat (see Phase 1 survey) and is available at https://www.fws.gov/northeast/pafo/.

To protect potentially occupied habitat and recovery habitat for the bog turtle, as well as habitat for a myriad of other wetland-dependent species, we recommend protection of all wetlands, spring seeps, wet pastures, and riparian zones, as well as protection of associated upland buffer areas (minimum buffer width of 100 to 300 feet recommended), to ensure the long-term integrity of these habitats.

Indiana bats and Northern long-eared bat

Indiana bats and northern long-eared bats hibernate in caves and abandoned mines during the winter months (November through March), and use a variety of upland, wetland and riparian habitats during the spring, summer and fall. These bats usually roost in dead or living trees with exfoliating bark, crevices or cavities. Female Indiana and northern long-eared bats form nursery colonies under the exfoliating bark of dead or living trees, such as shagbark hickory, black birch, red oak, white oak, and sugar maple, in upland or riparian areas. Land-clearing, especially of forested areas, may adversely affect these bat species by killing, injuring or harassing roosting bats, and by removing or reducing the quality of foraging and roosting habitat. Indiana bats tend to prefer mature forests; while northern long-eared bats are also a forest dependent species, they can utilize smaller trees as day roosts.

In addition, if any natural caves or abandoned mines occur within the project area, it is possible that bats may be using them during hibernation or potentially as summer roost sites. Entrances to these potential hibernacula could be intentionally or inadvertently closed or destroyed during activities such as land clearing, grading, fill disposal, mining, road construction or building construction. If bats are present within a cave or abandoned mine when this occurs, they will become trapped inside and perish. Even if bats are not present during the closure, they may be adversely affected when they return to their hibernaculum in the fall and find it closed. This will force them to expend energy looking for another suitable hibernaculum during a time when it is crucial that they store up sufficient fat reserves for hibernation. Bats are at an increased risk of mortality when they enter hibernation with insufficient fat reserves, or are unable to locate a cave/mine with the suite of conditions (e.g., temperature, humidity, air flow) necessary for successful hibernation. Additional information on both bat species is available at https://www.fws.gov/Midwest/endangered/mammals.

Northern long-eared bats and Indiana bats are not known to occur on the subject property; however, survey information is incomplete, and a field investigation of any site may reveal previously unknown occurrences of these species if suitable habitat is present. Bog turtles are not known to occur within the acquisition boundary; however, a population is known in close proximity to the northeast (within 200 feet) in the vicinity of Walter Road and Mt. Olivet Roads increasing the chance the species may occur in stream and wetlands in that portion of the property. For bog turtles, management for early successional vegetation is beneficial, while Indiana bats and northern long-eared bats are primarily forest-dependent species. We are available to assist with developing management plans for portions of the acquisition that are likely to most benefit bog turtle or the two bat species.

Please contact Robert Anderson of my staff at 814-234-4090 if you have any questions or require further assistance.

Sincerely,

Sonja Jahrsdoerfer

Sonja Jahrsdoerfer
Project Leader

cc:
PFBC - Urban

APPENDIX H
Phase 1 ESA Report

PHASE I
ENVIRONMENTAL SITE ASSESSMENT

STRAWBRIDGE II PROPERTY
STRICKERSVILLE ROAD
LANDENBERG, CHESTER COUNTY, PENNSYLVANIA

July 2017

Prepared for:

The Conservation Fund
5807 Kennett Pike
Centreville, DE 19807

Prepared by:

Ten Bears Environmental Associates Company
1080 S. Chapel Street, Suite 200
Newark, Delaware 19702

P.N. 17-1726.A

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
EXECUTIVE SUMMARY		i
I.	INTRODUCTION	1
II.	GENERAL SITE CHARACTERISTICS	1
A.	SITE DESCRIPTION	1
B.	SURFACE TOPOGRAPHY AND SITE DRAINAGE	2
C.	FLOOD ZONES	2
D.	SOILS	2
E.	WETLANDS	3
F.	RADON INFORMATION	3
III.	USER PROVIDED INFORMATION	3
IV.	RECORDS REVIEW	3
A.	ENVIRONMENTAL DATABASE SEARCH	3
B.	ENVIRONMENTAL LIEN SEARCH REPORT	4
IV.	HISTORICAL INFORMATION	4
A.	THE PROPERTY	5
B.	SURROUNDING AREAS	5
V.	VISUAL SITE RECONNAISSANCE	5
A.	GENERAL SITE FEATURES	5
B.	SOLID WASTE DEBRIS	6
VI.	INTERVIEWS	6
A.	PROPERTY REPRESENTATIVE	6
B.	CURRENT / FORMER PROPERTY OWNERS	6

C. LOCAL OFFICIALS 6

VII. CONCLUSIONS AND RECOMMENDATIONS 7

VIII. DEVIATIONS AND / OR DATA GAPS 7

IX. LIMITATIONS, ASSUMPTIONS, AND CONDITIONS 8

X. USER RELIANCE 8

XII. SIGNATURE OF ENVIRONMENTAL PROFESSIONAL 8

XIII. REFERENCES 9

FIGURES

Figure 1 Site Location Sketch

APPENDICES

Appendix A User Questionnaire
Appendix B Environmental Database Search Report
Appendix C Environmental Lien Search Report
Appendix D Sanborn Fire Insurance Map – No Coverage Report
Appendix E Historical Aerial Photographs
Appendix F Historical Topographic Maps
Appendix G City Directory Abstract Report
Appendix H Site Photographs
Appendix I Environmental Professional Qualifications

EXECUTIVE SUMMARY

Ten Bears Environmental Associates Company (TBE) has completed a Phase I Environmental Site Assessment (ESA) of the Strawbridge Property located in Landenberg, Pennsylvania. TBE performed the assessment at the request of The Conservation Fund on behalf of the State of Pennsylvania, Department of Conservation and Natural Resources, the prospective purchasers. The purpose of the ESA was to identify potential environmental issues associated with the property by reviewing available historical and regulatory agency information, interviewing personnel familiar with current and historical practices at the site, and performing a visual reconnaissance to assess current site conditions. The ESA was performed in general accordance with the American Society for Testing and Materials' "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" (ASTM E 1527-13), which satisfies the minimum due diligence requirements of the U.S. Environmental Protection Agency's (EPA's) All Appropriate Inquiries (AAI) regulations, published in Title 40 Code of Federal Regulations, Part 312 (40 CFR 312), as determined by EPA rulemaking published in the December 30, 2013 Federal Register.

The Strawbridge Property comprises seven parcels containing approximately 982 acres of primarily agricultural farmland. Several stone and brick ruins of former residences and / or barns were observed within the Property. Two roads, Springlawn Road and Mount Olivat Road are located within the Property, but are restricted to pedestrian / cycling traffic only and are maintained by Elk and Franklin Townships. The site is located in a primarily mixed-use area, with agricultural farmland surrounding the property interspersed with residential development.

The findings of this assessment did not identify potential *recognized environmental conditions* (RECs) as defined by the ASTM E 1527-13 standard that, in TBE's opinion, would preclude the user from qualifying for the *innocent landowner, contiguous property owner* or *bona fide prospective purchaser* limitations to CERCLA (Federal Comprehensive Environmental Response, Compensation, and Liability Act) liability or trigger other regulatory obligations. A relatively minor and manageable issue was identified that may present some limited liability if mishandled in the future. This was related to scattered solid waste debris that would require proper handling and disposal if removed from the Property. Further information regarding the findings of this assessment is provided in the following report.

I. INTRODUCTION

Ten Bears Environmental Associates Company (TBE) has completed a Phase I Environmental Site Assessment (ESA) of the Strawbridge Property (hereinafter referred to as the "Property" or "Site") located in Landenberg, Pennsylvania. TBE performed the assessment at the request of The Conservation Fund on behalf of the State of Pennsylvania, Department of Conservation and Natural Resources, the prospective purchasers. The purpose of the assessment was to identify potential environmental issues associated with the Property by reviewing available historical and regulatory agency information, interviewing personnel familiar with current and historical practices at the site, and performing a visual reconnaissance to assess current site conditions.

The ESA was performed in general accordance with the American Society for Testing and Materials' "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" (ASTM E 1527-13), which satisfies the minimum due diligence requirements of the U.S. Environmental Protection Agency's (EPA's) All Appropriate Inquiries (AAI) regulations, as published in Title 40 Code of Federal Regulations, Part 312 (40 CFR 312), as determined by EPA rulemaking published in the December 30, 2013 Federal Register. This report summarizes the findings of the ESA and TBE's conclusions and recommendations regarding the environmental condition of the Property.

II. GENERAL SITE CHARACTERISTICS

TBE reviewed selected mapping and visually reviewed the Property for general characteristics that may be pertinent to an evaluation of environmental site conditions. The following summarizes TBE's findings regarding observed site conditions, surface topography and site drainage, flooding potential, soil conditions, wetlands, and Radon potential.

A. SITE DESCRIPTION

The Strawbridge Property comprises seven (7) parcels (Chester County Tax Parcel No.'s 70-5-6, 70-5-7, 70-5-8, 71-4-32.3, 72-6-1, 72-6-4, and 72-6-10) containing approximately 982 acres located in Landenberg, Pennsylvania. A majority of the Property is currently utilized for farming with the remainder consisting of undeveloped woodland. While there are no currently occupied structures on the Property, a few residential and barn foundations were observed at various locations.

The Property is bounded by Lewisville / Strickersville Road to the south, Chesterville Road to the west, residential properties and a portion of Walker Road to the north, and agricultural land and residential properties to the east. Surrounding land use is primarily agricultural and residential.

B. SURFACE TOPOGRAPHY AND SITE DRAINAGE

The surface elevations at the Site range from approximately 190 to 410 feet above mean sea level (MSL), based on a review of the U.S. Geological Survey (USGS) topographic map[(1)]. Topographic relief at the Property ranges from relatively flat plateaus to steep slopes with an overall general sloping towards Big Elk Creek, which flows through the Property from the northwest to the southeast. In addition, there are several small unnamed streams, as well as a portion of Tributary 4 of Big Elk Creek and Hodgson Run within the Property all flowing into Big Elk Creek. Groundwater flow typically follows topographic trends, absent man-made influences, indicating locally-variable flow towards Big Elk Creek, with an overall trend towards the southeast.

C. FLOOD ZONES

The applicable Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map[(2)] indicates the majority of the Site is mapped within Zone X, which are areas of 0.2 % flood chance; areas of 1 % annual flood chance with average depth of less than 1 foot or with drainage areas less than one square mile; and areas protected by levees from 1% annual chance flood. However, areas adjacent to Hodgson Run, Tributary 4, and Big Elk Creek are listed as being in Zone A on the FEMA Flood Insurance Rate Map. Zone A are areas inundated by the 1% annual chance flood, with "No Base Flood Elevations Determined."

D. SOILS

Ten Bears reviewed the online USDA Natural Resources Conservation Service Web Soil Survey to determine general soil conditions at the Property. There are many different types of soils mapped at the Site as follows: Baile silt loam; Baile silt loam, 3 to 8 percent slopes; Codorus silt loam; Comus silt loam; Glenelg silt loam, 3 to 8 percent slopes; Glenelg silt loam, 8 to 15 percent slopes; Glenville silt loam 0 to 3 percent slopes; Glenville silt loam, 3 to 6 percent slopes; Glenville silt loam, 8 to 15 percent slopes; Hatboro silt loam; Manor loam 3 to 8 percent slopes; Manor loam, 8 to 15 percent slopes; Manor loam 15 to 25 percent slopes; Manor loam 25 to 35 percent slopes; Urban land-Glenelg complex, 0 to 8 percent slopes; Urban land-Manor complex, 0 to 8 percent slopes; and Urban land-Manor complex, 8 to 25 percent slopes. The majority of the soils are described as well-drained and would not be associated with wetlands except for the Balie and Hatboro soils, which are described as being poorly draining soils. These soils are generally positioned along the various waterbodies within the Property.

E. WETLANDS

According to the US Fish and Wildlife Service on-line Wetlands Mapper, Big Elk Creek and some smaller streams are mapped as regulated water bodies within the Property. Although a formal wetlands delineation was not performed as part of this ESA, vegetated wetlands may also be present adjacent to these waterways. There are no other mapped wetlands located on the Property.

F. RADON INFORMATION

The EPA Radon Zone for Chester County, Pennsylvania is Zone 1, indicating that the average indoor radon level is greater than 4.0 pCi/L, which is the EPA's Action Level for occupied residential spaces. Radon typically accumulates in basements with poor ventilation. Since there are no buildings on the Property, excess accumulation of radon gas is not expected to be of concern.

III. USER PROVIDED INFORMATION

TBE requested that a representative of The Conservation Fund as the primary the user of this ESA, complete a Phase I Environmental Site Assessment User Questionnaire to provide information that may be pertinent to this assessment. A copy of the User Questionnaire was filled out by Mr. Blaine Philips of The Conservation Fund, and was returned to TBE. The Questionnaire is intended to assist in meeting the User's Responsibilities outlined in Section 6 of the ASTM E 1527-13 standard.

Information provided in the Questionnaire does not suggest that the users are aware of indications of potential environmental issues associated with the Property that would warrant further evaluation. A copy of the User Questionnaire, which was prepared and signed by Mr. Philips, dated July 13, 2017 is included as Appendix A.

IV. RECORDS REVIEW

A. ENVIRONMENTAL DATABASE SEARCH

Ten Bears reviewed an environmental database search report prepared by our subcontractor, Envirosite Corporation (EC), to evaluate environmental conditions reported to government agencies at and in the vicinity of the Property. The June 19, 2017 regulatory report (included in Appendix B) summarizes environmental regulatory agency information gathered from selected databases. For each database, EC reported on sites identified to be located within the distance prescribed by the ASTM E 1527-13 standard. EC also obtained information from several databases not included in the standard.

1. SUBJECT PROPERTY

The EC report did not identify the Strawbridge Property on any of the reviewed databases.

2. NEARBY SITES

Consistent with the agricultural and residential setting of the Site, no regulated sites were mapped within a 1 mile radius as reviewed by EC.

B. ENVIRONMENTAL LIEN SEARCH REPORT

The June 22, 2017 Nationwide Environmental Title Research, LLC property detail report is included as Appendix C. As indicated in the referenced report, the search did not identify environmental liens or activity and use limitations (AULs) associated with the Property.

Our review of the regulatory database did not suggest a potential for nearby sites to impact environmental conditions at the Property.

IV. HISTORICAL INFORMATION

TBE reviewed available historical information for indications of past usage that may have impacted Site environmental conditions. Although requested from our subcontractor, EC, Sanborn Fire Insurance Maps were not available for the Property (See Appendix D). TBE's historical review included the following resources.

- Aerial photographs provided by Envirosite for the years 1952, 1968, 1976, 1982, 1987, 1992, 1999, 2008, 2011, and 2015 (Appendix E);
- Historical USGS topographic maps provided by Envirosite for the years 1898, 1900, 1917, 1942, 1953, 1953 (rev1970), 1992, 1997, 2011, 2014, and 2016 (Appendix F);
- City Directory listings for the years 1965, 1970, 1975, 1980, 1985, 1990, 1995, 1998, 2001, 2006, 2010 and 2015 (Appendix G); and
- Other available resources previously referenced herein.

The following summarizes TBE's understanding of historical uses of the Property and surrounding areas, based on the referenced sources.

A. THE PROPERTY

The Property appears to be primarily undeveloped land with several small buildings observed at various locations within the Property beginning with the 1898 topographic map. In addition, Springlawn Road and Mount Olivat Road traverse the Property from northwest to southeast and north to south, respectively. The buildings remain visible through the 1952 aerial photograph. However, a majority of those buildings are no longer present starting with the 1953 mapping and 1968 aerial photograph. None of the structures are visible by the 1976 photograph with the Property usage remaining agricultural fields and woods. The Property remained relatively unchanged throughout the remaining years reviewed.

B. SURROUNDING AREAS

Beginning with the 1898 topographic map and 1952 aerial photograph, surrounding properties appear to be either agricultural land and associated buildings or residential housing. The surrounding area remains relatively unchanged until the 1987 photograph when further residential houses were built to the north. The surrounding area remains relatively unchanged for the remaining years reviewed.

The reviewed documents suggest a level of development typical for the rural setting of the site.

V. VISUAL SITE RECONNAISSANCE

TBE performed a visual reconnaissance at the Property on June 22 and June 27, 2017. The reconnaissance included a review of building ruins on the Property and walking visual review of outdoor areas of the Property, as well as portions of adjoining properties visible from the Property and / or nearby public areas. Photographs taken during the reconnaissance are provided as Appendix H. The following summarizes TBE's site observations, particularly pertaining to potential environmental issues.

A. GENERAL SITE FEATURES

The Strawbridge Property comprises seven (7) parcels (Chester County Tax Parcel No.'s 70-5-6, 70-5-7, 70-5-8, 71-4-32.3, 72-6-1, 72-6-4, and 72-6-10) containing approximately 982 acres located in Landenberg, Pennsylvania. A majority of the Property is currently utilized for farming with the remainder consisting of undeveloped woodland. While there are no currently occupied structures on the Property, a few residential and barn foundations were observed at various locations. The building ruins consisted of stone foundation walls and brick exterior walls. The building ruins were generally limited to foundations with only one or two portions of

the exterior walls remaining. No interior floors, stairs to basements, or other building structures were observed.

The site is located in a primarily mixed-use area, with farmland intermixed with residential properties on all sides of the Property. No apparent heating sources were noted at the former residences / barns.

B. SOLID WASTE DEBRIS

A relatively small amount of solid waste was observed scattered around the former buildings. In general, observed solid waste included, but was not limited to: brick, metal debris, tires, and wire mesh fencing.

VI. INTERVIEWS

TBE interviewed available personnel familiar with historical practices at the Site, to assess potential environmental issues associated with the Property. The following summarizes these interviews.

A. PROPERTY REPRESENTATIVE

Ten Bears spoke with Mr. Ronald Ayers, who is the caretaker for the property. Mr. Ayres indicated he has been working at the Property since 1959 and was not aware of any potential environmental issues associated with the property. He further stated that the structures noted on the historical documents were gone prior to his working there and the Property has been primarily in agricultural use the entire time. Prior to 1959 portions of the site were used for cattle grazing.

B. CURRENT / FORMER PROPERTY OWNERS

Current / former property owners were not available at the time of the assessment.

C. LOCAL OFFICIALS

ASTM E1527-13 recommends interviews with local officials, particularly fire companies, for information regarding storage of flammables (i.e., USTs and ASTs). The West Grove and Union Volunteer Fire Companies provide fire protection for the subject property and surrounding area. Typically, local fire departments are not tasked with the inspection of underground storage tanks (USTs) and / or enforcement of other ancillary environmental regulations. Further, information regarding USTs and / or other environmental enforcement actions falls under the purview of the Pennsylvania

Department of Environmental Protection (PADEP) and would be referenced in Section IV above.

VII. CONCLUSIONS AND RECOMMENDATIONS

Ten Bears has completed a Phase I Environmental Site Assessment of the Strawbridge Property in Landenberg, Pennsylvania. This assessment was performed in conformance with the scope and limitations of ASTM Practice E 1527-13. Exceptions to, or deletions from, this practice are summarized in Section XI of this report. The findings of this assessment did not identify potential *recognized environmental conditions* (RECs) as defined by the ASTM E 1527-13 standard that, in TBE's opinion, would preclude the user from qualifying for the *innocent landowner, contiguous property owner* or *bona fide prospective purchaser* limitations to CERCLA (Federal Comprehensive Environmental Response, Compensation, and Liability Act) liability or trigger other regulatory obligations. No historical recognized environmental conditions (HRECs) or controlled recognized environmental conditions (CRECs) were identified at the Property. However, the assessment did identified a minor environmental condition that, while manageable, could present some liability if mishandled during the real estate transfer or in the future.

SECONDARY CONCERN

- **Solid Waste Debris / Stored Materials** - Solid waste debris observed at the Site, was primarily situated near the ruins of the former residences / barns. The debris consisted of brick, concrete, wood, metal, tires, and wire mesh fencing. TBE estimates the volume of surface solid waste observed at the Site as approximately 20 to 30 cubic yards.

  TBE recommends that solid waste and stored materials not intended for reuse at the Property be transported to an appropriate permitted off-site facility for recycling or disposal in accordance with applicable regulations. Some of the observed waste materials, particularly tires may require separate disposal.

VIII. DEVIATIONS AND / OR DATA GAPS

Some deviations from the ASTM-required information sources were encountered while completing this assessment. In particular, the time frame between reviewed historical documents, in some cases, exceeded five years. The following *Standard Historical Sources*, as listed in ASTM E1527-13, were not reviewed as part of this assessment.

- Sanborn Fire Insurance Maps,
- Building Department Records, and
- Zoning / Land Use Records

In addition, former owners / occupants of the Property were not readily available to interview at the time of this assessment. The majority of the standard historical sources listed above, with the exception of and former owner / occupant interviews, typically do not provide significant historical property usage information beyond that obtained from the sources reviewed as part of this ESA. Based on the findings of this assessment, TBE's opinion is that the deviations and / or minor data failures encountered during this ESA do not represent data gaps.

IX. LIMITATIONS, ASSUMPTIONS, AND CONDITIONS

This report is based on Ten Bears Environmental Associates Company's professional opinion regarding environmental conditions visually observed at the Property during the reconnaissance and our interpretation of the reviewed historical information, maps, and regulatory documentation. The observations, conclusions, and recommendations presented in this report are based solely on conditions encountered and available documents at the time of the reconnaissance effort. Latent conditions and other contingencies bearing upon the environmental condition of the Site may be evident in the future. While this evaluation was performed in an effort to generally characterize the environmental condition of the Property, the scope of services was limited due to practicable budgetary and time constraints. As such, further investigation may identify conditions that were not encountered during this assessment.

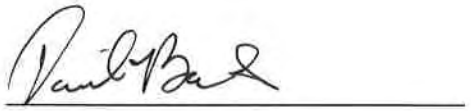
X. USER RELIANCE

This report is intended for the exclusive use of The Conservation Fund and the Pennsylvania Department of Conservation and Natural Resources. The information contained in this report may not be relied upon by parties other than The Conservation Fund and the Pennsylvania Department of Conservation and Natural Resources without the prior written consent of Ten Bears Environmental Associates Company.

XII. SIGNATURE OF ENVIRONMENTAL PROFESSIONAL

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental Professional* as defined in §312.10 of 40 CFR Part 312.

I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. I have performed this assessment in accordance with ASTM 1527-13.



David P. Bailey
Senior Environmental Scientist

7/13/17
Date

Mr. Bailey's professional resume is included as Appendix I.

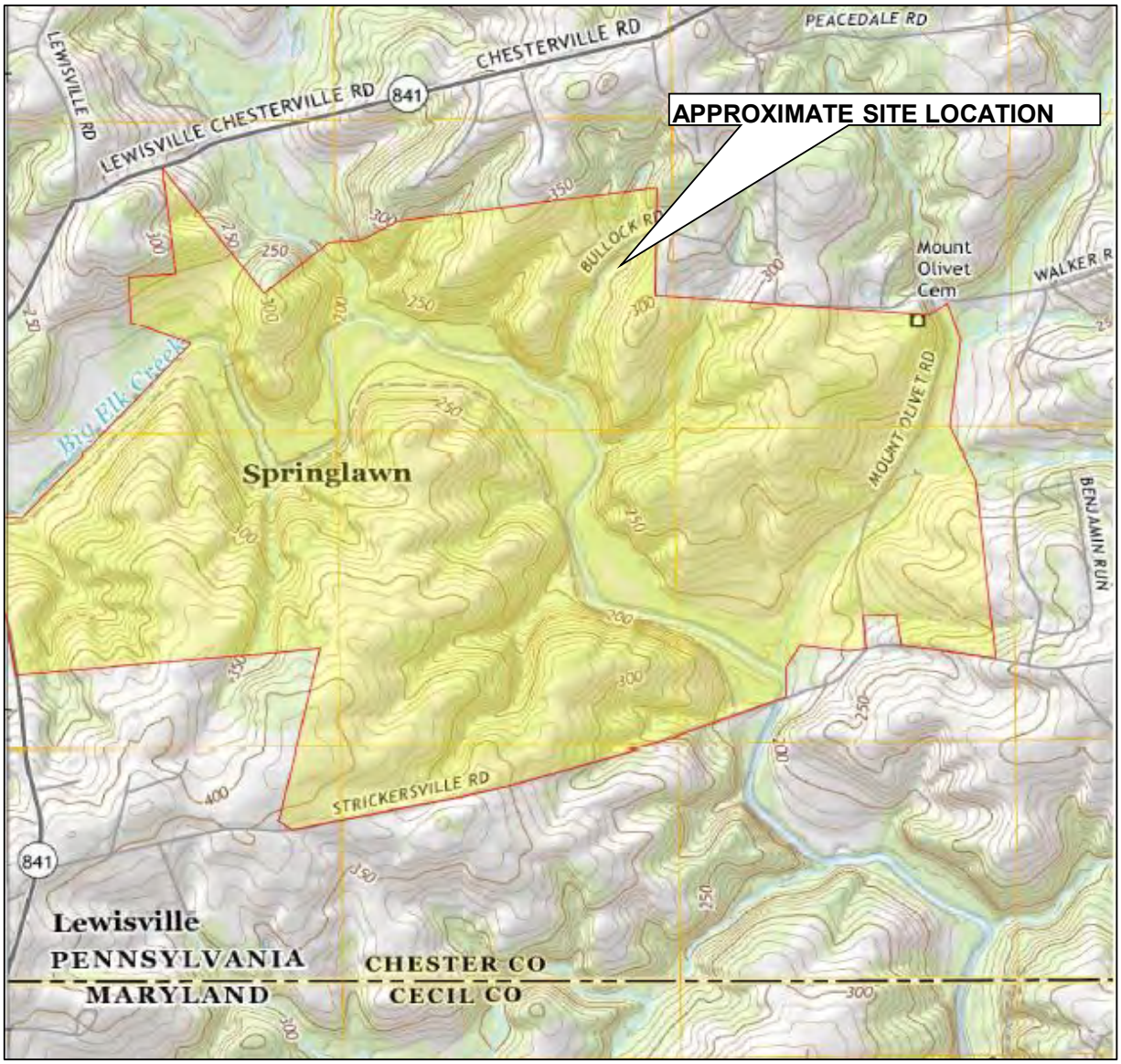
XIII. REFERENCES

1. U.S. Department of the Interior, Geologic Survey, Newark-West 7-1/2 minute Quadrangle, 2016.

2. Federal Emergency Management Agency (FEMA), September 29, 2006. Flood Insurance Rate Map (FIRM), Chester County, Pennsylvania, Map Number 42029C00375F.

3. Environmental Protection Agency, Map of Radon Zones. Chester County, Pennsylvania.

FIGURES



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, FOR NEWARK - WEST, DE (2016)

Ten Bears Environmental

Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633 Fax: (302) 731-8655

FIGURE 1 - SITE LOCATION SKETCH

STRAWBRIDGE PROPERTY

STRICKERSVILLE ROAD

LANDENBERG, CHESTER COUNTY, PENNSYLVANIA

DATE:	7/13/2017	JOB NUMBER:	17-1726.A
DRAWN BY:	DPB	SCALE:	N.T.S.
CHECKED BY:		FIGURE NO:	1
FILE NO:	17-1726.A_FIG	SHEET	1 OF 1

APPENDIX A

USER QUESTIONAIRE

PHASE I ENVIRONMENTAL SITE ASSESSMENT
USER QUESTIONNAIRE

TEN BEARS ENVIRONMENTAL ASSOCIATES COMPANY
NEWARK AND MILTON, DELAWARE

Property Name: Strawbridge Property
Property Use: Agricultural / Undeveloped
Address: Landenberg, PA

Project Number: 17-1726.A
Date: _____

To assist us with our Phase I Environmental Site Assessment (ESA), and in accordance with the American Society for Testing and Materials, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM E 1527-05), we request that you respond to the following questions to the best of your ability.

1. Are you aware of any environmental cleanup liens against the property that are filed or recorded under federal, tribal, or local law?

NO

2. Are you aware of any *Activity and Land Use Limitations* (ALUs), such as engineering controls, land use restrictions, or institutional controls that are in place at the site and / or have been filed or recorded in a registry under federal, tribal, state or local law?

NO

3. As the user of this ESA, do you have any specialized knowledge or experience related to the property or nearby properties? For example, are you involved in the same line of business as current or former occupants of the property or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by this type of business?

NO

PHASE I ENVIRONMENTAL SITE ASSESSMENT
USER QUESTIONNAIRE (continued)

4. If the ESA is being performed in preparation of a property transfer, does the purchase price being paid for the property reasonably reflect the fair market value of the property?

Yes

5. Are you aware of commonly known or reasonably ascertainable information about the property that would assist in identifying recognized environmental conditions associated with the property?

No

   a. What are the historical uses of the property? farming, recreation (horse riding)

   b. Do you know of specific regulated substances that are present, or formerly were present, at the property?

NO

   c. Do you know of releases of regulated substances that have occurred at the property?

NO

   d. Do you know of any environmental remediation activities or cleanups that have taken place at the property?

NO

6. Based on your knowledge and experience related to the property, are there any obvious indicators that point to the presence or likely presence of contamination at the property?

NO

7. Does the Property utilize a community septic sewerage system? NOT Sure

   a. Are there any known problems associated with the system? Not Sure

8. Are there any onsite drinking water wells and an associated water supply system? Not Sure

   a. Are you aware of any problems associated with the drinking water wells, water quality, and / or the supply system? NO

This Questionnaire was completed by:

Name: BLAINE T. PHILLIPS Company: The Conservation Fund

Title: Mid-Atlantic Director Address: 5807 Kennett Pike

Phone No.: 302-656-1103 Centreville, DE 19807

By signing below, the preparer, as designated above, represents that, to the best of the preparer's knowledge, the above statements and facts are true and correct and to the best of the preparer's actual knowledge, not material facts have been suppressed or misstated.

Preparer's Signature: Blaine T. Mid

Date: 7/13/17

APPENDIX B

ENVIRONMENTAL DATABASE SEARCH REPORT

Government Records Report | 2017

Order Number: 13094

Report Generated: 06/19/2017

Project Name: Strawbridge II Property

Project Number: 17-1726.A

Strawbridge II Property
99 Bullock Road
Landenberg, PA 19350

1175 Post Road East
Westport, CT 06880
Toll Free: 866-211-2028
www.envirositecorp.com

Table of Contents 2017

Section	Page
Executive Summary	1
Executive Summary by Distance	2
Executive Summary by Database	3
Property Proximity Map	7
Area Map	8
Map Findings Summary	9
Unmappable Summary	14
Environmental Records Searched	15
Geological Landscape Section	30
Geological Landscape Section Soil Map	33
Geological Landscape Section Summary	34
Geological Findings Map	468
Geological Landscape Section Map Findings	469
Geological Landscape Section Map Findings Radon	602
Geological Landscape Records Searched	603

Disclaimer - Copyright and Trademark Notice

All information contained in this report are based on data available from various public, government and other sources and are based upon the best data available from those sources. The information available in this report may be available from other sources and is not exclusive or the exclusive property of Envirosite Corporation.

NO WARRANTY EXPRESSED OR IMPLIED, IS MADE IN CONNECTION WITH THIS REPORT, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ALL RISK IS ASSUMED BY USER AND Envirosite assumes no liability for faulty or inaccurate information. The Reports may utilize a variety of public and other sources reasonably available to Envirosite. Envirosite cannot, and does not assure, warrant, guarantee or assume any liability for the correctness, comprehensiveness, timeliness or completeness of any of such information, nor is the information in any Report to be construed as legal advice with respect to environmental risks associated with any property. Envirosite shall not be liable to anyone for any claims, causes of action, suits, damages, losses, costs and expenses (including, without limitation, attorneys' fees and costs) arising out of or caused by this report regardless of the acts, errors or omissions, or negligence of Envirosite. Any damages shall be limited to the purchase price of the report.

Purchaser of the report accepts the report "As Is". The report is intended only to provide information only and should not be considered as providing any legal advice, prediction, forecast, or fact as to the environmental risk for any specific property. Reports are proprietary to Envirosite, and contain copyrighted material and trademarks of Envirosite. All other trademarks used herein are the property of their respective owners. All rights of Envirosite as to the Reports are reserved.

Envirosite corporation has conducted a search of all reasonably ascertainable records in accordance with EPA's AAI (40 CFR Part 312) requirements and the ASTM E-1527-13 Environmental Site Assessments standard.

SUBJECT PROPERTY INFORMATION:

ADDRESS:

Strawbridge II Property
99 Bullock Road
Landenberg, PA 19350

COORDINATES:

Latitude (North):	39.735822 - 39°44'9"
Longitude (West):	-75.858291 - -75°51'29.8"
Universal Transverse Mercator:	Zone 18N
UTM X (Meters):	426454.47
UTM Y (Meters):	4398788.83

ELEVATION:

Elevation:	72.001 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH SUBJECT PROPERTY:

Subject Property Map: 39075f7 NEWARK WEST, MD
Most Recent Revision: No Available Data.

Subject Property Map: 39075f8 BAY VIEW, MD
Most Recent Revision: 2016

No Mapped Sites

SUBJECT PROPERTY SEARCH RESULTS:

The subject property was not listed in any of the databases searched by Envirosite Corporation.

SEARCH RESULTS:

Following sites were unable to be mapped.

SITE NAME:	ADDRESS, CITY, ZIP:	DATABASE(S):
BELLA MUSHROOM FARMS	RR 1 BOX 165B, LANDENBERG 19350	EFACTS ENV Remediation - PA
CHESTER HILLS FARM	WICKERTON RD, LANDENBERG 19350	EFACTS ENV Remediation - PA
CURTIS GREER FARM	PENN GREEN RD, LANDENBERG 19350	EFACTS ENV Remediation - PA
CVS PHARMACY 7183	730 NEWARK RD, LANDENBERG 19350	BRS, RCRA_LQG
EASTERN SHORE NATURAL GAS LONDON...	LONDONDERRY TWP	EFACTS - PA, FRS
ESNG PIPELINE SEGMENTS 1 AND 1A	HIGHLAND TWP	EFACTS - PA
FISHER'S SANITARY SERVICE	RR 1, KUTZTOWN 19350	EFACTS - PA
GIOFFREDI MUSHROOMS INC	PENN GREEN RD, LANDENBERG 19350	EFACTS ENV Remediation - PA
LANDENBURG	1/4 MI S OF NEWARK &..., LANDENBERG 19350	EFACTS ENV Remediation - PA, LUST - PA
LAWRENCE FARM	RR 1 BOX 185, LANDENBERG 19350	EFACTS - PA
LEONE PIZZINI & SON	RR 1 BOX 96, LANDENBERG 19350	EFACTS ENV Remediation - PA
LOT B5 - NICHOLS SUBD	WALKER RD, LANDENBERG 19350	EFACTS - PA
MACKIE PROPERTY DEV	PEACEDALE RD, LANDENBERG 19350	EFACTS - PA
MANFREDINI MUSHROOM FARM	PENN GREEN RD, LANDENBERG 19350	EFACTS ENV Remediation - PA
SARANA PROPERTY	PA SR 841, LANDENBERG 19350	EFACTS - PA
SCHADD POND PESTICIDES	107 LAVENDER LANE, LANDENBERG 19350	EFACTS - PA
TIMBAR PKG AND DISPLAY	COMMERCE ST, NEW OXFORD 19350	AST - PA
TUTTLE & MANET	399C FLEETWOOD RD, COATESVILLE 19350	RCRA_NONGEN
US POSTAL SVC	PENN GREEN RD, LANDENBERG 19350	EFACTS ENV Remediation - PA

DATABASE(S) WITH NO MAPPED SITES:

FEDERAL RCRA NON-CORRACTS TSD FACILITIES LIST

ARCHIVED RCRA TSDF	Archived Resource Conservation and Recovery Act: Treatment Storage and Disposal Facilities
RCRA_TSDF	Resource Conservation and Recovery Act: Treatment Storage and Disposal Facilities

FEDERAL CERCLIS LIST

CERCLIS NFRAP	Comprehensive Environmental Response Compensation and Liability Act No Further Remedial Action Planned
CERCLIS-HIST	Comprehensive Environmental Response Compensation and Liability Act
FEDERAL FACILITY	Federal Facility sites
SEMS_8R_ACTIVE SITES	Sites on SEMS Active Site Inventory
SEMS_8R_ARCHIVED SITES	Sites on SEMS Archived Site Inventory

FEDERAL RCRA CORRACTS FACILITIES LIST

CORRACTS	Hazardous Waste Corrective Action

FEDERAL DELISTED NPL SITE LIST

DELISTED NPL	Delisted National Priority List
DELISTED PROPOSED NPL	Delisted proposed National Priority List
SEMS_DELETED NPL	Sites Deleted from National Priorities List

FEDERAL ERNS LIST

ERNS	Emergency Response Notification System

FEDERAL INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES

FED E C	Engineering Controls
FED I C	Institutional Controls
RCRA IC_EC	RCRA sites with Institutional and Engineering Controls
E C - PA	Engineering Controls
I C - PA	Institutional Controls

FEDERAL NPL SITE LIST

NPL	National Priority List
NPL EPA R1 GIS	GIS for EPA Region 1 NPL
NPL EPA R6 GIS	GIS for EPA Region 6 NPL
NPL EPA R8 GIS	GIS for EPA Region 8 NPL
NPL EPA R9 GIS	GIS for EPA Region 9 NPL
NPL LIENS	National Priority List Liens
PART NPL	Part National Priority List
PROPOSED NPL	Proposed National Priority List
SEMS_FINAL NPL	Sites included on the Final National Priorities List
SEMS_PROPOSED NPL	Sites Proposed to be Added to the National Priorities List

FEDERAL RCRA GENERATORS LIST

RCRA_CESQG	Resource Conservation and Recovery Act_Conditionally Exempt Small Quantity Generators
RCRA_FULL_DETAIL	Resource Conservation and Recovery Act_Full detail
RCRA_LQG	Resource Conservation and Recovery Act_ Large Quantity Generators
RCRA_NONGEN	Resource Conservation and Recovery Act_Non Generators
RCRA_SQG	Resource Conservation and Recovery Act_Small Quantity Generators

STATE AND TRIBAL REGISTERED STORAGE TANK LISTS

FEMA UST	FEMA Underground Storage Tanks
INDIAN UST R1	Underground Storage Tanks on Indian Land in EPA Region 1
INDIAN UST R10	Underground Storage Tanks on Indian Land in EPA Region 10
INDIAN UST R2	Underground Storage Tanks on Indian Land in EPA Region 2
INDIAN UST R4	Underground Storage Tanks on Indian Land in EPA Region 4
INDIAN UST R5	Underground Storage Tanks on Indian Land in EPA Region 5
INDIAN UST R6	Underground Storage Tanks on Indian Land in EPA Region 6
INDIAN UST R7	Underground Storage Tanks on Indian Land in EPA Region 7
INDIAN UST R8	Underground Storage Tanks on Indian Land in EPA Region 8
INDIAN UST R9	Underground Storage Tanks on Indian Land in EPA Region 9
AST - PA	Aboveground Storage Tanks
UST - PA	Underground Storage Tanks

RECORDS OF EMERGENCY RELEASE REPORTS

HMIRS (DOT)	Hazardous Materials Information Reporting Systems

STATE AND TRIBAL LEAKING STORAGE TANK LISTS

INDIAN LUST R1	Leaking Underground Storage Tanks on Indian Land in EPA Region 1
INDIAN LUST R10	Leaking Underground Storage Tanks on Indian Land in EPA Region 10
INDIAN LUST R2	Leaking Underground Storage Tanks on Indian Land in EPA Region 2
INDIAN LUST R4	Leaking Underground Storage Tanks on Indian Land in EPA Region 4
INDIAN LUST R5	Leaking Underground Storage Tanks on Indian Land in EPA Region 5
INDIAN LUST R6	Leaking Underground Storage Tanks on Indian Land in EPA Region 6
INDIAN LUST R7	Leaking Underground Storage Tanks on Indian Land in EPA Region 7
INDIAN LUST R8	Leaking Underground Storage Tanks on Indian Land in EPA Region 8
INDIAN LUST R9	Leaking Underground Storage Tanks on Indian Land in EPA Region 9
LAST - PA	Leaking Aboveground Storage Tanks
LUST - PA	Leaking Underground Storage Tanks
URLT - PA	Unregulated Leaking Tanks

STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS

ABANDONED LF - PA	Abandoned Landfill

STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS *(cont.)*

HIST LF INVENTORY - PA	Historical Landfills
INACTIVE LF - PA	Inactive Land Fills
SWF/LF - PA	Solid Waste Facilities and Landfills

STATE- AND TRIBAL - EQUIVALENT CERCLIS

HSCA - PA	Hazardous Site Cleanup Act
HSCA REM - PA	Hazardous Site Cleanup Act Remediation

STATE AND TRIBAL VOLUNTARY CLEANUP SITES

VCP - PA	Voluntary Cleanup Program

OTHER ASCERTAINABLE RECORDS

CORRECTIVE ACTIONS_2020	Wastes - Hazardous Waste - Corrective Action

LOCAL LISTS OF LANDFILL / SOLID WASTE DISPOSAL SITES

DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Sites
INDIAN ODI R8	Open Dump Inventory
ODI	Open Dump Inventory
TRIBAL ODI	Indian Open Dump Inventory Sites

LOCAL LISTS OF HAZARDOUS WASTE / CONTAMINATED SITES

FED CDL	DOJ Clandestine Drug Labs
US HIST CDL	Historical Clandestine Drug Labs

LOCAL BROWNFIELD LISTS

FED BROWNFIELDS	Federal Brownfields
TRIBAL BROWNFIELDS	Tribal Brownfields
BROWNFIELDS - PA	Brownfields

LOCAL LAND RECORDS

LIENS 2	CERCLA Lien Information

RECORDS OF EMERGENCY RELEASE REPORTS

SPILLS - PA	Chemical Spills

OTHER ASCERTAINABLE RECORDS

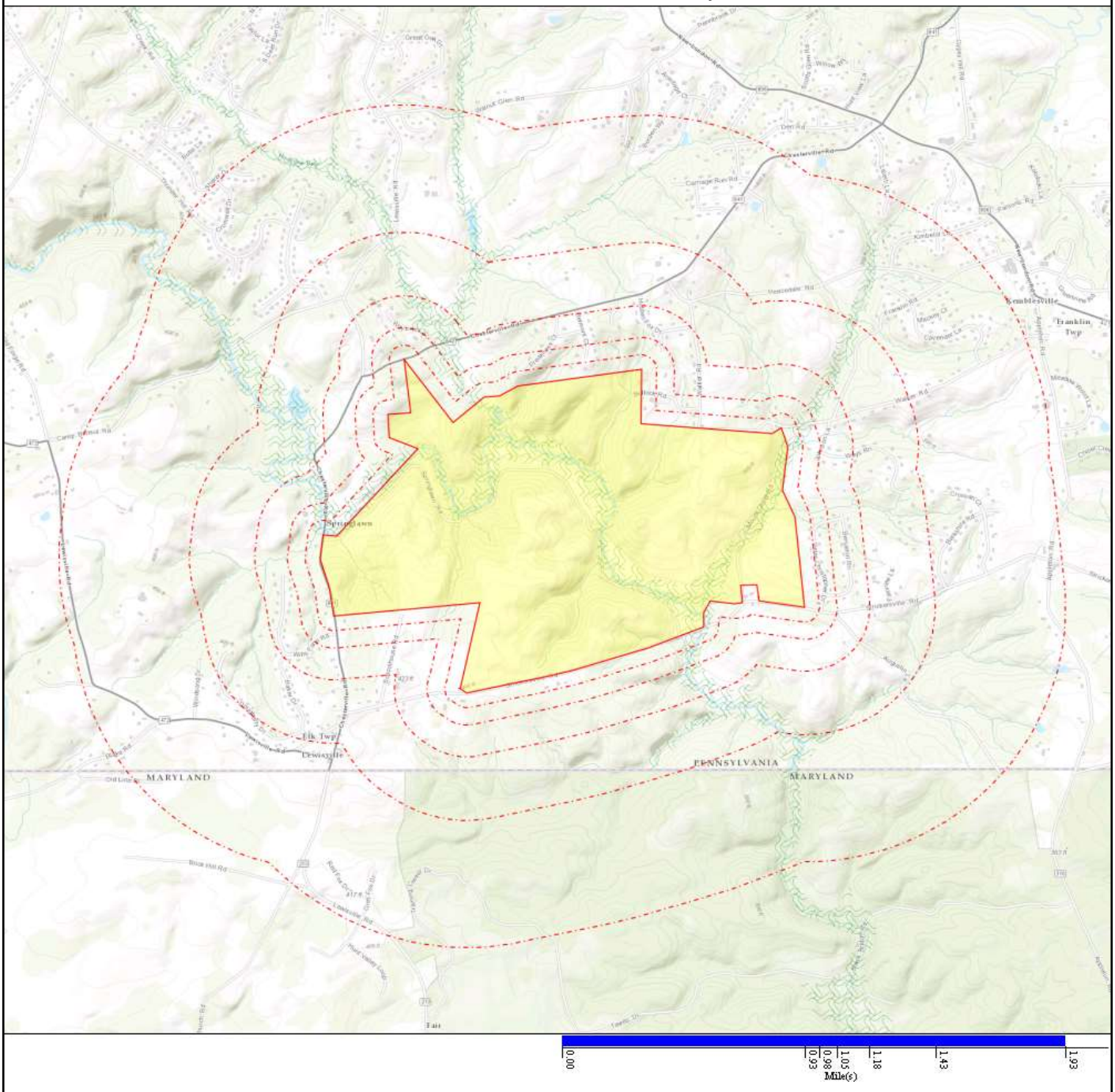
AFS	Air Facility Systems
BRS	Biennial Reporting Systems
CDC HAZDAT	Hazardous Substance Release and Health Effects Information
COAL ASH DOE	Coal Ash: Department of Energy
COAL ASH EPA	Coal Ash: Environmental Protection Agency
COAL GAS	Coal Gas Plants
CONSENT (DECREES)	Superfund Consent Decree
DIGITAL OBSTACLE	Obstacles of interest to aviation users
DOD	Department of Defense
DOT OPS	Department of Transportation Office of Pipeline Safety
ECHO	EPA Enforcement and Compliance History Online
ENOI	Electronic Notice of Intent
FA HWF	Financial Assurance for Hazardous Waste Facilities
FEDLAND	Federal Lands
FRS	Facility Index Systems
FTTS	FIFRA/TSCA Tracking System
FTTS INSP	FIFRA/TSCA Tracking System: Inspections
FUDS	Formerly Used Defense Sites
ICIS	Integrated Compliance Information System
INDIAN RESERVATION	Indian Reservations
LEAD_SMELTER	Lead Smelter Sites
LUCIS	Land Use Control Information Systems
MINES	Mines
MLTS	Material Licensing Tracking Systems

OTHER ASCERTAINABLE RECORDS *(cont.)*

NPL AOC	Areas related to NPL remediation sites
OSHA	Occupational Safety & Health Administration
PADS	PCB Activity Database Systems
PCB TRANSFORMER	Polychlorinated Biphenyls Transformers
RAATS	RCRA Administrative Action Tracking Systems
RADINFO	Radiation Information Systems
RMP	Risk Management Plans
ROD	Record of Decision
SCRD DRYCLEANERS	SCRD Drycleaners
SEMS_SMELTER	Sites on SEMS Potential Smelter Activity
SSTS	Section 7 Tracking Systems
TOSCA-CHEMICAL	Toxic Substance Control Act: Chemicals
TOSCA-PLANT	Toxic Substance Control Act: Plants
TRIS	Toxic Release Inventory Systems
UMTRA	Uranium Mill Tailing Sites
ACT 2 DEED - PA	Deed Acknowledgment locations
AIRS - PA	Air Permits
ARCT - PA	Archived Storage Tanks
AUL - PA	Activity Use Limitations
DRYCLEANERS - PA	Drycleaners
EFACTS - PA	Environment Facility Application Compliance Tracking System
EFACTS ENV REMEDIATION - PA	Environmental Cleanup & Brownfields records from the PA eFACTS.
MANIFEST - PA	Manifest information
UIC - PA	Underground Injection Controls

SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

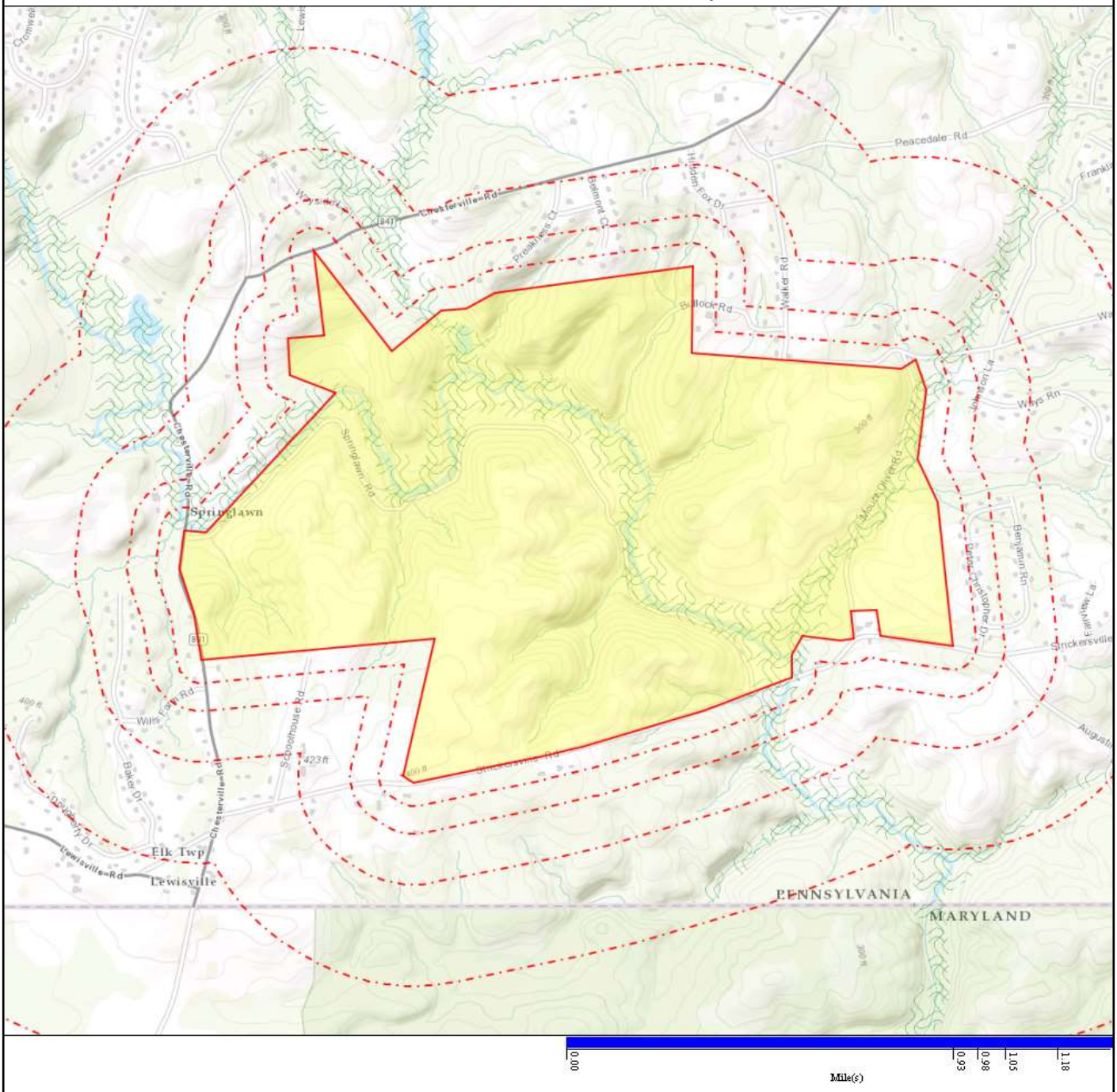
PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: June 19, 2017



- Subject Property
- Department of Defense (No Data)
- FEMA FloodZone 100
- Equal/Higher Elevation
- DFIRM Floodzone 100
- FEMA FloodZone 500 (No Data)
- Lower Elevation
- DFIRM Floodzone 500 (No Data)
- Indian Reservation (No Data)
- CDC HAZDAT (No Data)
- Federal Lands (No Data)
- National Priority List (No Data)

SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: June 19, 2017



DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
FEDERAL RCRA NON-CORRACTS TSD FACILITIES LIST								
ARCHIVED RCRA TSDF		0.500	0	0	0	--	--	0
RCRA_TSDF		0.500	0	0	0	--	--	0
FEDERAL CERCLIS LIST								
CERCLIS NFRAP		0.500	0	0	0	--	--	0
CERCLIS-HIST		0.500	0	0	0	--	--	0
FEDERAL FACILITY		1.000	0	0	0	0	--	0
SEMS_8R_ACTIVE SITES		0.500	0	0	0	--	--	0
SEMS_8R_ARCHIVED SITES		0.500	0	0	0	--	--	0
FEDERAL RCRA CORRACTS FACILITIES LIST								
CORRACTS		1.000	0	0	0	0	--	0
FEDERAL DELISTED NPL SITE LIST								
DELISTED NPL		1.000	0	0	0	0	--	0
DELISTED PROPOSED NPL		1.000	0	0	0	0	--	0
SEMS_DELETED NPL		1.000	0	0	0	0	--	0
FEDERAL ERNS LIST								
ERNS		SP	--	--	--	--	--	0
FEDERAL INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES								
FED E C		0.500	0	0	0	--	--	0
FED I C		0.500	0	0	0	--	--	0
RCRA IC_EC		0.250	0	0	--	--	--	0
E C - PA		0.500	0	0	0	--	--	0
I C - PA		0.500	0	0	0	--	--	0
FEDERAL NPL SITE LIST								
NPL		1.000	0	0	0	0	--	0
NPL EPA R1 GIS		1.000	0	0	0	0	--	0
NPL EPA R6 GIS		1.000	0	0	0	0	--	0
NPL EPA R8 GIS		1.000	0	0	0	0	--	0
NPL EPA R9 GIS		1.000	0	0	0	0	--	0
NPL LIENS		SP	--	--	--	--	--	0
PART NPL		1.000	0	0	0	0	--	0
PROPOSED NPL		1.000	0	0	0	0	--	0
SEMS_FINAL NPL		1.000	0	0	0	0	--	0
SEMS_PROPOSED NPL		1.000	0	0	0	0	--	0

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
FEDERAL RCRA GENERATORS LIST								
RCRA_CESQG		0.250	0	0	--	--	--	0
RCRA_FULL_DETAIL		0.250	0	0	--	--	--	0
RCRA_LQG		0.250	0	0	--	--	--	0
RCRA_NONGEN		0.250	0	0	--	--	--	0
RCRA_SQG		0.250	0	0	--	--	--	0
STATE AND TRIBAL REGISTERED STORAGE TANK LISTS								
FEMA UST		0.250	0	0	--	--	--	0
INDIAN UST R1		0.250	0	0	--	--	--	0
INDIAN UST R10		0.250	0	0	--	--	--	0
INDIAN UST R2		0.250	0	0	--	--	--	0
INDIAN UST R4		0.250	0	0	--	--	--	0
INDIAN UST R5		0.250	0	0	--	--	--	0
INDIAN UST R6		0.250	0	0	--	--	--	0
INDIAN UST R7		0.250	0	0	--	--	--	0
INDIAN UST R8		0.250	0	0	--	--	--	0
INDIAN UST R9		0.250	0	0	--	--	--	0
AST - PA		0.250	0	0	--	--	--	0
UST - PA		0.250	0	0	--	--	--	0
RECORDS OF EMERGENCY RELEASE REPORTS								
HMIRS (DOT)		SP	--	--	--	--	--	0
STATE AND TRIBAL LEAKING STORAGE TANK LISTS								
INDIAN LUST R1		0.500	0	0	0	--	--	0
INDIAN LUST R10		0.500	0	0	0	--	--	0
INDIAN LUST R2		0.500	0	0	0	--	--	0
INDIAN LUST R4		0.500	0	0	0	--	--	0
INDIAN LUST R5		0.500	0	0	0	--	--	0
INDIAN LUST R6		0.500	0	0	0	--	--	0
INDIAN LUST R7		0.500	0	0	0	--	--	0
INDIAN LUST R8		0.500	0	0	0	--	--	0
INDIAN LUST R9		0.500	0	0	0	--	--	0
LAST - PA		0.500	0	0	0	--	--	0
LUST - PA		0.500	0	0	0	--	--	0
URLT - PA		0.500	0	0	0	--	--	0

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS								
ABANDONED LF - PA		0.500	0	0	0	--	--	0
HIST LF INVENTORY - PA		0.500	0	0	0	--	--	0
INACTIVE LF - PA		0.500	0	0	0	--	--	0
SWF/LF - PA		0.500	0	0	0	--	--	0
STATE- AND TRIBAL - EQUIVALENT CERCLIS								
HSCA - PA		1.000	0	0	0	0	--	0
HSCA REM - PA		1.000	0	0	0	0	--	0
STATE AND TRIBAL VOLUNTARY CLEANUP SITES								
VCP - PA		0.500	0	0	0	--	--	0
OTHER ASCERTAINABLE RECORDS								
CORRECTIVE ACTIONS_2020		0.500	0	0	0	--	--	0
LOCAL LISTS OF LANDFILL / SOLID WASTE DISPOSAL SITES								
DEBRIS REGION 9		0.500	0	0	0	--	--	0
INDIAN ODI R8		0.500	0	0	0	--	--	0
ODI		0.500	0	0	0	--	--	0
TRIBAL ODI		0.500	0	0	0	--	--	0
LOCAL LISTS OF HAZARDOUS WASTE / CONTAMINATED SITES								
FED CDL		SP	--	--	--	--	--	0
US HIST CDL		SP	--	--	--	--	--	0
LOCAL BROWNFIELD LISTS								
FED BROWNFIELDS		0.500	0	0	0	--	--	0
TRIBAL BROWNFIELDS		0.500	0	0	0	--	--	0
BROWNFIELDS - PA		0.500	0	0	0	--	--	0
LOCAL LAND RECORDS								
LIENS 2		SP	--	--	--	--	--	0
RECORDS OF EMERGENCY RELEASE REPORTS								
SPILLS - PA		0.125	0	--	--	--	--	0
OTHER ASCERTAINABLE RECORDS								
AFS		SP	--	--	--	--	--	0
BRS		SP	--	--	--	--	--	0
CDC HAZDAT		SP	--	--	--	--	--	0
COAL ASH DOE		0.500	0	0	0	--	--	0

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
OTHER ASCERTAINABLE RECORDS *(cont.)*								
COAL ASH EPA		0.500	0	0	0	--	--	0
COAL GAS		1.000	0	0	0	0	--	0
CONSENT (DECREES)		1.000	0	0	0	0	--	0
DIGITAL OBSTACLE		1.000	0	0	0	0	--	0
DOD		1.000	0	0	0	0	--	0
DOT OPS		SP	--	--	--	--	--	0
ECHO		SP	--	--	--	--	--	0
ENOI		SP	--	--	--	--	--	0
FA HWF		SP	--	--	--	--	--	0
FEDLAND		1.000	0	0	0	0	--	0
FRS		SP	--	--	--	--	--	0
FTTS		SP	--	--	--	--	--	0
FTTS INSP		SP	--	--	--	--	--	0
FUDS		1.000	0	0	0	0	--	0
ICIS		SP	--	--	--	--	--	0
INDIAN RESERVATION		1.000	0	0	0	0	--	0
LEAD_SMELTER		SP	--	--	--	--	--	0
LUCIS		0.500	0	0	0	--	--	0
MINES		0.250	0	0	--	--	--	0
MLTS		SP	--	--	--	--	--	0
NPL AOC		1.000	0	0	0	0	--	0
OSHA		SP	--	--	--	--	--	0
PADS		SP	--	--	--	--	--	0
PCB TRANSFORMER		SP	--	--	--	--	--	0
RAATS		SP	--	--	--	--	--	0
RADINFO		SP	--	--	--	--	--	0
RMP		0.500	0	0	0	--	--	0
ROD		1.000	0	0	0	0	--	0
SCRD DRYCLEANERS		0.250	0	0	--	--	--	0
SEMS_SMELTER		SP	--	--	--	--	--	0
SSTS		SP	--	--	--	--	--	0
TOSCA-CHEMICAL		SP	--	--	--	--	--	0
TOSCA-PLANT		SP	--	--	--	--	--	0
TRIS		SP	--	--	--	--	--	0
UMTRA		0.500	0	0	0	--	--	0
ACT 2 DEED - PA		0.500	0	0	0	--	--	0

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
OTHER ASCERTAINABLE RECORDS *(cont.)*								
AIRS - PA		SP	--	--	--	--	--	0
ARCT - PA		0.250	0	0	--	--	--	0
AUL - PA		0.500	0	0	0	--	--	0
DRYCLEANERS - PA		0.250	0	0	--	--	--	0
EFACTS - PA		0.500	0	0	0	--	--	0
EFACTS ENV REMEDIATION - PA		0.500	0	0	0	--	--	0
MANIFEST - PA		0.250	0	0	--	--	--	0
UIC - PA		SP	--	--	--	--	--	0

ENVIROSITE ID:	NAME:	ADDRESS:	CITY:	ZIP:	DATABASE(S):
333967915	BELLA MUSHROOM FARMS	RR 1 BOX 165B	LANDENBERG	19350	EFACTS ENV Remediation - PA
333979956	CHESTER HILLS FARM	WICKERTON RD	LANDENBERG	19350	EFACTS ENV Remediation - PA
333985364	CURTIS GREER FARM	PENN GREEN RD	LANDENBERG	19350	EFACTS ENV Remediation - PA
337158209	CVS PHARMACY 7183	730 NEWARK RD	LANDENBERG	19350	BRS, RCRA_LQG
27229570	EASTERN SHORE NATURAL GAS LONDONDERRY	LONDONDERRY TWP			EFACTS - PA, FRS
340646551	ESNG PIPELINE SEGMENTS 1 AND 1A	HIGHLAND TWP			EFACTS - PA
342441041	FISHER'S SANITARY SERVICE	RR 1	KUTZTOWN	19350	EFACTS - PA
334004298	GIOFFREDI MUSHROOMS INC	PENN GREEN RD	LANDENBERG	19350	EFACTS ENV Remediation - PA
325968271	LANDENBURG	1/4 MI S OF NEWARK & SUNNY DELL	LANDENBERG	19350	EFACTS ENV Remediation - PA, LUST - PA
340698288	LAWRENCE FARM	RR 1 BOX 185	LANDENBERG	19350	EFACTS - PA
334019343	LEONE PIZZINI & SON	RR 1 BOX 96	LANDENBERG	19350	EFACTS ENV Remediation - PA
340709978	LOT B5 - NICHOLS SUBD	WALKER RD	LANDENBERG	19350	EFACTS - PA
340681149	MACKIE PROPERTY DEV	PEACEDALE RD	LANDENBERG	19350	EFACTS - PA
333994553	MANFREDINI MUSHROOM FARM	PENN GREEN RD	LANDENBERG	19350	EFACTS ENV Remediation - PA
340752986	SARANA PROPERTY	PA SR 841	LANDENBERG	19350	EFACTS - PA
340718950	SCHADD POND PESTICIDES	107 LAVENDER LANE	LANDENBERG	19350	EFACTS - PA
1234781	TIMBAR PKG AND DISPLAY	COMMERCE ST	NEW OXFORD	19350	AST - PA
14510083	TUTTLE & MANET	399C FLEETWOOD RD	COATESVILLE	19350	RCRA_NONGEN
334035376	US POSTAL SVC	PENN GREEN RD	LANDENBERG	19350	EFACTS ENV Remediation - PA

FEDERAL RCRA NON-CORRACTS TSD FACILITIES LIST

ARCHIVED RCRA TSDF: Resource Conservation and Recovery Act hazardous waste transportation storage disposal and treatment facilities

Agency Version Date: 03/20/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 06/09/2017

RCRA_TSDF: Resource Conservation and Recovery Act hazardous waste transportation storage disposal and treatment facilities

Agency Version Date: 03/20/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 06/09/2017

FEDERAL CERCLIS LIST

CERCLIS NFRAP: The CERCLIS sites with No Further Remedial Action Planned from the CERCLIS program database. The Environmental Protection Agency decommissioned the CERCLIS data in 2014. The last update was November 12, 2013.

Agency Version Date: 11/16/2016
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 06/06/2017

CERCLIS-HIST: The CERCLIS program database contains information on the assessment and remediation of federal hazardous waste sites. The Environmental Protection Agency decommissioned the CERCLIS data in 2014. The last update was November 12, 2013.

Agency Version Date: 11/15/2016
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 06/06/2017

FEDERAL FACILITY: Sites where Federal Facilities Restoration and Reuse Office (FFRRO) arranged cleanup for Base Closure and Property Transfer at Federal Facilities

Agency Version Date: 03/28/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8712
Most Recent Contact: 06/06/2017

SEMS_8R_ACTIVE SITES: The Active Site Inventory Report displays site and location information at active SEMS sites. An active site is one at which site assessment, removal, remedial, enforcement, cost recovery, or oversight activities are being planned or conducted. NPL sites include latitude and longitude information. For non-NPL sites, a brief site status is provided.

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

SEMS_8R_ARCHIVED SITES: The Archived Site Inventory displays site and location information at sites archived from SEMS. An archived site is one at which EPA has determined that assessment has been completed and no further remedial action is planned under the Superfund program at this time.

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

FEDERAL RCRA CORRACTS FACILITIES LIST

CORRACTS: List of facilities where Resource Conservation and Recovery Act Corrective Action Program used to investigate and remediate hazardous releases

Agency Version Date: 03/20/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-1667
Most Recent Contact: 06/09/2017

FEDERAL DELISTED NPL SITE LIST

DELISTED NPL: National Priority List of sites that were delisted and no longer require action

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

DELISTED PROPOSED NPL: Sites that have been delisted from the proposed National Priority List

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

SEMS_DELETED NPL: All Deleted National Priority List Sties

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

FEDERAL ERNS LIST

ERNS: Emergency Response Notification System records of reported spills

Agency Version Date: 05/03/2017
Agency Update Frequency: Annually
Planned Next Contact: 07/12/2017
Agency: National Response Center United States Coast Guard
Agency Contact: N/R
Most Recent Contact: 05/03/2017

FEDERAL INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES

Fed E C: Federal listing of remediation sites with engineering controls

Agency Version Date: 05/17/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/26/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 05/17/2017

Fed I C: Federal listing of remediation sites with institutional controls

Agency Version Date: 05/17/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/26/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 05/17/2017

RCRA IC_EC: Sites with institutional or engineering controls related to Resource Conservation and Recovery Act

Agency Version Date: 03/20/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 06/09/2017

FEDERAL INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES (cont.)

E C - PA: Sites with Engineering Controls

Agency Version Date: 05/05/2017
Agency Update Frequency: No update
Planned Next Contact: 07/14/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 05/05/2017

I C - PA: Sites with Institutional Controls

Agency Version Date: 05/05/2017
Agency Update Frequency: No update
Planned Next Contact: 07/14/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 05/05/2017

FEDERAL NPL SITE LIST

NPL: List of priority contaminated sites among identified releases or threatened releases of hazardous substances pollutants or contaminants nationally

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

NPL EPA R1 GIS: Geospatial data for the Environmental Protection Agency Region 1 National Priority List subject to environmental regulation

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/06/2017

NPL EPA R6 GIS: Geospatial data for the Environmental Protection Agency Region 6 National Priority List subject to environmental regulation

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/06/2017

NPL EPA R8 GIS: Geospatial data for the Environmental Protection Agency Region 8 National Priority List subject to environmental regulation

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/06/2017

NPL EPA R9 GIS: Geospatial data for the Environmental Protection Agency Region 9 National Priority List subject to environmental regulation

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/06/2017

NPL LIENS: National Priority List of sites with Liens

Agency Version Date: 01/19/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/11/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 04/14/2017

FEDERAL NPL SITE LIST (cont.)

PART NPL: Sites that are a part of an National Priority List site referred to as the parent site

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

PROPOSED NPL: Sites that have been proposed for the National Priority List

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

SEMS_FINAL NPL: All Included National Priority List Sites

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

SEMS_PROPOSED NPL: All Proposed National Priority List Sites

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

FEDERAL RCRA GENERATORS LIST

RCRA_CESQG: Resource Conservation and Recovery Act listing of licensed conditionally exempt small quantity generators

Agency Version Date: 03/20/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 06/09/2017

RCRA_FULL_DETAIL: Full detail of related sites to the Resource Conservation and Recovery Act

Agency Version Date: 03/20/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 06/09/2017

RCRA_LQG: Resource Conservation and Recovery Act listing of licensed large quantity generators

Agency Version Date: 03/20/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 06/09/2017

RCRA_NONGEN: Resource Conservation and Recovery Act listing of licensed non-generators

Agency Version Date: 03/20/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 06/09/2017

RCRA_SQG: Resource Conservation and Recovery Act listing of licensed small quantity generators

Agency Version Date: 03/20/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 06/09/2017

STATE AND TRIBAL REGISTERED STORAGE TANK LISTS

FEMA UST: FEMA underground storage tank listing

Agency Version Date: 05/25/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/08/2017
Agency: FEMA
Agency Contact: 202-212-5283
Most Recent Contact: 05/12/2017

INDIAN UST R1: Underground Storage Tanks on Indian Land in EPA Region 1

Agency Version Date: 04/18/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 06/27/2017
Agency: U.S. Environmental Protection Agency Region 1
Agency Contact: 855-246-3642
Most Recent Contact: 04/18/2017

INDIAN UST R10: Underground Storage Tanks on Indian Land in EPA Region 10

Agency Version Date: 05/25/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/03/2017
Agency: U.S. Environmental Protection Agency Region 10
Agency Contact: 855-246-3642
Most Recent Contact: 05/25/2017

INDIAN UST R2: Underground Storage Tanks on Indian Land in EPA Region 2

Agency Version Date: 04/24/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/03/2017
Agency: U.S. Environmental Protection Agency Region 2
Agency Contact: 855-246-3642
Most Recent Contact: 04/24/2017

INDIAN UST R4: Underground Storage Tanks on Indian Land in EPA Region 4

Agency Version Date: 05/15/2017
Agency Update Frequency: Semi Annually
Planned Next Contact: 07/24/2017
Agency: U.S. Environmental Protection Agency Region 4
Agency Contact: 855-246-3642
Most Recent Contact: 05/15/2017

INDIAN UST R5: Underground Storage Tanks on Indian Land in EPA Region 5

Agency Version Date: 05/04/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/13/2017
Agency: U.S. Environmental Protection Agency Region 5
Agency Contact: 855-246-3642
Most Recent Contact: 05/04/2017

INDIAN UST R6: Underground Storage Tanks on Indian Land in EPA Region 6

Agency Version Date: 05/18/2017
Agency Update Frequency: Semi Annually
Planned Next Contact: 07/27/2017
Agency: U.S. Environmental Protection Agency Region 6
Agency Contact: 855-246-3642
Most Recent Contact: 05/18/2017

INDIAN UST R7: Underground Storage Tanks on Indian Land in EPA Region 7

Agency Version Date: 11/21/2016
Agency Update Frequency: Varies
Planned Next Contact: 07/13/2017
Agency: U.S. Environmental Protection Agency Region 7
Agency Contact: 855-246-3642
Most Recent Contact: 05/04/2017

INDIAN UST R8: Underground Storage Tanks on Indian Land in EPA Region 8

Agency Version Date: 04/17/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 06/26/2017
Agency: U.S. Environmental Protection Agency Region 8
Agency Contact: 855-246-3642
Most Recent Contact: 04/17/2017

STATE AND TRIBAL REGISTERED STORAGE TANK LISTS (cont.)

INDIAN UST R9: Underground Storage Tanks on Indian Land in EPA Region 9

Agency Version Date: 04/17/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 06/26/2017
Agency: U.S. Environmental Protection Agency Region 9
Agency Contact: 855-246-3642
Most Recent Contact: 04/17/2017

AST - PA: Registered Aboveground Storage Tanks

Agency Version Date: 04/25/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/04/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 772-5599
Most Recent Contact: 04/25/2017

UST - PA: Registered Underground Storage Tanks

Agency Version Date: 04/25/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/04/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 772-5599
Most Recent Contact: 04/25/2017

RECORDS OF EMERGENCY RELEASE REPORTS

HMIRS (DOT): Hazardous Material spills reported by the Department of Transportation

Agency Version Date: 03/22/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/09/2017
Agency: U.S. Department of Transportation
Agency Contact: (202) 366-4996
Most Recent Contact: 05/31/2017

STATE AND TRIBAL LEAKING STORAGE TANK LISTS

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land in EPA Region 1

Agency Version Date: 04/18/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 06/27/2017
Agency: U.S. Environmental Protection Agency Region 1
Agency Contact: 855-246-3642
Most Recent Contact: 04/18/2017

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land in EPA Region 10

Agency Version Date: 05/15/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/24/2017
Agency: U.S. Environmental Protection Agency Region 10
Agency Contact: 855-246-3642
Most Recent Contact: 05/15/2017

INDIAN LUST R2: Leaking Underground Storage Tanks on Indian Land in EPA Region 2

Agency Version Date: 04/25/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/04/2017
Agency: U.S. Environmental Protection Agency Region 2
Agency Contact: 855-246-3642
Most Recent Contact: 04/25/2017

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land in EPA Region 4

Agency Version Date: 05/15/2017
Agency Update Frequency: Semi Annually
Planned Next Contact: 07/24/2017
Agency: U.S. Environmental Protection Agency Region 4
Agency Contact: 855-246-3642
Most Recent Contact: 05/15/2017

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land in EPA Region 5

Agency Version Date: 05/04/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/13/2017
Agency: U.S. Environmental Protection Agency Region 5
Agency Contact: 855-246-3642
Most Recent Contact: 05/04/2017

STATE AND TRIBAL LEAKING STORAGE TANK LISTS (cont.)

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land in EPA Region 6

Agency Version Date: 05/08/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/17/2017
Agency: U.S. Environmental Protection Agency Region 6
Agency Contact: 855-246-3642
Most Recent Contact: 05/08/2017

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land in EPA Region 7

Agency Version Date: 09/13/2016
Agency Update Frequency: Varies
Planned Next Contact: 07/13/2017
Agency: U.S. Environmental Protection Agency Region 7
Agency Contact: 855-246-3642
Most Recent Contact: 05/04/2017

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land in EPA Region 8

Agency Version Date: 05/05/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/14/2017
Agency: U.S. Environmental Protection Agency Region 8
Agency Contact: 855-246-3642
Most Recent Contact: 05/05/2017

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land in EPA Region 9

Agency Version Date: 04/17/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 06/26/2017
Agency: U.S. Environmental Protection Agency Region 9
Agency Contact: 855-246-3642
Most Recent Contact: 04/17/2017

LAST - PA: Leaking Aboveground Storage Tanks

Agency Version Date: 04/25/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/04/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 04/25/2017

LUST - PA: Leaking Underground Storage Tanks

Agency Version Date: 04/25/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/04/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 04/25/2017

URLT - PA: Unregulated Tanks with leaks

Agency Version Date: 04/25/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/04/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 04/25/2017

STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS

ABANDONED LF - PA: Landfills that have been abandoned listed in the Abandoned Landfill Inventory

Agency Version Date: 01/04/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/14/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 787-7381
Most Recent Contact: 04/18/2017

HIST LF INVENTORY - PA: Listing of Historical landfills

Agency Version Date: 12/28/2016
Agency Update Frequency: No update
Planned Next Contact: 06/23/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 787-7381
Most Recent Contact: 03/28/2017

STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS (cont.)

INACTIVE LF - PA: Inactive Landfills

Agency Version Date: 01/04/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/14/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 787-7381
Most Recent Contact: 04/18/2017

SWF/LF - PA: State Landfill Sites

Agency Version Date: 01/04/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/14/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 787-7381
Most Recent Contact: 04/18/2017

STATE- AND TRIBAL - EQUIVALENT CERCLIS

HSCA - PA: Sites listed in the Hazardous Site Cleanup

Agency Version Date: 05/05/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/14/2017
Agency: Department of Environmental Protection
Agency Contact: N/R
Most Recent Contact: 05/05/2017

HSCA REM - PA: Sites under the HSCA that are designated as Remedial Response

Agency Version Date: 05/05/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/14/2017
Agency: Department of Environmental Protection
Agency Contact: N/R
Most Recent Contact: 05/05/2017

STATE AND TRIBAL VOLUNTARY CLEANUP SITES

VCP - PA: Voluntary Cleanup Program Sites

Agency Version Date: 03/28/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 06/06/2017

OTHER ASCERTAINABLE RECORDS

Corrective Actions_2020: The RCRA cleanup baseline includes facilities expected to need corrective action.

Agency Version Date: 03/20/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/18/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: N/R
Most Recent Contact: 06/09/2017

LOCAL LISTS OF LANDFILL / SOLID WASTE DISPOSAL SITES

DEBRIS REGION 9: Torres Martinez Reservation illegal dump site listing

Agency Version Date: 03/29/2017
Agency Update Frequency: Varies
Planned Next Contact: 06/23/2017
Agency: U.S. Environmental Protection Agency Region 9
Agency Contact: 855-246-3642
Most Recent Contact: 03/28/2017

INDIAN ODI R8: Region 8 Indian land open dump inventory sites mainted within the STARS program

Agency Version Date: 01/04/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/10/2017
Agency: Indian Health Service
Agency Contact: 855-246-3642
Most Recent Contact: 05/01/2017

LOCAL LISTS OF LANDFILL / SOLID WASTE DISPOSAL SITES (cont.)

ODI: Open dump inventory sites

Agency Version Date: 03/07/2017
Agency Update Frequency: No Update
Planned Next Contact: 07/25/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 855-246-3642
Most Recent Contact: 05/16/2017

TRIBAL ODI: Indian land open dump inventory for all regions

Agency Version Date: 05/18/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/27/2017
Agency: Indian Health Service
Agency Contact: 301-443-3593
Most Recent Contact: 05/18/2017

LOCAL LISTS OF HAZARDOUS WASTE / CONTAMINATED SITES

FED CDL: The U.S. Department of Justice listing of clandestine drug lab locations

Agency Version Date: 04/17/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 06/26/2017
Agency: U.S. Department of Justice
Agency Contact: 202-307-7610
Most Recent Contact: 04/17/2017

US HIST CDL: The U.S. Department of Justice historical listing of clandestine drug lab locations

Agency Version Date: 04/17/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 06/26/2017
Agency: U.S. Department of Justice
Agency Contact: 202-307-7610
Most Recent Contact: 04/17/2017

LOCAL BROWNFIELD LISTS

Fed Brownfields: Federal brownfield remediation sites

Agency Version Date: 04/25/2017
Agency Update Frequency: Semi Annually
Planned Next Contact: 07/04/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 855-246-3642
Most Recent Contact: 04/25/2017

TRIBAL BROWNFIELDS: Tribal brownfield remediation site listing

Agency Version Date: 03/07/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/28/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 855-246-3642
Most Recent Contact: 05/01/2017

BROWNFIELDS - PA: Locations determined to be Brownfield Sites

Agency Version Date: 05/19/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/28/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 05/19/2017

LOCAL LAND RECORDS

LIENS 2: Comprehensive Environmental Response Compensation and Liability Act sites with liens

Agency Version Date: 05/11/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/04/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 04/07/2017

RECORDS OF EMERGENCY RELEASE REPORTS

SPILLS - PA: Listing of Hazardous Material spills/releases reported in the Hazardous Material Logbook

Agency Version Date: 05/05/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/14/2017
Agency: Department of Environmental Protection
Agency Contact: N/R
Most Recent Contact: 05/05/2017

OTHER ASCERTAINABLE RECORDS

AFS: Air Facility Systems Quarterly Extract

Agency Version Date: 12/28/2016
Agency Update Frequency: Quarterly
Planned Next Contact: 06/23/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 03/28/2017

BRS: Reporting of hazardous waste generation and management from large quantity generators

Agency Version Date: 03/20/2017
Agency Update Frequency: Biennial
Planned Next Contact: 08/18/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 06/09/2017

CDC HAZDAT: The Agency for Toxic Substances and Disease Registry's Hazardous Substance Release/Health Effects Database.

Agency Version Date: 06/28/2014
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: Agency for Toxic Substances and Disease Registry
Agency Contact: 770-488-6399
Most Recent Contact: 06/06/2017

COAL ASH DOE: List of existing and planned generators with 1 megawatt or greater of combined capacity that are utilizing coal ash impoundments.

Agency Version Date: 03/23/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/10/2017
Agency: Department of Energy
Agency Contact: (202) 586-8800
Most Recent Contact: 06/01/2017

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

Agency Version Date: 05/08/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/17/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/08/2017

COAL GAS: Manufactured Gas Plant locations

Agency Version Date: 06/28/2014
Agency Update Frequency: Quarterly
Planned Next Contact: 08/07/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 855-246-3642
Most Recent Contact: 05/11/2017

CONSENT (DECREES): Legal decisions regarding responsibility for Superfund locations

Agency Version Date: 03/23/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 06/06/2017

DIGITAL OBSTACLE: The Digital Obstacle File describes all known obstacles of interest to aviation users in the U.S. with limited coverage of the Pacific the Caribbean Canada and Mexico. The obstacles are assigned unique numerical identifiers; accuracy codes and listed in order of ascending latitude within each state or area by FAA Region.

Agency Version Date: 02/16/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/06/2017
Agency: Federal Aviation Administration
Agency Contact: 855-379-6518
Most Recent Contact: 04/27/2017

OTHER ASCERTAINABLE RECORDS (cont.)

DOD: Department of Defense sites

Agency Version Date: 04/03/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 06/06/2017

DOT OPS: Incident Data Report

Agency Version Date: 03/06/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/24/2017
Agency: U.S. Department of Transportation
Agency Contact: (202) 366-4996
Most Recent Contact: 05/15/2017

ECHO: ECHO is EPA Enforcement and Compliance History Online website to search for facilities in your community to assess their compliance with environmental regulations related to CAA, CWA, RCRA, & SDWA.

Agency Version Date: 03/27/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/14/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-1667
Most Recent Contact: 06/05/2017

ENOI: ENOI - EPA Electronic Notice of Intent (eNOI) database contains construction sites industrial facilities pesticides and vessel operators to apply for coverage and submit a variety of other reports electronically required under EPAs Construction Genera

Agency Version Date: 03/10/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/28/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/19/2017

FA HWF: Hazardous Waste Facilities with Financial Assurance

Agency Version Date: 04/11/2017
Agency Update Frequency: Varies
Planned Next Contact: 06/20/2017
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 04/11/2017

FEDLAND: Federal land locations

Agency Version Date: 03/27/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/14/2017
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 06/05/2017

FRS: Facility Registry Systems

Agency Version Date: 03/02/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/20/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/11/2017

FTTS: Tracking of administrative and enforcement activities related to FIFRA/TSCA

Agency Version Date: 05/08/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/04/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 564-2280
Most Recent Contact: 05/08/2017

FTTS INSP: Tracking of inspections related to FIFRA/TSCA

Agency Version Date: 05/08/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/04/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 564-2280
Most Recent Contact: 05/08/2017

OTHER ASCERTAINABLE RECORDS (cont.)

FUDS: Defense sites that require cleanup

Agency Version Date: 05/08/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/17/2017
Agency: US Army Corps of Engineering
Agency Contact: (202) 761-0011
Most Recent Contact: 05/08/2017

ICIS: Comprised of all Federal Administrative and Judicial enforcement information [intended to replace PCS] by tracking enforcement and compliance information (also contains what used to be known as FFTS)

Agency Version Date: 03/28/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 06/06/2017

INDIAN RESERVATION: Indian Reservation sites

Agency Version Date: 05/10/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/19/2017
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 05/10/2017

LEAD_SMELTER: Listing of former Lead Smelter Sites

Agency Version Date: 05/16/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/25/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/16/2017

LUCIS: Land Use Control Information Systems

Agency Version Date: 06/28/2014
Agency Update Frequency: No Longer Maintained
Planned Next Contact: 08/21/2017
Agency: Department of the Navy: BRAC PMO
Agency Contact: (619) 532-0900
Most Recent Contact: 05/24/2017

MINES: Mines Master Index Files

Agency Version Date: 03/27/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/14/2017
Agency: Department of Labor
Agency Contact: (202) 693-9400
Most Recent Contact: 06/05/2017

MLTS: Sites in possession/use of radioactive materials regulated by NRC

Agency Version Date: 11/28/2016
Agency Update Frequency: Varies
Planned Next Contact: 07/24/2017
Agency: Nuclear Regulatory Commission
Agency Contact: (800) 397-4209
Most Recent Contact: 04/27/2017

NPL AOC: Areas of Concern related to NPL remediation sites

Agency Version Date: 04/03/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: Environmental Protection Agency
Agency Contact: N/R
Most Recent Contact: 06/06/2017

OSHA: OSHA's listing of inspections violations and fatality information

Agency Version Date: 03/28/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: Occupational Safety & Health Administration
Agency Contact: 800-321-6742
Most Recent Contact: 06/06/2017

OTHER ASCERTAINABLE RECORDS (cont.)

PADS: Listing of generators transporters commercial store/ brokers and disposers of PCB

Agency Version Date: 04/28/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/07/2017
Agency: Environmental Protection Agency
Agency Contact: (703) 308-8404
Most Recent Contact: 04/28/2017

PCB TRANSFORMER: Registry of PCB's

Agency Version Date: 04/08/2017
Agency Update Frequency: No Update
Planned Next Contact: 08/25/2017
Agency: Environmental Protection Agency
Agency Contact: (703) 308-8404
Most Recent Contact: 06/16/2017

RAATS: Listing of major violators with enforcement actions issued under RCRA. Includes administrative and civil actions filed by the EPA. This dataset is no longer maintained.

Agency Version Date: 03/20/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/18/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 06/09/2017

RADINFO: EPA regulated facilities with radiation and radioactive materials

Agency Version Date: 04/08/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/25/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 06/16/2017

RMP: Facilities producing/handling/ process/ distribute/ store specific chemicals report plans required by the Clean Air Act

Agency Version Date: 01/10/2017
Agency Update Frequency: Monthly
Planned Next Contact: 08/22/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 564-2534
Most Recent Contact: 05/24/2017

ROD: Permanent remedy at an NPL site

Agency Version Date: 04/28/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 06/06/2017

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners

Agency Version Date: 03/09/2017
Agency Update Frequency: No Update
Planned Next Contact: 07/27/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/18/2017

SEMS_SMELTER: This report includes sites that have smelting-related, or potentially smelting-related, indicators in the SEMS database. The report includes information on the site location as well as contaminants of concern.

Agency Version Date: 03/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/15/2017
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/06/2017

SSTS: Tracking of facilities who produce pesticides and their quantity

Agency Version Date: 02/28/2017
Agency Update Frequency: Annually
Planned Next Contact: 02/28/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 02/28/2017

OTHER ASCERTAINABLE RECORDS (cont.)

TOSCA-CHEMICAL: Chemicals controlled by the Toxic Substance Control Act

Agency Version Date: 06/28/2014
Agency Update Frequency: Varies
Planned Next Contact: 07/18/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/09/2017

TOSCA-PLANT: Plants controlled by the Toxic Substance Control Act

Agency Version Date: 03/15/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/02/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/24/2017

TRIS: Information regarding toxic chemicals that are being used/manufactured/ treated/ transported/released into the environment

Agency Version Date: 03/27/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/14/2017
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 06/05/2017

UMTRA: Uranium Recovery Sites

Agency Version Date: 03/27/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/14/2017
Agency: United States Nuclear Regulatory Commission
Agency Contact: (301) 415-8200
Most Recent Contact: 06/05/2017

ACT 2 DEED - PA: Sites listed with Deed Acknowledgment

Agency Version Date: 03/28/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 787-2043
Most Recent Contact: 06/06/2017

AIRS - PA: Permit and Emissions Inventory

Agency Version Date: 09/29/2016
Agency Update Frequency: Annually
Planned Next Contact: 09/13/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-9241
Most Recent Contact: 06/15/2017

ARCT - PA: Aboveground Storage tanks Out of service

Agency Version Date: 04/17/2017
Agency Update Frequency: Varies
Planned Next Contact: 06/26/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 772-5599
Most Recent Contact: 04/17/2017

AUL - PA: Sites with Activity Use Limitation

Agency Version Date: 03/24/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/11/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 06/02/2017

DRYCLEANERS - PA: Dry Cleaning Facilities

Agency Version Date: 03/13/2017
Agency Update Frequency: Varies
Planned Next Contact: 09/01/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 772-9482
Most Recent Contact: 06/05/2017

OTHER ASCERTAINABLE RECORDS (cont.)

EFACTS - PA: Environment Facility Application Compliance Tracking System

Agency Version Date: 12/21/2016
Agency Update Frequency: Quarterly
Planned Next Contact: 07/18/2017
Agency: PA Department of Environmental Protection
Agency Contact: N/R
Most Recent Contact: 05/09/2017

EFACTS ENV Remediation - PA: Environmental Cleanup & Brownfields records from the PA eFACTS (Environment Facility Application Compliance Tracking System).

Agency Version Date: 02/21/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/11/2017
Agency: PA Department of Environmental Protection
Agency Contact: 360.902.1452
Most Recent Contact: 05/02/2017

MANIFEST - PA: State's Hazardous Waste Manifest

Agency Version Date: 03/01/2017
Agency Update Frequency: Monthly
Planned Next Contact: 08/15/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 787-6239
Most Recent Contact: 06/06/2017

UIC - PA: Regulated Underground Injection Controlled wells

Agency Version Date: 04/07/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/25/2017
Agency: Department of Environmental Protection
Agency Contact: (717) 787-2043
Most Recent Contact: 06/16/2017

SUBJECT PROPERTY ADDRESS:

Strawbridge II Property
99 Bullock Road
Landenberg, PA 19350

SUBJECT PROPERTY COORDINATES:

Latitude(North):	39.735822 - 39°44'9"
Longitude(West):	-75.858291 - -75°51'29.8"
Universal Transverse Mercator:	Zone 18N
UTM X (Meters):	426454.47
UTM Y (Meters):	4398788.83

ELEVATION:

Elevation:	72.001 ft. above sea level

USGS TOPOGRAPHIC MAP:

Subject Property Map:	39075f7 NEWARK WEST, MD
Most Recent Revision:	No Available Data.
Subject Property Map:	39075f8 BAY VIEW, MD
Most Recent Revision:	2016

GEOHYDROLOGY DATA:

SUBJECT PROPERTY TOPOGRAPHY:

Topographic Gradient: East

DFIRM FLOOD ZONE:

	DFIRM Flood
Subject Property County:	Electronic Data:
CHESTER	Yes - refer to the PROPERTY PROXIMITY MAP and AREA MAP
Flood Plain Panel at Subject Property:	42029C
Additional Panels in search area:	24015C

FEMA FLOOD ZONE:

	FEMA Flood
Subject Property County:	Electronic Data:
CHESTER	Yes - refer to the PROPERTY PROXIMITY MAP and AREA MAP
Flood Plain Panel at Subject Property:	42029C0605D 42029C0585D
Additional Panels in search area:	2400190020A 42029C0445D 42029C0465D

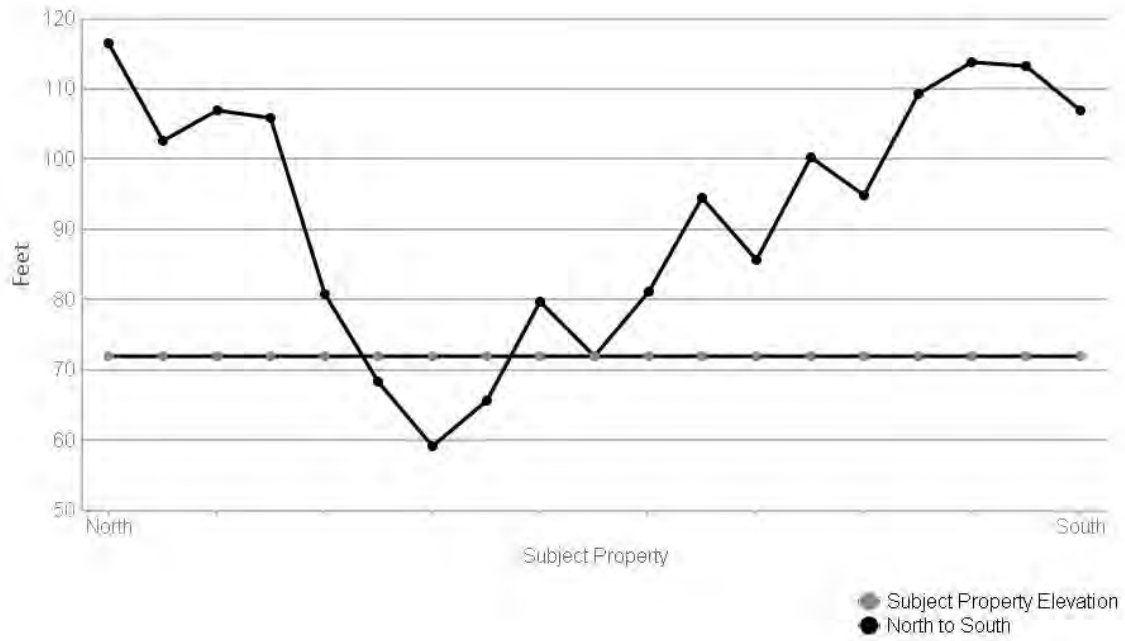
NATIONAL WETLAND INVENTORY:

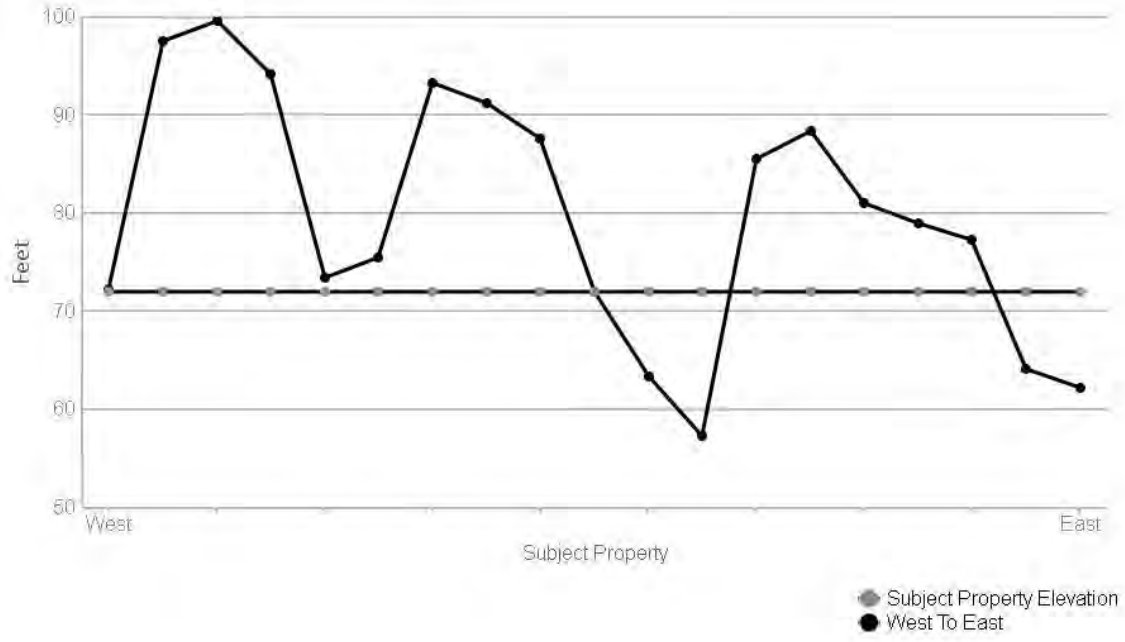
	NWI Electronic
NWI Quad at Subject Property:	Data Coverage:
NEWARK WEST	Yes - refer to the Geological Findings Map

LITHOSTRATIGRAPHIC INFORMATION:

ROCK STRATIGRAPHIC UNIT:		GEOLOGIC AGE IDENTIFICATION
Era:	Paleozoic	Category: 135 Ce Cambrian eugeosynclinal
System:	Cambrian	
Series:	Cambrian eugeosynclinal	
Code:	Ce	

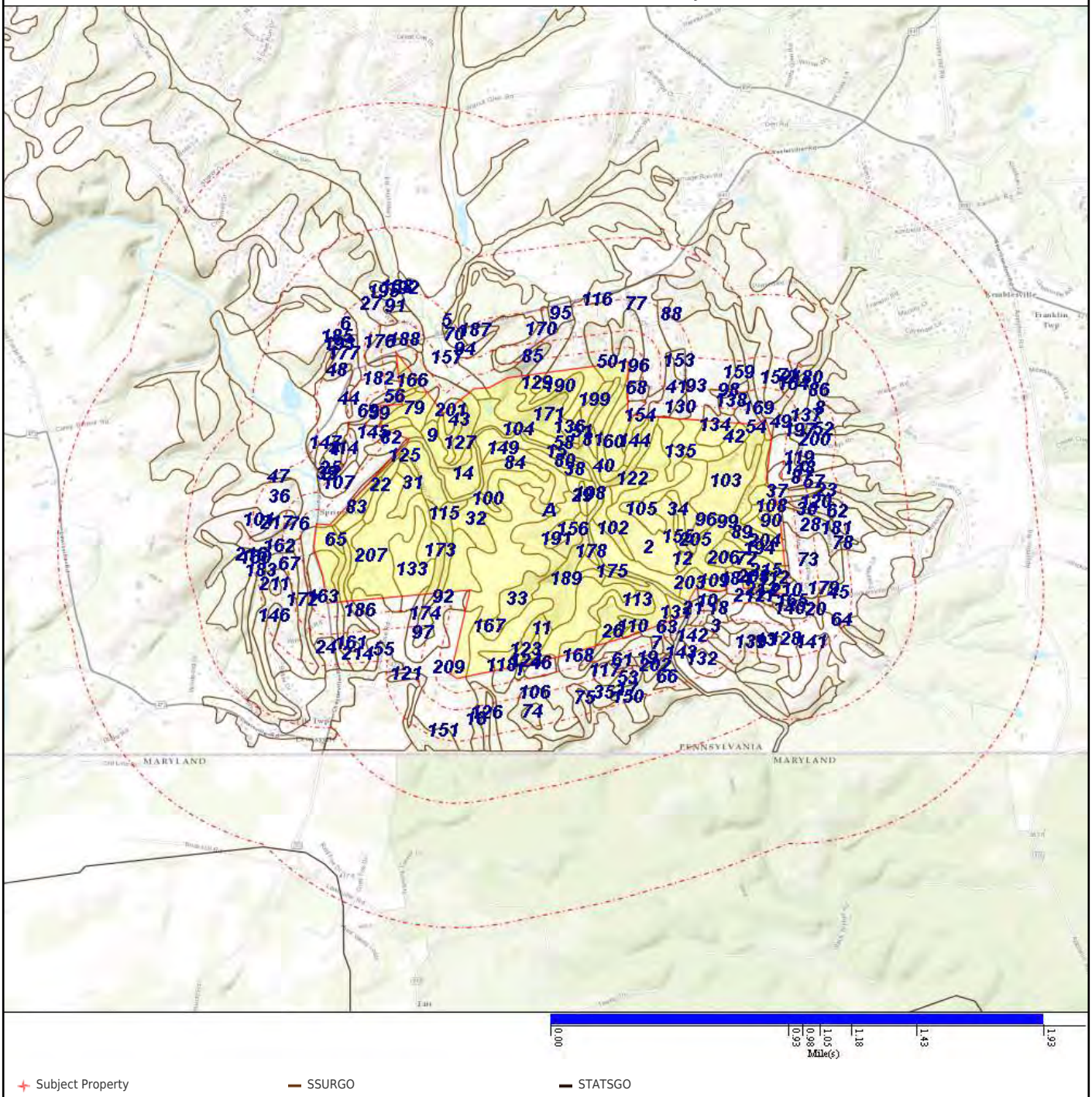
SURROUNDING ELEVATION PROFILES:





SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: June 19, 2017



SOIL COMPOSITION IN GENERAL AREA OF SUBJECT PROPERTY:

Agency source: Soil Conservation Service, US Department of Agriculture

SOIL MAP ID 1

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 2

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 3

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 4

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 5

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 6

USDA Soil Name	Glenelg,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.8-7.2
2	20-46	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent	4.23-14.11	4.2-7.7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	20-46	Clay loam	M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-7.7
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.4-7.2
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	137-193	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-42	4.3-7

SOIL MAP ID 7

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 8

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 9

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	9-47	Loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 10

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 11

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 12

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 13

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 14

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	4.5-7.3

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 15

USDA Soil Name	Comus,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	8
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-30	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
2	30-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	99-152	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4.23-42.34	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	99-152	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4.23-42.34	4.5-6

SOIL MAP ID 16

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 17

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 18

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 19

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 20

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 21

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-48	Silt loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 22

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 23

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 24

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size	No data	No data

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 25

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 26

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14	6-7.3

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 27

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 28

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 29

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	95
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-43	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 30

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	30
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 31

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 32

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 33

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 34

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 35

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 36

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 37

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 38

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	95
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-43	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 39

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 40

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 41

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 42

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials,	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	1984.	the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 43

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 44

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 45

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	5.5-7.3

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM,	1.4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	1984).	1.4-14	4.5-5.5

SOIL MAP ID 46

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 47

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 48

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 49

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	48-99	Silt loam	a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 50

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 51

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	15-33	Fine sandy loam	construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 52

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 53

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 54

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 55

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 56

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 57

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 58

USDA Soil Name	Comus,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	8
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-30	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
2	30-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	99-152	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4.23-42.34	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	99-152	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4.23-42.34	4.5-6

SOIL MAP ID 59

USDA Soil Name	Glenelg,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.8-7.2
2	20-46	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size	4.23-14.11	4.2-7.7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	20-46	Clay loam	of State Highway and Transportation Officials, 1984.	distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-7.7
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.4-7.2
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	137-193	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-42	4.3-7

SOIL MAP ID 60

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	20-58	Loam	M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 61

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM,	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 62

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 63

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 64

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 65

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 66

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 67

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 68

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 69

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 70

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 71

USDA Soil Name	Glenelg,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.8-7.2
2	20-46	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of	4.23-14.11	4.2-7.7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	20-46	Clay loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-7.7
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.4-7.2
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4-14	4.3-7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4-14	4.3-7
6	137-193	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-42	4.3-7

SOIL MAP ID 72

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 73

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 74

USDA Soil Name	Glenelg,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.8-7.2
2	20-46	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-7.7
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4.23-14.11	4.4-7.2

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4.23-14.11	4.4-7.2
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	137-193	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-42	4.3-7

SOIL MAP ID 75

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent	4.23-14	6-6.8

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	27-51	Silt loam	M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 76

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-48	Silt loam	construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 77

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 78

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 79

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	1.4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	102-178	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 80

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 81

USDA Soil Name	Glenelg,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.8-7.2
2	20-46	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-7.7
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4.23-14.11	4.4-7.2

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4.23-14.11	4.4-7.2
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	137-193	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-42	4.3-7

SOIL MAP ID 82

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	95
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-43	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-43	Silt loam	M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 83

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 84

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 85

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 86

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 87

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	15-33	Fine sandy loam	construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 88

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 89

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 90

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 91

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	0.2-0.75	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-102	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 92

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 93

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	1.4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	102-178	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 94

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in	4.23-14	6-6.8

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	14-42	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 95

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	No data	No data

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		of State Highway and Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 96

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 97

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference:	4.23-14	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	51-76	Silt loam	a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in	14-42	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 98

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	0.42-1.41	4.1-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	25-102	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 99

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 100

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	25-41	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	41-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	41-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	76-127	Silty clay loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
5	127-178	Loam	Granular materials (35% or less passing No. 200), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 101

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 102

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 103

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 104

USDA Soil Name	Water,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

SOIL MAP ID 105

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 106

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 107

USDA Soil Name	Chester,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-25	4-6.6
2	25-43	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of	4-14	4.2-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	25-43	Silt loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.2-5.5
3	43-56	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
4	56-76	Clay loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	76-97	Clay loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	76-97	Clay loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4-14	4.5-5.5
6	97-142	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-20	4.5-5.5
7	142-234	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-75	4.5-5.5

SOIL MAP ID 108

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 109

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 110

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 111

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14	6-7.3

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM,	0.2-0.75	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 112

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 113

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 114

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 115

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 116

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 117

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 118

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 119

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 120

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 121

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials,	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	1984.	the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 122

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 123

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 124

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 125

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials,	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	1984.	the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 126

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of	0.42-1.41	4.1-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	25-102	Silt loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 127

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 128

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 129

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 130

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size	No data	No data

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 131

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 132

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	0.42-4	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 133

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	of State Highway and Transportation Officials, 1984.	distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 134

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 135

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 136

USDA Soil Name	Glenelg,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	3.8-7.2

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.8-7.2
2	20-46	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-7.7
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.4-7.2
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM,	4-14	4.3-7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	1984).	4-14	4.3-7
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
6	137-193	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-42	4.3-7

SOIL MAP ID 137

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	0.42-4	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 138

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	of State Highway and Transportation Officials, 1984.	distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 139

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	0.2-0.75	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-102	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 140

USDA Soil Name	Chester,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-25	4-6.6
2	25-43	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.2-5.5
3	43-56	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
4	56-76	Clay loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	56-76	Clay loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	76-97	Clay loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
6	97-142	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-20	4.5-5.5
7	142-234	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM,	14-75	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	142-234	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	1984).	14-75	4.5-5.5

SOIL MAP ID 141

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 142

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 143

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-48	Silt loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 144

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 145

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14	6-7.3

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM,	0.2-0.75	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 146

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 147

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 148

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference:	0.42-4	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	76-102	Loam	a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 149

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials,	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	1984.	the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 150

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	20-58	Loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 151

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM,	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 152

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	1.4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	102-178	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 153

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 154

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 155

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	0.2-0.75	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-102	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 156

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 157

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	95
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-43	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 158

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	95
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-43	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-43	Silt loam	M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 159

USDA Soil Name	Glenelg,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.8-7.2
2	20-46	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-7.7
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.4-7.2
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.3-7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-107	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
6	137-193	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-42	4.3-7

SOIL MAP ID 160

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	0.2-0.75	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-102	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 161

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 162

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 163

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 164

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 165

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 166

USDA Soil Name	Glenelg,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.8-7.2
2	20-46	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-7.7
3	46-76	Clay loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference:	4.23-14.11	4.4-7.2

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	46-76	Clay loam	a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.4-7.2
4	76-107	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7
5	107-137	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.3-7

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	137-193	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-42	4.3-7

SOIL MAP ID 167

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 168

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 169

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	5
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-48	Silt loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 170

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 171

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 172

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent	4.23-14	6-6.8

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	27-51	Silt loam	M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 173

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 174

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 175

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	9-47	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 176

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 177

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 178

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 179

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 180

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	95
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-43	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 181

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	1.41-4.23	4.1-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 182

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	1.4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	102-178	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 183

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 184

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	No data	No data

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		of State Highway and Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 185

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in	4.23-14	6-6.8

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and	14-42	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 186

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 187

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	76-112	Coarse sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 188

USDA Soil Name	Baile,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	85
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-25	Silt loam	Silt-Clay materials (more than 35% passing No. 200), clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is 50% or more), Elastic Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.1-6.6
2	25-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-1.41	4.1-5.5
3	102-152	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.1-5.5

SOIL MAP ID 189

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	4.23-14	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and	14-42	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 190

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 191

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	20-58	Loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 192

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4.23-14.11	4.5-7.3

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 193

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	9-47	Loam	M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 194

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM,	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 195

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM	0.42-4	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 196

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	of State Highway and Transportation Officials, 1984.	distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 197

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 198

USDA Soil Name	Comus,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	8
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-30	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
2	30-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	30-99	Silt loam	material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	99-152	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	4.5-6

SOIL MAP ID 199

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 200

USDA Soil Name	Urban land,Miscellaneous area
USDA Soil Texture	Not Reported
Hydrologic Soil Group	Not Reported
Soil Drainage Class	Not Reported
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Not Reported

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15		Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Gravels, clean gravels, Poorly Graded Gravel. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	No data	No data

SOIL MAP ID 201

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials,	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	1984.	the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 202

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	11
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-48	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	48-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 203

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Poorly drained
Hydric Classification	95
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-23	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-7.3
2	23-43	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent	4.23-14.11	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	23-43	Silt loam	M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.5-6
3	43-99	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4.23	4.5-6
4	99-208	Loam	Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.41-4.23	4.5-5.5

SOIL MAP ID 204

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 205

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 206

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 207

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 208

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 209

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	5.5-7.3
2	20-76	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-6
3	76-102	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.42-4	4.5-5.5
4	102-178	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	1.4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	102-178	Loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	1.4-14	4.5-5.5

SOIL MAP ID 210

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in	4.23-14.11	3.6-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 211

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	2
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials,	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and	4.23-14.11	4.2-6.6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-20	Loam	1984.	the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	20-58	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	58-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID 212

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 213

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 214

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 215

USDA Soil Name	Glenville,Series
USDA Soil Texture	Silt loam
Hydrologic Soil Group	C/D
Soil Drainage Class	Moderately well drained
Hydric Classification	10
Corrosion Potential - Uncoated Steel	High

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-27	Silt loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-7.3
2	27-51	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	6-6.8
3	51-76	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14	4.5-6
4	76-102	Silt loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75	0.2-0.75	4.5-6

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	76-102	Silt loam	Transportation Officials, 1984.	mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	0.2-0.75	4.5-6
5	102-150	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6
6	150-208	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	14-42	4.5-6

SOIL MAP ID 216

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-5	Loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
2	5-15	Sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
3	15-33	Fine sandy loam	Silt-Clay materials (more than 35% passing No. 200) clayey soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-6.5
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays (liquid limit is less than 50%), Lean Clay. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil	4-14	4.5-5.5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
4	33-56	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-14	4.5-5.5
5	56-76	Fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, sands with fines, Clayey Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
6	76-112	Coarse sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
7	112-135	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
8	135-210	Loamy sand	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4-141	3.6-5.5
9	210-275		No data	No data	0.1-0.5	No data
10	275-350		No data	No data	5-15	No data

SOIL MAP ID 217

USDA Soil Name	Manor,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	B
Soil Drainage Class	Well drained
Hydric Classification	0
Corrosion Potential - Uncoated Steel	Moderate

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-9	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	4.2-6.6
2	9-47	Loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	FINE-GRAINED SOILS, Silts and clays, (liquid limit is less than 50%), Silt. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-14.11	3.6-6
3	47-152	Very fine sandy loam	Silt-Clay materials (more than 35% passing NO. 200), silty soils. Reference: This is a classification of soil material for highway and airfield construction (Procedure M 145-73 in Am. Assoc. of State Highway and Transportation Officials, 1984.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand. Reference: This is a classification of soil material designed for general construction purposes. It is dependent on the particle size distribution of the <75 mm, the liquid limit, and the plasticity index and on whether the soil material is high in organic matter (ASTM test D 2487, in ASTM, 1984).	4.23-42.34	3.6-6

SOIL MAP ID A

USDA Soil Name	Mt. Airy,Series
USDA Soil Texture	Loam
Hydrologic Soil Group	A
Soil Drainage Class	Well drained
Hydric Classification	7
Corrosion Potential - Uncoated Steel	Low

Layer	Depth (inches)	Soil Texture	AASHTO Group	Unified Soil Description	Saturated Hydraulic Conductivity micro m/sec	Soil Reaction pH
1	0-15	Loam	No data	No data	4.2343-14.1143	4.5-5.5
2	15-84	No data	No data	No data	4.2343-42.343	4.5-5.5
3	84-94		No data	No data	0.0706-0.3529	No data

WATER AGENCY DATA:

WATER AGENCY SEARCH DISTANCES:

DATABASE:	SEARCH DISTANCE (MILES):
OIL & GAS WELLS - PA	1.000
PWS	1.000
WELLS - PA	1.000

FEDERAL WATER AGENCY DATA SUMMARY:

MAP ID:	WELL ID:	LOCATION FROM SP:
No Wells Found	N/R	N/R

Note: PWS System location is not always the same as well location.

STATE/LOCAL WATER AGENCY DATA SUMMARY:

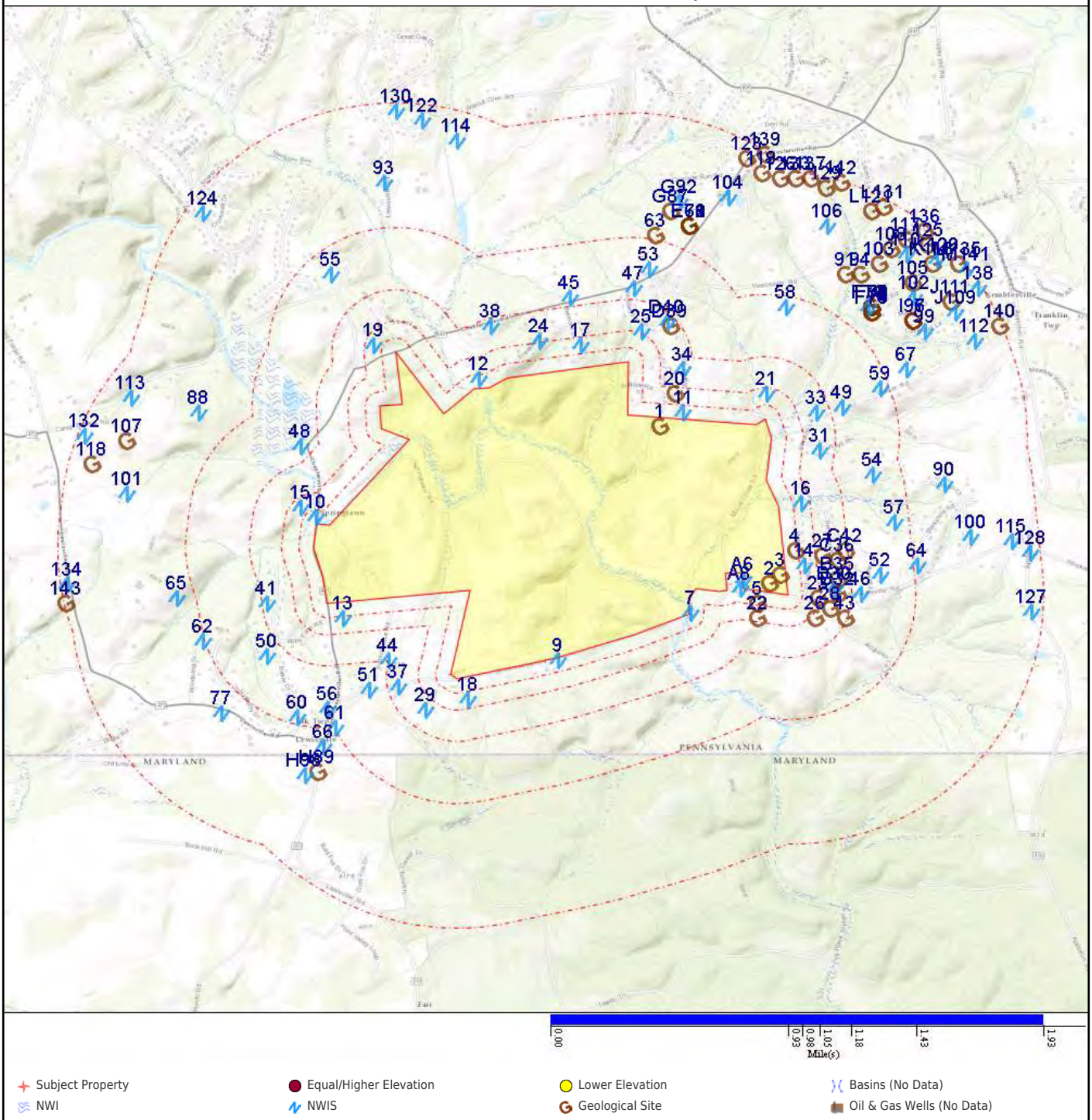
MAP ID:	WELL ID:	LOCATION FROM SP:
1	103763	< 1/8 Mile ENE
2	103632	< 1/8 Mile ESE
3	103631	< 1/8 Mile ESE
4	103626	< 1/8 Mile E
5	103633	< 1/8 Mile ESE
20	103654	< 1/8 Mile NE
22	103634	< 1/8 Mile ESE
23	103637	< 1/8 Mile ESE
26	103635	1/8 - 1/4 Mile ESE
27	103630	1/8 - 1/4 Mile E
28	103623	1/8 - 1/4 Mile ESE
B32	103625	1/8 - 1/4 Mile ESE
B35	103628	1/8 - 1/4 Mile E
C36	103629	1/8 - 1/4 Mile E
D39	103665	1/8 - 1/4 Mile NE
C42	103636	1/8 - 1/4 Mile E
43	103624	1/8 - 1/4 Mile ESE
63	103655	1/2 - 1 Mile NNE
E68	103767	1/2 - 1 Mile NNE
E69	103766	1/2 - 1 Mile NNE
E70	103768	1/2 - 1 Mile NNE

STATE/LOCAL WATER AGENCY DATA SUMMARY: *(cont.)*

MAP ID:	WELL ID:	LOCATION FROM SP:
E71	103765	1/2 - 1 Mile NNE
E72	103764	1/2 - 1 Mile NNE
F73	103783	1/2 - 1 Mile ENE
F74	103784	1/2 - 1 Mile ENE
F75	103785	1/2 - 1 Mile ENE
F78	103778	1/2 - 1 Mile ENE
F79	103781	1/2 - 1 Mile ENE
F80	103777	1/2 - 1 Mile ENE
F81	103775	1/2 - 1 Mile ENE
F82	103774	1/2 - 1 Mile ENE
F83	103780	1/2 - 1 Mile ENE
F84	103776	1/2 - 1 Mile ENE
F85	103779	1/2 - 1 Mile ENE
F86	103782	1/2 - 1 Mile ENE
G87	103656	1/2 - 1 Mile NNE
91	103652	1/2 - 1 Mile ENE
94	103651	1/2 - 1 Mile ENE
I95	103760	1/2 - 1 Mile ENE
I96	103762	1/2 - 1 Mile ENE
I97	103761	1/2 - 1 Mile ENE
103	103650	1/2 - 1 Mile ENE
105	103649	1/2 - 1 Mile ENE
107	103571	1/2 - 1 Mile W
108	103647	1/2 - 1 Mile ENE
J111	103668	1/2 - 1 Mile ENE
K116	103648	1/2 - 1 Mile ENE
117	103645	1/2 - 1 Mile ENE
118	103577	1/2 - 1 Mile W
119	103608	1/2 - 1 Mile NE
L121	103646	1/2 - 1 Mile NE
123	103658	1/2 - 1 Mile NE
125	103639	1/2 - 1 Mile ENE
126	103607	1/2 - 1 Mile NE
129	103603	1/2 - 1 Mile NE
L131	103644	1/2 - 1 Mile NE
133	103606	1/2 - 1 Mile NE
M135	103643	1/2 - 1 Mile ENE
136	103638	1/2 - 1 Mile ENE
137	103605	1/2 - 1 Mile NE
139	103657	1/2 - 1 Mile NE
140	103666	1/2 - 1 Mile ENE
142	103602	1/2 - 1 Mile NE
143	103491	1/2 - 1 Mile W

SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: June 19, 2017



Map Id: 1
Direction: ENE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.016 mi. / 86.401 ft.
Relative: Higher

Site Name : 103763
39.7409544616, -75.8502800276
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098324
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103763
Owner :	FORD HERMAN
Yield GPM :	18
Casing Top :	0 / 55 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4009
Date Drilled :	N/R
Well Depth :	97
Static Level :	22
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	24
Site Type :	WELL
Elevation :	0
Latitude :	39.7409544616
Longitude :	-75.8502800276
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 2
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.014 mi. / 75.899 ft.
Relative: Higher

Site Name : 103632
39.7317845974, -75.8422199701
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342099164
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103632
Owner :	HANLEY A
Yield GPM :	7
Casing Top :	0 / 44 / 6
Licensee :	KENNETH L MADRON WELL DRILLING CO
Local Well Number :	4724N
Date Drilled :	01/01/1983
Well Depth :	290
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
Latitude :	39.7317845974
Longitude :	-75.8422199701
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 3
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.015 mi. / 80.4 ft.
Relative: Higher

Site Name : 103631
39.7323345983, -75.8413900786
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097595
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103631
Owner :	DARHUN INC
Yield GPM :	7
Casing Top :	0 / 80 / 6
Licensee :	N/R
Local Well Number :	4723N
Date Drilled :	03/01/1979
Well Depth :	240
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	65
Site Type :	WELL
Elevation :	0
Latitude :	39.7323345983
Longitude :	-75.8413900786
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 4
Direction: E
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.016 mi. / 87.001 ft.
Relative: Higher

Site Name : 103626
39.7337245768, -75.8402799693
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098170
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103626
Owner :	DARHUN INC
Yield GPM :	25
Casing Top :	0 / 150.75 / 6
Licensee :	N/R
Local Well Number :	4718N
Date Drilled :	08/01/1978
Well Depth :	198
Static Level :	33
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	130
Site Type :	WELL
Elevation :	0
Latitude :	39.7337245768
Longitude :	-75.8402799693
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 5
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.015 mi. / 76.699 ft.
Relative: Higher

Site Name : 103633
39.7306746217, -75.8430600575
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098209
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103633
Owner :	HANLEY A
Yield GPM :	3
Casing Top :	0 / 68 / 6
Licensee :	N/R
Local Well Number :	4725N
Date Drilled :	04/01/1979
Well Depth :	220
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	65
Site Type :	WELL
Elevation :	0
Latitude :	39.7306746217
Longitude :	-75.8430600575
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: A6
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.013 mi. / 67.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394355075504001
Site Name:	CH 6313
Site Type:	GW
DMS Latitude:	394355
DMS Longitude:	0755040
Decimal Latitude:	39.73205515
Decimal Longitude:	-75.84410610
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	239
Method Altitude Determined:	M

Map Id: A6
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.013 mi. / 67.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000624
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	160
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-24
Ground Water End Date:	2000-06-24
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 7
Direction: ESE
Distance: 0.007 mi.
Actual: 35.183 ft.
Elevation: 0.01 mi. / 54.902 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	01494990
Site Name:	Big Elk Creek near Lewisville, PA
Site Type:	ST
DMS Latitude:	394348

Map Id: 7
Direction: ESE
Distance: 0.007 mi.
Actual: 35.183 ft.
Elevation: 0.01 mi. / 54.902 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

DMS Longitude:	0755054
Decimal Latitude:	39.73011070
Decimal Longitude:	-75.84799510
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	275
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	N/R
Data Types:	NNNANNNNNNNNNNNNNNNNNNNNNNNNA
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	19900426
Drainage Area:	41.0
Contributing Drainage Area:	41.0
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	N/R
Data-Other GW File:	NNNNNNNN
National Aquifer Code:	N/R
Local Aquifer Code:	N/R
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444230900
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	1973-05-24
Water Quality End Date:	2016-08-23
Water Quality Count:	90
Ground Water Begin Date:	--
Ground Water End Date:	--
Ground Water Count:	0
Site Visit Begin Date:	1990-04-26
Site Visit End Date:	2017-01-30
Site Visit Count:	184
State:	PA
Classcode:	NWIS

Map Id: A8
Direction: ESE
Distance: 0.014 mi.
Actual: 75.453 ft.
Elevation: 0.014 mi. / 71.299 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394353075504101
Site Name:	CH 6314
Site Type:	GW
DMS Latitude:	394353
DMS Longitude:	0755041
Decimal Latitude:	39.73149960
Decimal Longitude:	-75.84438389
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	228
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000613
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	265
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-13
Ground Water End Date:	2000-06-13
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: A8
Direction: ESE
Distance: 0.014 mi.
Actual: 75.453 ft.
Elevation: 0.014 mi. / 71.299 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 9
Direction: S
Distance: 0.016 mi.
Actual: 85.475 ft.
Elevation: 0.021 mi. / 108.399 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394338075512901
Site Name:	CH 6315
Site Type:	GW
DMS Latitude:	394338
DMS Longitude:	0755129
Decimal Latitude:	39.72733289
Decimal Longitude:	-75.85771778
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	371
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1988
Date Site Established:	20000624
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 9
Direction: S
Distance: 0.016 mi.
Actual: 85.475 ft.
Elevation: 0.021 mi. / 108.399 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-24
Ground Water End Date:	2000-06-24
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 10
Direction: W
Distance: 0.023 mi.
Actual: 123.594 ft.
Elevation: 0.042 mi. / 220.801 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	01494980
Site Name:	Big Elk Creek at Lewisville, PA
Site Type:	ST
DMS Latitude:	394408
DMS Longitude:	0755233
Decimal Latitude:	39.73566597
Decimal Longitude:	-75.87549630
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	U
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAYVIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	N/R
Method Altitude Determined:	N/R
Altitude Accuracy:	N/R
Altitude Datum:	N/R
Hydrologic Unit Code:	N/R
Drainage Basin Code:	N/R

Map Id: 10
Direction: W
Distance: 0.023 mi.
Actual: 123.594 ft.
Elevation: 0.042 mi. / 220.801 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	N/R
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNI
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	19750426
Drainage Area:	31.2
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	N/R
Data-Other GW File:	NNNNNNNN
National Aquifer Code:	N/R
Local Aquifer Code:	N/R
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	N/R
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	--
Ground Water End Date:	--
Ground Water Count:	0
Site Visit Begin Date:	1949-07-14
Site Visit End Date:	1991-09-09
Site Visit Count:	20
State:	PA
Classcode:	NWIS

Map Id: 11
Direction: ENE
Distance: 0.025 mi.
Actual: 129.463 ft.
Elevation: 0.018 mi. / 95.098 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394430075505601
Site Name:	CH 6308
Site Type:	GW
DMS Latitude:	394430
DMS Longitude:	0755056
Decimal Latitude:	39.74177720
Decimal Longitude:	-75.84855080
Latitude-Longitude Method:	M

Map Id: 11
Direction: ENE
Distance: 0.025 mi.
Actual: 129.463 ft.
Elevation: 0.018 mi. / 95.098 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	310
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000612
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	192
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-12
Ground Water End Date:	2000-06-12
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 12
Direction: NW
Distance: 0.036 mi.
Actual: 188.630 ft.
Elevation: 0.013 mi. / 67.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394437075515001
Site Name:	CH 1792
Site Type:	GW
DMS Latitude:	394437
DMS Longitude:	0755150
Decimal Latitude:	39.74372149
Decimal Longitude:	-75.86355140
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	278
Method Altitude Determined:	M
Altitude Accuracy:	010
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	N/R
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	19660101
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYYNNNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	N/R
Local Aquifer Type Code:	N/R
Well Depth:	70.0
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	N/R
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	1966-10-01
Ground Water End Date:	1966-10-01
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 12
Direction: NW
Distance: 0.036 mi.
Actual: 188.630 ft.
Elevation: 0.013 mi. / 67.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 13
Direction: WSW
Distance: 0.066 mi.
Actual: 347.613 ft.
Elevation: 0.019 mi. / 102.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394347075522601
Site Name:	CH 6260
Site Type:	GW
DMS Latitude:	394347
DMS Longitude:	0755226
Decimal Latitude:	39.72983274
Decimal Longitude:	-75.87355180
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	352
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 13
Direction: WSW
Distance: 0.066 mi.
Actual: 347.613 ft.
Elevation: 0.019 mi. / 102.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-07-19
Ground Water End Date:	2000-07-19
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 14
Direction: E
Distance: 0.076 mi.
Actual: 400.357 ft.
Elevation: 0.017 mi. / 89.199 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394358075502401
Site Name:	CH 6280
Site Type:	GW
DMS Latitude:	394358
DMS Longitude:	0755024
Decimal Latitude:	39.73288850
Decimal Longitude:	-75.83966150
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	292
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 14
Direction: E
Distance: 0.076 mi.
Actual: 400.357 ft.
Elevation: 0.017 mi. / 89.199 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1987
Date Site Established:	20000624
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	150
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-24
Ground Water End Date:	2000-06-24
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 15
Direction: W
Distance: 0.085 mi.
Actual: 450.810 ft.
Elevation: 0.045 mi. / 237.861 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394410075523701
Site Name:	CH 6261
Site Type:	GW
DMS Latitude:	394410
DMS Longitude:	0755237
Decimal Latitude:	39.73622150
Decimal Longitude:	-75.87660750
Latitude-Longitude Method:	M

Map Id: 15
Direction: W
Distance: 0.085 mi.
Actual: 450.810 ft.
Elevation: 0.045 mi. / 237.861 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	238
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-07-19
Ground Water End Date:	2000-07-19
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 16
Direction: E
Distance: 0.087 mi.
Actual: 457.422 ft.
Elevation: 0.014 mi. / 71.401 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394411075502501
Site Name:	CH 6279
Site Type:	GW
DMS Latitude:	394411
DMS Longitude:	0755025
Decimal Latitude:	39.73649957
Decimal Longitude:	-75.83993930
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	249
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000629
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	140
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-29
Ground Water End Date:	2000-06-29
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 16
Direction: E
Distance: 0.087 mi.
Actual: 457.422 ft.
Elevation: 0.014 mi. / 71.401 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 17
Direction: NNE
Distance: 0.087 mi.
Actual: 459.306 ft.
Elevation: 0.022 mi. / 116.699 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394444075512301
Site Name:	CH 6266
Site Type:	GW
DMS Latitude:	394444
DMS Longitude:	0755123
Decimal Latitude:	39.74566598
Decimal Longitude:	-75.85605110
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	386
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1994
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 17
Direction: NNE
Distance: 0.087 mi.
Actual: 459.306 ft.
Elevation: 0.022 mi. / 116.699 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-06
Ground Water End Date:	2000-06-06
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 18
Direction: SSW
Distance: 0.090 mi.
Actual: 475.066 ft.
Elevation: 0.022 mi. / 116.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394330075515301
Site Name:	CH 6316
Site Type:	GW
DMS Latitude:	394330
DMS Longitude:	0755153
Decimal Latitude:	39.72511066
Decimal Longitude:	-75.86438470
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	375
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 18
Direction: SSW
Distance: 0.090 mi.
Actual: 475.066 ft.
Elevation: 0.022 mi. / 116.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1992
Date Site Established:	20000624
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	360
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-24
Ground Water End Date:	2000-06-24
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 19
Direction: NW
Distance: 0.092 mi.
Actual: 484.541 ft.
Elevation: 0.018 mi. / 96.699 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394444075521801
Site Name:	CH 6254
Site Type:	GW
DMS Latitude:	394444
DMS Longitude:	0755218
Decimal Latitude:	39.74566580
Decimal Longitude:	-75.87132950
Latitude-Longitude Method:	M

Map Id: 19
Direction: NW
Distance: 0.092 mi.
Actual: 484.541 ft.
Elevation: 0.018 mi. / 96.699 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	325
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1999
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	300
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-19
Ground Water End Date:	2000-06-19
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 20
Direction: NE
Distance: 0.099 mi.
Actual: 521.901 ft.
Elevation: 0.017 mi. / 90.4 ft.
Relative: Higher

Site Name : 103654
39.7428944999, -75.849170036
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097388
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103654
Owner :	DIFFER W
Yield GPM :	15
Casing Top :	0 / 95 / 6
Licensee :	N/R
Local Well Number :	4746N
Date Drilled :	09/27/1983
Well Depth :	125
Static Level :	0
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	80
Site Type :	WELL
Elevation :	0
Latitude :	39.7428944999
Longitude :	-75.849170036
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 21
Direction: ENE
Distance: 0.101 mi.
Actual: 531.348 ft.
Elevation: 0.016 mi. / 86.001 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394434075503401
Site Name:	CH 6307
Site Type:	GW
DMS Latitude:	394434
DMS Longitude:	0755034
Decimal Latitude:	39.74288836
Decimal Longitude:	-75.84243940
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	275
Method Altitude Determined:	M

Map Id: 21
Direction: ENE
Distance: 0.101 mi.
Actual: 531.348 ft.
Elevation: 0.016 mi. / 86.001 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1996
Date Site Established:	20000805
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	220
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-08-05
Ground Water End Date:	2000-08-05
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 22
Direction: ESE
Distance: 0.110 mi.
Actual: 580.751 ft.
Elevation: 0.016 mi. / 86.601 ft.
Relative: Higher

Site Name : 103634
39.7298346026, -75.8430600889
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097678
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103634
Owner :	HANLEY A
Yield GPM :	6.5
Casing Top :	0 / 47 / 6
Licensee :	N/R

Map Id: 22
Direction: ESE
Distance: 0.110 mi.
Actual: 580.751 ft.
Elevation: 0.016 mi. / 86.601 ft.
Relative: Higher

Site Name : 103634
39.7298346026, -75.8430600889
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342097678
EPA ID: N/R

WELLS - PA ***(cont.)***

Local Well Number :	4726N
Date Drilled :	07/01/1980
Well Depth :	140
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	40
Site Type :	WELL
Elevation :	0
Latitude :	39.7298346026
Longitude :	-75.8430600889
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 23
Direction: ESE
Distance: 0.121 mi.
Actual: 641.251 ft.
Elevation: 0.019 mi. / 97.799 ft.
Relative: Higher

Site Name : 103637
39.7309546569, -75.8386100605
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098190
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103637
Owner :	DARHUN INC
Yield GPM :	1.33
Casing Top :	0 / 60 / 6
Licensee :	N/R
Local Well Number :	4729N
Date Drilled :	10/01/1979
Well Depth :	300
Static Level :	55
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	35
Site Type :	WELL
Elevation :	0
Latitude :	39.7309546569
Longitude :	-75.8386100605
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 24
Direction: N
Distance: 0.128 mi.
Actual: 677.705 ft.
Elevation: 0.021 mi. / 112.598 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394445075513401
Site Name:	CH 6265
Site Type:	GW
DMS Latitude:	394445
DMS Longitude:	0755134
Decimal Latitude:	39.74594370
Decimal Longitude:	-75.85910678
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	370
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1995
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-08
Ground Water End Date:	2000-06-08
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 24
Direction: N
Distance: 0.128 mi.
Actual: 677.705 ft.
Elevation: 0.021 mi. / 112.598 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 25
Direction: NNE
Distance: 0.130 mi.
Actual: 689.009 ft.
Elevation: 0.021 mi. / 112.799 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394447075510701
Site Name:	CH 6268
Site Type:	GW
DMS Latitude:	394447
DMS Longitude:	0755107
Decimal Latitude:	39.74649930
Decimal Longitude:	-75.85160650
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	378
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 25
Direction: NNE
Distance: 0.130 mi.
Actual: 689.009 ft.
Elevation: 0.021 mi. / 112.799 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-12
Ground Water End Date:	2000-06-12
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 26
Direction: ESE
Distance: 0.141 mi.
Actual: 746.448 ft.
Elevation: 0.018 mi. / 93.999 ft.
Relative: Higher

Site Name : 103635
39.7298346344, -75.8388900321
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097150
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103635
Owner :	LISHON CONST CO
Yield GPM :	2
Casing Top :	0 / 100 / 6
Licensee :	N/R
Local Well Number :	4727N
Date Drilled :	06/01/1981
Well Depth :	340
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	60
Site Type :	WELL
Elevation :	0
Latitude :	39.7298346344
Longitude :	-75.8388900321
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 27
Direction: E
Distance: 0.150 mi.
Actual: 793.972 ft.
Elevation: 0.018 mi. / 95 ft.
Relative: Higher

Site Name : 103630
39.7334545885, -75.8383300691
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098037
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103630
Owner :	DARHUN INC
Yield GPM :	100
Casing Top :	0 / 38 / 6
Licensee :	N/R
Local Well Number :	4722N
Date Drilled :	05/01/1979
Well Depth :	270
Static Level :	2
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	20
Site Type :	WELL
Elevation :	0
Latitude :	39.7334545885
Longitude :	-75.8383300691
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 28
Direction: ESE
Distance: 0.174 mi.
Actual: 916.746 ft.
Elevation: 0.019 mi. / 102.001 ft.
Relative: Higher

Site Name : 103623
39.7303946635, -75.8377800351
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097677
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103623
Owner :	DARHUN INC
Yield GPM :	4
Casing Top :	0 / 50 / 6
Licensee :	N/R
Local Well Number :	4715N
Date Drilled :	05/01/1979
Well Depth :	180
Static Level :	2
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	10
Site Type :	WELL
Elevation :	0
Latitude :	39.7303946635
Longitude :	-75.8377800351
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 29
Direction: SW
Distance: 0.177 mi.
Actual: 932.576 ft.
Elevation: 0.022 mi. / 114.701 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394328075520301
Site Name:	CH 5436
Site Type:	GW
DMS Latitude:	394328
DMS Longitude:	0755203
Decimal Latitude:	39.72444444
Decimal Longitude:	-75.86750000
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD83
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	375
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	H
Data Types:	NANNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	199406
Date Site Established:	19980101
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YNYNNNNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCK
Local Aquifer Type Code:	U
Well Depth:	280
Hole Depth:	280
Source of Depth Data:	D
Project Number:	444227500
Realtime-Data Flag:	N/R
Peak Begin Date:	N/R
Peak End Date:	N/R
Peak Count:	N/R
Water Quality Begin Date:	N/R
Water Quality End Date:	N/R
Water Quality Count:	N/R
Ground Water Begin Date:	N/R
Ground Water End Date:	N/R
Ground Water Count:	N/R
Site Visit Begin Date:	N/R
Site Visit End Date:	N/R
Site Visit Count:	N/R
State:	PA

Map Id: 29
Direction: SW
Distance: 0.177 mi.
Actual: 932.576 ft.
Elevation: 0.022 mi. / 114.701 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: B30
Direction: ESE
Distance: 0.184 mi.
Actual: 970.326 ft.
Elevation: 0.019 mi. / 97.999 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394353075501601
Site Name:	CH 6278
Site Type:	GW
DMS Latitude:	394353
DMS Longitude:	0755016
Decimal Latitude:	39.73149965
Decimal Longitude:	-75.83743910
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	328
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1955
Date Site Established:	20000722
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	130
Hole Depth:	N/R

Map Id: B30
Direction: ESE
Distance: 0.184 mi.
Actual: 970.326 ft.
Elevation: 0.019 mi. / 97.999 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-07-22
Ground Water End Date:	2000-07-22
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 31
Direction: E
Distance: 0.193 mi.
Actual: 1016.798 ft.
Elevation: 0.017 mi. / 87.402 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394422075502001
Site Name:	CH 6305
Site Type:	GW
DMS Latitude:	394422
DMS Longitude:	0755020
Decimal Latitude:	39.73955510
Decimal Longitude:	-75.83855030
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	290
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 31
Direction: E
Distance: 0.193 mi.
Actual: 1016.798 ft.
Elevation: 0.017 mi. / 87.402 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000626
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	140
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-26
Ground Water End Date:	2000-06-26
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: B32
Direction: ESE
Distance: 0.194 mi.
Actual: 1025.929 ft.
Elevation: 0.019 mi. / 101.001 ft.
Relative: Higher

Site Name : 103625
39.7312246052, -75.8372199948
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097017
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103625
Owner :	DARHUN INC
Yield GPM :	4
Casing Top :	0 / 66 / 6
Licensee :	N/R
Local Well Number :	4717N
Date Drilled :	08/01/1979
Well Depth :	200
Static Level :	40

Map Id: B32
Direction: ESE
Distance: 0.194 mi.
Actual: 1025.929 ft.
Elevation: 0.019 mi. / 101.001 ft.
Relative: Higher

Site Name : 103625
39.7312246052, -75.8372199948
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342097017
EPA ID: N/R

WELLS - PA ***(cont.)***

Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	55
Site Type :	WELL
Elevation :	0
Latitude :	39.7312246052
Longitude :	-75.8372199948
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 33
Direction: ENE
Distance: 0.195 mi.
Actual: 1030.148 ft.
Elevation: 0.015 mi. / 77.598 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394430075502101
Site Name:	CH 6304
Site Type:	GW
DMS Latitude:	394430
DMS Longitude:	0755021
Decimal Latitude:	39.74177729
Decimal Longitude:	-75.83882810
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	255
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1985
Date Site Established:	N/R

Map Id: 33
Direction: ENE
Distance: 0.195 mi.
Actual: 1030.148 ft.
Elevation: 0.015 mi. / 77.598 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	150
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-26
Ground Water End Date:	2000-06-26
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 34
Direction: NE
Distance: 0.196 mi.
Actual: 1037.443 ft.
Elevation: 0.019 mi. / 99.301 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394439075505601
Site Name:	CH 6309
Site Type:	GW
DMS Latitude:	394439
DMS Longitude:	0755056
Decimal Latitude:	39.74427717
Decimal Longitude:	-75.84855080
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42

Map Id: 34
Direction: NE
Distance: 0.196 mi.
Actual: 1037.443 ft.
Elevation: 0.019 mi. / 99.301 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	317
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1987
Date Site Established:	20000805
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	185
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-08-05
Ground Water End Date:	2000-08-05
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: B35
Direction: E
Distance: 0.199 mi.
Actual: 1052.694 ft.
Elevation: 0.019 mi. / 97.9 ft.
Relative: Higher

Site Name : 103628
39.732064626, -75.8372200074
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098036
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103628
Owner :	DARHUN INC
Yield GPM :	3
Casing Top :	0 / 42 / 6
Licensee :	N/R
Local Well Number :	4720N
Date Drilled :	03/01/1979
Well Depth :	220
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	20
Site Type :	WELL
Elevation :	0
Latitude :	39.732064626
Longitude :	-75.8372200074
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: C36
Direction: E
Distance: 0.207 mi.
Actual: 1094.095 ft.
Elevation: 0.017 mi. / 91.499 ft.
Relative: Higher

Site Name : 103629
39.7331745911, -75.8372199966
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098181
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103629
Owner :	DARHUN INC
Yield GPM :	25
Casing Top :	0 / 80 / 6
Licensee :	N/R
Local Well Number :	4721N
Date Drilled :	03/01/1979
Well Depth :	220
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	10
Site Type :	WELL
Elevation :	0
Latitude :	39.7331745911
Longitude :	-75.8372199966
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 37
Direction: SW
Distance: 0.207 mi.
Actual: 1095.303 ft.
Elevation: 0.023 mi. / 120.899 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394333075521101
Site Name:	CH 5431
Site Type:	GW
DMS Latitude:	394333
DMS Longitude:	0755210
Decimal Latitude:	39.72583330
Decimal Longitude:	-75.86944440
Latitude-Longitude Method:	D
Latitude-Longitude Accuracy:	5
Latitude-Longitude Datum:	NAD83
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	396
Method Altitude Determined:	D
Altitude Accuracy:	10
Altitude Datum:	NAVD88
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	F
Data Types:	NNNONNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	19980707
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	NYNNNNNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCK
Local Aquifer Type Code:	U
Well Depth:	131
Hole Depth:	131
Source of Depth Data:	S
Project Number:	444227500
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	1998-07-07
Water Quality End Date:	1998-07-07
Water Quality Count:	1
Ground Water Begin Date:	--
Ground Water End Date:	--
Ground Water Count:	0
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 37
Direction: SW
Distance: 0.207 mi.
Actual: 1095.303 ft.
Elevation: 0.023 mi. / 120.899 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 38
Direction: NNW
Distance: 0.215 mi.
Actual: 1133.729 ft.
Elevation: 0.018 mi. / 92.402 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394448075514701
Site Name:	CH 6264
Site Type:	GW
DMS Latitude:	394448
DMS Longitude:	0755147
Decimal Latitude:	39.74677700
Decimal Longitude:	-75.86271800
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	302
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1960
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 38
Direction: NNW
Distance: 0.215 mi.
Actual: 1133.729 ft.
Elevation: 0.018 mi. / 92.402 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-08
Ground Water End Date:	2000-06-08
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: D39
Direction: NE
Distance: 0.218 mi.
Actual: 1150.050 ft.
Elevation: 0.02 mi. / 107.999 ft.
Relative: Higher

Site Name : 103665
39.7467844284, -75.8494400435
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098075
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103665
Owner :	HEINEMAN ANDREW
Yield GPM :	12
Casing Top :	0 / 48 / 6
Licensee :	N/R
Local Well Number :	4757N
Date Drilled :	05/27/1983
Well Depth :	90
Static Level :	17
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	43
Site Type :	WELL
Elevation :	0
Latitude :	39.7467844284
Longitude :	-75.8494400435
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: D40
Direction: NE
Distance: 0.222 mi.
Actual: 1170.854 ft.
Elevation: 0.021 mi. / 109.6 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394449075510001
Site Name:	CH 6263
Site Type:	GW
DMS Latitude:	394449
DMS Longitude:	0755100
Decimal Latitude:	39.74705490
Decimal Longitude:	-75.84966190
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	365
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-08
Ground Water End Date:	2000-06-08
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: D40
Direction: NE
Distance: 0.222 mi.
Actual: 1170.854 ft.
Elevation: 0.021 mi. / 109.6 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 41
Direction: WSW
Distance: 0.231 mi.
Actual: 1219.688 ft.
Elevation: 0.062 mi. / 326.772 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394350075524601
Site Name:	CH 6386
Site Type:	GW
DMS Latitude:	394350
DMS Longitude:	0755246
Decimal Latitude:	39.73066600
Decimal Longitude:	-75.87910759
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	338
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000628
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 41
Direction: WSW
Distance: 0.231 mi.
Actual: 1219.688 ft.
Elevation: 0.062 mi. / 326.772 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-28
Ground Water End Date:	2000-06-28
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: C42
Direction: E
Distance: 0.240 mi.
Actual: 1268.463 ft.
Elevation: 0.017 mi. / 87.799 ft.
Relative: Higher

Site Name : 103636
39.7337245961, -75.8366700722
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342096454
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103636
Owner :	DARHUN INC
Yield GPM :	3
Casing Top :	0 / 79 / 6
Licensee :	N/R
Local Well Number :	4728N
Date Drilled :	10/01/1979
Well Depth :	220
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	75
Site Type :	WELL
Elevation :	0
Latitude :	39.7337245961
Longitude :	-75.8366700722
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 43
Direction: ESE
Distance: 0.243 mi.
Actual: 1281.267 ft.
Elevation: 0.019 mi. / 102.001 ft.
Relative: Higher

Site Name : 103624
39.7298346227, -75.8366700139
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098131
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103624
Owner :	DARHUN INC
Yield GPM :	1
Casing Top :	0 / 130.5 / 6
Licensee :	N/R
Local Well Number :	4716N
Date Drilled :	07/01/1979
Well Depth :	300
Static Level :	45
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	85
Site Type :	WELL
Elevation :	0
Latitude :	39.7298346227
Longitude :	-75.8366700139
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: 44
Direction: SW
Distance: 0.248 mi.
Actual: 1307.639 ft.
Elevation: 0.024 mi. / 129.101 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394338075521401
Site Name:	CH 6318
Site Type:	GW
DMS Latitude:	394338
DMS Longitude:	0755214
Decimal Latitude:	39.72733280
Decimal Longitude:	-75.87021830
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	421
Method Altitude Determined:	M

Map Id: 44
Direction: SW
Distance: 0.248 mi.
Actual: 1307.639 ft.
Elevation: 0.024 mi. / 129.101 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	H
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000628
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-28
Ground Water End Date:	2000-06-28
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 45
Direction: N
Distance: 0.283 mi.
Actual: 1493.765 ft.
Elevation: 0.021 mi. / 113.199 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394454075512601
Site Name:	CH 6267
Site Type:	GW
DMS Latitude:	394454

Map Id: 45
Direction: N
Distance: 0.283 mi.
Actual: 1493.765 ft.
Elevation: 0.021 mi. / 113.199 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

DMS Longitude:	0755126
Decimal Latitude:	39.74844370
Decimal Longitude:	-75.85688450
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	360
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-19
Ground Water End Date:	2000-06-19
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 46
Direction: ESE
Distance: 0.286 mi.
Actual: 1511.194 ft.
Elevation: 0.019 mi. / 99.199 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394352075500901
Site Name:	CH 6277
Site Type:	GW
DMS Latitude:	394352
DMS Longitude:	0755009
Decimal Latitude:	39.73122189
Decimal Longitude:	-75.83549460
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	321
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000624
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-24
Ground Water End Date:	2000-06-24
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 46
Direction: ESE
Distance: 0.286 mi.
Actual: 1511.194 ft.
Elevation: 0.019 mi. / 99.199 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 47
Direction: NNE
Distance: 0.293 mi.
Actual: 1547.102 ft.
Elevation: 0.023 mi. / 122.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394456075510901
Site Name:	CH 6269
Site Type:	GW
DMS Latitude:	394456
DMS Longitude:	0755109
Decimal Latitude:	39.74899930
Decimal Longitude:	-75.85216200
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	400
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	H
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 47
Direction: NNE
Distance: 0.293 mi.
Actual: 1547.102 ft.
Elevation: 0.023 mi. / 122.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-09
Ground Water End Date:	2000-06-09
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 48
Direction: WNW
Distance: 0.294 mi.
Actual: 1553.832 ft.
Elevation: 0.045 mi. / 236.549 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394423075523701
Site Name:	CH 6262
Site Type:	GW
DMS Latitude:	394423
DMS Longitude:	0755237
Decimal Latitude:	39.73983255
Decimal Longitude:	-75.87660750
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	243
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 48
Direction: WNW
Distance: 0.294 mi.
Actual: 1553.832 ft.
Elevation: 0.045 mi. / 236.549 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1960
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	125
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-07-19
Ground Water End Date:	2000-07-19
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 49
Direction: ENE
Distance: 0.299 mi.
Actual: 1580.821 ft.
Elevation: 0.017 mi. / 92.001 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394431075501401
Site Name:	CH 6303
Site Type:	GW
DMS Latitude:	394431
DMS Longitude:	0755014
Decimal Latitude:	39.74205508
Decimal Longitude:	-75.83688360
Latitude-Longitude Method:	M

Map Id: 49
Direction: ENE
Distance: 0.299 mi.
Actual: 1580.821 ft.
Elevation: 0.017 mi. / 92.001 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	290
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000612
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-12
Ground Water End Date:	2000-06-12
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 50
Direction: WSW
Distance: 0.316 mi.
Actual: 1670.118 ft.
Elevation: 0.067 mi. / 356.299 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394339075524601
Site Name:	CH 6385
Site Type:	GW
DMS Latitude:	394339
DMS Longitude:	0755246
Decimal Latitude:	39.72761050
Decimal Longitude:	-75.87910759
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	401
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000628
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-28
Ground Water End Date:	2000-06-28
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 50
Direction: WSW
Distance: 0.316 mi.
Actual: 1670.118 ft.
Elevation: 0.067 mi. / 356.299 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 51
Direction: SW
Distance: 0.322 mi.
Actual: 1702.228 ft.
Elevation: 0.024 mi. / 124.4 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394332075521901
Site Name:	CH 6317
Site Type:	GW
DMS Latitude:	394332
DMS Longitude:	0755219
Decimal Latitude:	39.72566616
Decimal Longitude:	-75.87160730
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	408
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1991
Date Site Established:	20000719
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	380
Hole Depth:	N/R

Map Id: 51
Direction: SW
Distance: 0.322 mi.
Actual: 1702.228 ft.
Elevation: 0.024 mi. / 124.4 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-07-19
Ground Water End Date:	2000-07-19
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 52
Direction: E
Distance: 0.366 mi.
Actual: 1934.015 ft.
Elevation: 0.019 mi. / 98.999 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394356075500401
Site Name:	CH 6276
Site Type:	GW
DMS Latitude:	394356
DMS Longitude:	0755004
Decimal Latitude:	39.73233300
Decimal Longitude:	-75.83410570
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	326
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 52
Direction: E
Distance: 0.366 mi.
Actual: 1934.015 ft.
Elevation: 0.019 mi. / 98.999 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000624
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	300
Hole Depth:	N/R
Source of Depth Data:	D
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-24
Ground Water End Date:	2000-06-24
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 53
Direction: NNE
Distance: 0.378 mi.
Actual: 1994.410 ft.
Elevation: 0.023 mi. / 123.743 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394500075510501
Site Name:	CH 6270
Site Type:	GW
DMS Latitude:	394500
DMS Longitude:	0755105
Decimal Latitude:	39.75011040
Decimal Longitude:	-75.85105090
Latitude-Longitude Method:	M

Map Id: 53
Direction: NNE
Distance: 0.378 mi.
Actual: 1994.410 ft.
Elevation: 0.023 mi. / 123.743 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	412
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	150
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-08
Ground Water End Date:	2000-06-08
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 54
Direction: E
Distance: 0.388 mi.
Actual: 2048.333 ft.
Elevation: 0.018 mi. / 94.199 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394417075500601
Site Name:	CH 6306
Site Type:	GW
DMS Latitude:	394417
DMS Longitude:	0755006
Decimal Latitude:	39.73816626
Decimal Longitude:	-75.83466128
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	311
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1986
Date Site Established:	20000626
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-26
Ground Water End Date:	2000-06-26
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 54
Direction: E
Distance: 0.388 mi.
Actual: 2048.333 ft.
Elevation: 0.018 mi. / 94.199 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 55
Direction: NW
Distance: 0.400 mi.
Actual: 2111.353 ft.
Elevation: 0.019 mi. / 98.999 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394459075522901
Site Name:	CH 6146
Site Type:	GW
DMS Latitude:	394459
DMS Longitude:	0755229
Decimal Latitude:	39.74983240
Decimal Longitude:	-75.87438520
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	338
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000629
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 55
Direction: NW
Distance: 0.400 mi.
Actual: 2111.353 ft.
Elevation: 0.019 mi. / 98.999 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-29
Ground Water End Date:	2000-06-29
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 56
Direction: SW
Distance: 0.424 mi.
Actual: 2240.765 ft.
Elevation: 0.024 mi. / 128.199 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394328075523001
Site Name:	CH 1785
Site Type:	GW
DMS Latitude:	394328
DMS Longitude:	0755230
Decimal Latitude:	39.72455505
Decimal Longitude:	-75.87466290
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	428
Method Altitude Determined:	M
Altitude Accuracy:	010
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 56
Direction: SW
Distance: 0.424 mi.
Actual: 2240.765 ft.
Elevation: 0.024 mi. / 128.199 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	H
Data Types:	N/R
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	19690101
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYYNNNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	N/R
Local Aquifer Type Code:	N/R
Well Depth:	159
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	N/R
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	1974-07-01
Ground Water End Date:	1974-07-01
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 57
Direction: E
Distance: 0.447 mi.
Actual: 2358.811 ft.
Elevation: 0.018 mi. / 93.999 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394407075500001
Site Name:	CH 6274
Site Type:	GW
DMS Latitude:	394407
DMS Longitude:	0755000
Decimal Latitude:	39.73538850
Decimal Longitude:	-75.83299450
Latitude-Longitude Method:	M

Map Id: 57
Direction: E
Distance: 0.447 mi.
Actual: 2358.811 ft.
Elevation: 0.018 mi. / 93.999 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	320
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000622
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-22
Ground Water End Date:	2000-06-22
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 58
Direction: NE
Distance: 0.452 mi.
Actual: 2388.973 ft.
Elevation: 0.019 mi. / 101.099 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394452075502901
Site Name:	CH 6312
Site Type:	GW
DMS Latitude:	394452
DMS Longitude:	0755029
Decimal Latitude:	39.74788830
Decimal Longitude:	-75.84105050
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	334
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1965
Date Site Established:	20000610
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	155
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-10
Ground Water End Date:	2000-06-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 58
Direction: NE
Distance: 0.452 mi.
Actual: 2388.973 ft.
Elevation: 0.019 mi. / 101.099 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 59
Direction: ENE
Distance: 0.464 mi.
Actual: 2450.059 ft.
Elevation: 0.02 mi. / 108.199 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394435075500401
Site Name:	CH 6302
Site Type:	GW
DMS Latitude:	394435
DMS Longitude:	0755004
Decimal Latitude:	39.74316620
Decimal Longitude:	-75.83410570
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	350
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	20000625
Date Site Established:	20000805
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 59
Direction: ENE
Distance: 0.464 mi.
Actual: 2450.059 ft.
Elevation: 0.02 mi. / 108.199 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-08-05
Ground Water End Date:	2000-08-05
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 60
Direction: WSW
Distance: 0.477 mi.
Actual: 2517.316 ft.
Elevation: 0.078 mi. / 412.73 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394326075523801
Site Name:	CH 6384
Site Type:	GW
DMS Latitude:	394326
DMS Longitude:	0755238
Decimal Latitude:	39.72399948
Decimal Longitude:	-75.87688530
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	419
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 60
Direction: WSW
Distance: 0.477 mi.
Actual: 2517.316 ft.
Elevation: 0.078 mi. / 412.73 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000629
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-29
Ground Water End Date:	2000-06-29
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 61
Direction: SW
Distance: 0.499 mi.
Actual: 2633.369 ft.
Elevation: 0.024 mi. / 128.599 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394324075522801
Site Name:	CH 6259
Site Type:	GW
DMS Latitude:	394324
DMS Longitude:	0755228
Decimal Latitude:	39.72344396
Decimal Longitude:	-75.87410740
Latitude-Longitude Method:	M

Map Id: 61
Direction: SW
Distance: 0.499 mi.
Actual: 2633.369 ft.
Elevation: 0.024 mi. / 128.599 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	425
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-23
Ground Water End Date:	2000-06-23
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	MD
Classcode:	NWIS

Map Id: 62
Direction: WSW
Distance: 0.509 mi.
Actual: 2689.542 ft.
Elevation: 0.078 mi. / 413.386 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394342075530301
Site Name:	CH 6382
Site Type:	GW
DMS Latitude:	394342
DMS Longitude:	0755303
Decimal Latitude:	39.72844380
Decimal Longitude:	-75.88383000
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	420
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	H
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1970
Date Site Established:	20000623
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	150
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-23
Ground Water End Date:	2000-06-23
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 62
Direction: WSW
Distance: 0.509 mi.
Actual: 2689.542 ft.
Elevation: 0.078 mi. / 413.386 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 63
Direction: NNE
Distance: 0.515 mi.
Actual: 2719.260 ft.
Elevation: 0.071 mi. / 375 ft.
Relative: Higher

Site Name : 103655
39.7520643556, -75.850559975
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342096455
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103655
Owner :	SKINNER A
Yield GPM :	6
Casing Top :	0 / 30 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	4747N
Date Drilled :	11/01/1978
Well Depth :	72
Static Level :	27
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	24
Site Type :	WELL
Elevation :	0
Latitude :	39.7520643556
Longitude :	-75.850559975
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 64
Direction: E
Distance: 0.517 mi.
Actual: 2731.923 ft.
Elevation: 0.019 mi. / 98.399 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394358075495401
Site Name:	CH 6275
Site Type:	GW
DMS Latitude:	394358
DMS Longitude:	0754954

Map Id: 64
Direction: E
Distance: 0.517 mi.
Actual: 2731.923 ft.
Elevation: 0.019 mi. / 98.399 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Decimal Latitude:	39.73288857
Decimal Longitude:	-75.83132778
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	320
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000622
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-22
Ground Water End Date:	2000-06-22
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 65
Direction: W
Distance: 0.574 mi.
Actual: 3031.192 ft.
Elevation: 0.066 mi. / 348.753 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394351075531001
Site Name:	CH 6378
Site Type:	GW
DMS Latitude:	394351
DMS Longitude:	0755310
Decimal Latitude:	39.73094375
Decimal Longitude:	-75.88577450
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	415
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	280
Hole Depth:	N/R
Source of Depth Data:	D
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-08-05
Ground Water End Date:	2000-08-05
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 65
Direction: W
Distance: 0.574 mi.
Actual: 3031.192 ft.
Elevation: 0.066 mi. / 348.753 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 66
Direction: SW
Distance: 0.574 mi.
Actual: 3031.604 ft.
Elevation: 0.082 mi. / 430.774 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394320075523101
Site Name:	CH 1784
Site Type:	GW
DMS Latitude:	394320
DMS Longitude:	0755231
Decimal Latitude:	39.72233286
Decimal Longitude:	-75.87494070
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	430
Method Altitude Determined:	M
Altitude Accuracy:	20
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	H
Data Types:	N/R
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	19700210
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYYNNNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	N/R
Local Aquifer Type Code:	N/R
Well Depth:	150
Hole Depth:	N/R

Map Id: 66
Direction: SW
Distance: 0.574 mi.
Actual: 3031.604 ft.
Elevation: 0.082 mi. / 430.774 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	N/R
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	1970-10
Ground Water End Date:	1970-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	MD
Classcode:	NWIS

Map Id: 67
Direction: ENE
Distance: 0.587 mi.
Actual: 3097.548 ft.
Elevation: 0.022 mi. / 114.301 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394439075495701
Site Name:	CH 6301
Site Type:	GW
DMS Latitude:	394439
DMS Longitude:	0754957
Decimal Latitude:	39.74427730
Decimal Longitude:	-75.83216120
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	381
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 67
Direction: ENE
Distance: 0.587 mi.
Actual: 3097.548 ft.
Elevation: 0.022 mi. / 114.301 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1980
Date Site Established:	20000613
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	100
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-13
Ground Water End Date:	2000-06-13
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: E68
Direction: NNE
Distance: 0.593 mi.
Actual: 3129.549 ft.
Elevation: 0.079 mi. / 417.999 ft.
Relative: Higher

Site Name : 103767
39.7526143721, -75.8480600139
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097151
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103767
Owner :	CARRIAGE PRK 20
Yield GPM :	25
Casing Top :	0 / 27 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	X 4013
Date Drilled :	N/R
Well Depth :	73
Static Level :	23

Map Id: E68
Direction: NNE
Distance: 0.593 mi.
Actual: 3129.549 ft.
Elevation: 0.079 mi. / 417.999 ft.
Relative: Higher

Site Name : 103767
39.7526143721, -75.8480600139
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342097151
EPA ID: N/R

WELLS - PA ***(cont.)***

Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	12
Site Type :	WELL
Elevation :	0
Latitude :	39.7526143721
Longitude :	-75.8480600139
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: E69
Direction: NNE
Distance: 0.593 mi.
Actual: 3129.549 ft.
Elevation: 0.079 mi. / 417.999 ft.
Relative: Higher

Site Name : 103766
39.7526143721, -75.8480600139
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098093
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103766
Owner :	BROOKING ORVILE
Yield GPM :	25
Casing Top :	0 / 40 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	X 4012
Date Drilled :	N/R
Well Depth :	140
Static Level :	25
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	30
Site Type :	WELL
Elevation :	0
Latitude :	39.7526143721
Longitude :	-75.8480600139
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: E70
Direction: NNE
Distance: 0.593 mi.
Actual: 3129.549 ft.
Elevation: 0.079 mi. / 417.999 ft.
Relative: Higher

Site Name : 103768
39.7526143721, -75.8480600139
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098095
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103768
Owner :	SKINNER ALBERT
Yield GPM :	5
Casing Top :	0 / 38 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	X 4014
Date Drilled :	N/R
Well Depth :	160
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	30
Site Type :	WELL
Elevation :	0
Latitude :	39.7526143721
Longitude :	-75.8480600139
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: E71
Direction: NNE
Distance: 0.593 mi.
Actual: 3129.549 ft.
Elevation: 0.079 mi. / 417.999 ft.
Relative: Higher

Site Name : 103765
39.7526143721, -75.8480600139
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098341
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103765
Owner :	SKINNER AL
Yield GPM :	10
Casing Top :	0 / 20 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	X 4011
Date Drilled :	N/R
Well Depth :	71
Static Level :	20
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	12
Site Type :	WELL
Elevation :	0
Latitude :	39.7526143721
Longitude :	-75.8480600139
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: E72
Direction: NNE
Distance: 0.593 mi.
Actual: 3129.549 ft.
Elevation: 0.079 mi. / 417.999 ft.
Relative: Higher

Site Name : 103764
39.7526143721, -75.8480600139
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342211141
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103764
Owner :	HANNUM C C
Yield GPM :	10
Casing Top :	0 / 48 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4010
Date Drilled :	N/R
Well Depth :	139
Static Level :	28
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	45
Site Type :	WELL
Elevation :	0
Latitude :	39.7526143721
Longitude :	-75.8480600139
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: F73
Direction: ENE
Distance: 0.596 mi.
Actual: 3147.891 ft.
Elevation: 0.018 mi. / 96.499 ft.
Relative: Higher

Site Name : 103783
39.7476143648, -75.8347200031
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097170
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103783
Owner :	KIMBELOT CORP
Yield GPM :	0
Casing Top :	0 / 44 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4029
Date Drilled :	N/R
Well Depth :	400
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
Latitude :	39.7476143648
Longitude :	-75.8347200031
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F74
Direction: ENE
Distance: 0.596 mi.
Actual: 3147.891 ft.
Elevation: 0.018 mi. / 96.499 ft.
Relative: Higher

Site Name : 103784
39.7476143648, -75.8347200031
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098388
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103784
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 44 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4030
Date Drilled :	N/R
Well Depth :	160
Static Level :	38
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
Latitude :	39.7476143648
Longitude :	-75.8347200031
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F75
Direction: ENE
Distance: 0.596 mi.
Actual: 3147.891 ft.
Elevation: 0.018 mi. / 96.499 ft.
Relative: Higher

Site Name : 103785
39.7476143648, -75.8347200031
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342211143
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103785
Owner :	KIMBELOT CORP
Yield GPM :	6
Casing Top :	0 / 45 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4031
Date Drilled :	N/R
Well Depth :	280
Static Level :	60
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	40
Site Type :	WELL
Elevation :	0
Latitude :	39.7476143648
Longitude :	-75.8347200031
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F76
Direction: ENE
Distance: 0.602 mi.
Actual: 3178.291 ft.
Elevation: 0.019 mi. / 99.101 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394452075500701
Site Name:	CH 6311
Site Type:	GW
DMS Latitude:	394452
DMS Longitude:	0755007
Decimal Latitude:	39.74788837
Decimal Longitude:	-75.83493910
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	327
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000612
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-12
Ground Water End Date:	2000-06-12
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: F76
Direction: ENE
Distance: 0.602 mi.
Actual: 3178.291 ft.
Elevation: 0.019 mi. / 99.101 ft.
Relative: Higher

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 77
Direction: WSW
Distance: 0.605 mi.
Actual: 3192.406 ft.
Elevation: 0.08 mi. / 421.588 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394327075525801
Site Name:	CH 6383
Site Type:	GW
DMS Latitude:	394327
DMS Longitude:	0755258
Decimal Latitude:	39.72427720
Decimal Longitude:	-75.88244100
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	430
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000623
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 77
Direction: WSW
Distance: 0.605 mi.
Actual: 3192.406 ft.
Elevation: 0.08 mi. / 421.588 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-23
Ground Water End Date:	2000-06-23
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: F78
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103778
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097019
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103778
Owner :	KIMBELOT CORP
Yield GPM :	8
Casing Top :	0 / 51 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4024
Date Drilled :	N/R
Well Depth :	200
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	46
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F79
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103781
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097021
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103781
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 79 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4027
Date Drilled :	N/R
Well Depth :	180
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	74
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F80
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103777
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097392
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103777
Owner :	KIMBELOT CORP
Yield GPM :	12
Casing Top :	0 / 61 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4023
Date Drilled :	N/R
Well Depth :	300
Static Level :	70
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	56
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F81
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103775
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097608
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103775
Owner :	KIMBELOT CORP
Yield GPM :	20
Casing Top :	0 / 43 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4021
Date Drilled :	N/R
Well Depth :	200
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	38
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F82
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103774
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097767
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103774
Owner :	KIMBERLOT CORP
Yield GPM :	25
Casing Top :	0 / 46 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4020
Date Drilled :	N/R
Well Depth :	200
Static Level :	41
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	41
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F83
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103780
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098099
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103780
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 48 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4026
Date Drilled :	N/R
Well Depth :	160
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	43
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F84
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103776
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098299
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103776
Owner :	KIMBELOT CORP
Yield GPM :	20
Casing Top :	0 / 167 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4022
Date Drilled :	N/R
Well Depth :	240
Static Level :	50
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	162
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F85
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103779
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098467
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103779
Owner :	KIMBELOT CORP
Yield GPM :	30
Casing Top :	0 / 77 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4025
Date Drilled :	N/R
Well Depth :	240
Static Level :	45
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	72
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: F86
Direction: ENE
Distance: 0.610 mi.
Actual: 3221.659 ft.
Elevation: 0.019 mi. / 99.8 ft.
Relative: Higher

Site Name : 103782
39.7478943988, -75.834719996
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342211142
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103782
Owner :	KIMBELOT CORP
Yield GPM :	12
Casing Top :	0 / 44 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4028
Date Drilled :	N/R
Well Depth :	160
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
Latitude :	39.7478943988
Longitude :	-75.834719996
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: G87
Direction: NNE
Distance: 0.622 mi.
Actual: 3286.476 ft.
Elevation: 0.076 mi. / 398.999 ft.
Relative: Higher

Site Name : 103656
39.7534543153, -75.8494400453
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098267
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103656
Owner :	SKINNER ALBERT D
Yield GPM :	30
Casing Top :	0 / 38 / 5
Licensee :	MAYBERRY, LEONARD
Local Well Number :	4748N
Date Drilled :	07/28/1975
Well Depth :	110
Static Level :	20
Well Finish :	N/R
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	0
Site Type :	WELL
Elevation :	0
Latitude :	39.7534543153
Longitude :	-75.8494400453
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 88
Direction: WNW
Distance: 0.639 mi.
Actual: 3373.510 ft.
Elevation: 0.074 mi. / 389.764 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394430075530401
Site Name:	CH 6374
Site Type:	GW
DMS Latitude:	394430
DMS Longitude:	0755304
Decimal Latitude:	39.74177690
Decimal Longitude:	-75.88410780
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	382
Method Altitude Determined:	M

Map Id: 88
Direction: WNW
Distance: 0.639 mi.
Actual: 3373.510 ft.
Elevation: 0.074 mi. / 389.764 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	199202
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYY Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	400
Hole Depth:	N/R
Source of Depth Data:	D
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-10
Ground Water End Date:	2000-06-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: H89
Direction: SW
Distance: 0.650 mi.
Actual: 3429.561 ft.
Elevation: 0.079 mi. / 419.291 ft.
Relative: Higher

Site Name : MID STATES OIL REFINING-ELKTON
606 LEWISVILLE ROAD
ELKTON, MD 21921

Database(s) : [INACTIVE PCS]

Envirosite ID: 346207306
EPA ID: N/R

INACTIVE PCS

Issue Date :	03/02/2006
Original Issue Date :	03/02/2006
Effective Date :	03/02/2006
Expiration Date :	05/24/2007
Retirement Date :	N/R

Map Id: H89
Direction: SW
Distance: 0.650 mi.
Actual: 3429.561 ft.
Elevation: 0.079 mi. / 419.291 ft.
Relative: Higher

Site Name : MID STATES OIL REFINING-ELKTON
606 LEWISVILLE ROAD
ELKTON, MD 21921

Database(s) : [INACTIVE PCS] ***(cont.)***

Envirosite ID: 346207306
EPA ID: N/R

INACTIVE PCS ***(cont.)***

Termination Date :	N/R
Issuing Agency :	N/R
Agency Type Code :	State
Activity ID :	20034192
External Permit Number :	MDG342513
Facility Type Indicator :	NON-POTW
Permit Type Code :	General Permit Covered Facility
Major Minor Status :	N
Permit Status Code :	Expired
Total Design Flow Number :	N/R
Actual Average Flow Number :	N/R
State Water Body :	N/R
State Water Body Name :	LITTLE ELK CREEK
Permit Name :	MID STATES OIL REFINING-ELKTON
Permit Comp Status :	Y
RNC Tracking :	Y
Master External Permit Number :	MDG340000
TMDL Interface :	N/R
EDMR Authorization :	N
Pretreatment Indicator Code :	N/R

Map Id: 90
Direction: E
Distance: 0.654 mi.
Actual: 3453.558 ft.
Elevation: 0.021 mi. / 113.399 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394415075494701
Site Name:	CH 6273
Site Type:	GW
DMS Latitude:	394415
DMS Longitude:	0754947
Decimal Latitude:	39.73761075
Decimal Longitude:	-75.82938330
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	363
Method Altitude Determined:	M
Altitude Accuracy:	5

Map Id: 90
Direction: E
Distance: 0.654 mi.
Actual: 3453.558 ft.
Elevation: 0.021 mi. / 113.399 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000610
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-10
Ground Water End Date:	2000-06-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 91
Direction: ENE
Distance: 0.659 mi.
Actual: 3477.678 ft.
Elevation: 0.017 mi. / 88.199 ft.
Relative: Higher

Site Name : 103652
39.7498343771, -75.8366700507
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097345
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103652
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 42 / 6
Licensee :	N/R
Local Well Number :	4744N

Map Id: 91
Direction: ENE
Distance: 0.659 mi.
Actual: 3477.678 ft.
Elevation: 0.017 mi. / 88.199 ft.
Relative: Higher

Site Name : 103652
39.7498343771, -75.8366700507
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342097345
EPA ID: N/R

WELLS - PA ***(cont.)***

Date Drilled :	10/06/1977
Well Depth :	240
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	37
Site Type :	WELL
Elevation :	0
Latitude :	39.7498343771
Longitude :	-75.8366700507
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: G92
Direction: NNE
Distance: 0.668 mi.
Actual: 3525.663 ft.
Elevation: 0.078 mi. / 412.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394514075505701
Site Name:	CH 6258
Site Type:	GW
DMS Latitude:	394514
DMS Longitude:	0755057
Decimal Latitude:	39.75399920
Decimal Longitude:	-75.84882870
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	405
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: G92
Direction: NNE
Distance: 0.668 mi.
Actual: 3525.663 ft.
Elevation: 0.078 mi. / 412.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1991
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	125
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-08
Ground Water End Date:	2000-06-08
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 93
Direction: NNW
Distance: 0.676 mi.
Actual: 3571.887 ft.
Elevation: 0.052 mi. / 272.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394518075521501
Site Name:	CH 6252
Site Type:	GW
DMS Latitude:	394518
DMS Longitude:	0755215
Decimal Latitude:	39.75511010
Decimal Longitude:	-75.87049630
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27

Map Id: 93
Direction: NNW
Distance: 0.676 mi.
Actual: 3571.887 ft.
Elevation: 0.052 mi. / 272.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	270
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-07-22
Ground Water End Date:	2000-07-22
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 94
Direction: ENE
Distance: 0.689 mi.
Actual: 3636.258 ft.
Elevation: 0.016 mi. / 83.901 ft.
Relative: Higher

Site Name : 103651
39.7498344068, -75.8355600609
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342099165
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103651
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 54 / 6
Licensee :	N/R
Local Well Number :	4743N
Date Drilled :	10/05/1977
Well Depth :	260
Static Level :	47
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	49
Site Type :	WELL
Elevation :	0
Latitude :	39.7498344068
Longitude :	-75.8355600609
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: I95
Direction: ENE
Distance: 0.697 mi.
Actual: 3681.753 ft.
Elevation: 0.021 mi. / 112.402 ft.
Relative: Higher

Site Name : 103760
39.7470644354, -75.8316700593
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097779
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103760
Owner :	STRATTON HERBRT
Yield GPM :	5
Casing Top :	0 / 54 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4006
Date Drilled :	N/R
Well Depth :	153
Static Level :	48
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	48
Site Type :	WELL
Elevation :	0
Latitude :	39.7470644354
Longitude :	-75.8316700593
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: I96
Direction: ENE
Distance: 0.697 mi.
Actual: 3681.753 ft.
Elevation: 0.021 mi. / 112.402 ft.
Relative: Higher

Site Name : 103762
39.7470644354, -75.8316700593
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098062
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103762
Owner :	CENTURY BLDR 23
Yield GPM :	10
Casing Top :	0 / 55 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4008
Date Drilled :	N/R
Well Depth :	120
Static Level :	22
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	48
Site Type :	WELL
Elevation :	0
Latitude :	39.7470644354
Longitude :	-75.8316700593
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: I97
Direction: ENE
Distance: 0.697 mi.
Actual: 3681.753 ft.
Elevation: 0.021 mi. / 112.402 ft.
Relative: Higher

Site Name : 103761
39.7470644354, -75.8316700593
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342099166
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103761
Owner :	CENTURY BLDR
Yield GPM :	9
Casing Top :	0 / 70 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4007
Date Drilled :	N/R
Well Depth :	120
Static Level :	26
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	60
Site Type :	WELL
Elevation :	0
Latitude :	39.7470644354
Longitude :	-75.8316700593
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: H98
Direction: SW
Distance: 0.698 mi.
Actual: 3684.934 ft.
Elevation: 0.08 mi. / 423.556 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394314075523601
Site Name:	CE Ae 45
Site Type:	GW
DMS Latitude:	394314
DMS Longitude:	0755236
Decimal Latitude:	39.72066620
Decimal Longitude:	-75.87632968
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	24
State Code:	24
County Code:	015
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW, MD-PA
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	420.00
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	19660810
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	N
Data Reliability Code:	C
Data-Other GW File:	YYYYNNNN
National Aquifer Code:	N/R
Local Aquifer Code:	300PLCG
Local Aquifer Type Code:	N/R
Well Depth:	85.0
Hole Depth:	85.0
Source of Depth Data:	N/R
Project Number:	N/R
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	1966-08-10
Ground Water End Date:	1966-08-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	MD

Map Id: H98
Direction: SW
Distance: 0.698 mi.
Actual: 3684.934 ft.
Elevation: 0.08 mi. / 423.556 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 99
Direction: ENE
Distance: 0.718 mi.
Actual: 3789.528 ft.
Elevation: 0.021 mi. / 110.2 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394447075495201
Site Name:	CH 6300
Site Type:	GW
DMS Latitude:	394447
DMS Longitude:	0754952
Decimal Latitude:	39.74649950
Decimal Longitude:	-75.83077230
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	362
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000612
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	460
Hole Depth:	N/R

Map Id: 99
Direction: ENE
Distance: 0.718 mi.
Actual: 3789.528 ft.
Elevation: 0.021 mi. / 110.2 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-12
Ground Water End Date:	2000-06-12
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 100
Direction: E
Distance: 0.735 mi.
Actual: 3882.092 ft.
Elevation: 0.021 mi. / 110.699 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394404075494001
Site Name:	CH 6272
Site Type:	GW
DMS Latitude:	394404
DMS Longitude:	0754940
Decimal Latitude:	39.73455525
Decimal Longitude:	-75.82743870
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	359
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R

Map Id: 100
Direction: E
Distance: 0.735 mi.
Actual: 3882.092 ft.
Elevation: 0.021 mi. / 110.699 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000610
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-10
Ground Water End Date:	2000-06-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 101
Direction: W
Distance: 0.749 mi.
Actual: 3955.580 ft.
Elevation: 0.076 mi. / 400.919 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394413075532301
Site Name:	CH 6376
Site Type:	GW
DMS Latitude:	394413
DMS Longitude:	0755323
Decimal Latitude:	39.73705470
Decimal Longitude:	-75.88938580
Latitude-Longitude Method:	M

Map Id: 101
Direction: W
Distance: 0.749 mi.
Actual: 3955.580 ft.
Elevation: 0.076 mi. / 400.919 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	403
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	H
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-08-05
Ground Water End Date:	2000-08-05
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 102
Direction: ENE
Distance: 0.757 mi.
Actual: 3997.614 ft.
Elevation: 0.021 mi. / 110 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394454075495501
Site Name:	CH 6310
Site Type:	GW
DMS Latitude:	394454
DMS Longitude:	0754955
Decimal Latitude:	39.74844395
Decimal Longitude:	-75.83160560
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	348
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000610
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	125
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-10
Ground Water End Date:	2000-06-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 102
Direction: ENE
Distance: 0.757 mi.
Actual: 3997.614 ft.
Elevation: 0.021 mi. / 110 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 103
Direction: ENE
Distance: 0.762 mi.
Actual: 4024.918 ft.
Elevation: 0.057 mi. / 300 ft.
Relative: Higher

Site Name : 103650
39.7503943596, -75.8341700788
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098253
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103650
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 50 / 6
Licensee :	N/R
Local Well Number :	4742N
Date Drilled :	10/05/1977
Well Depth :	220
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	45
Site Type :	WELL
Elevation :	0
Latitude :	39.7503943596
Longitude :	-75.8341700788
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 104
Direction: NE
Distance: 0.765 mi.
Actual: 4036.903 ft.
Elevation: 0.075 mi. / 397.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394515075504401
Site Name:	CH 6257
Site Type:	GW
DMS Latitude:	394515
DMS Longitude:	0755044

Map Id: 104
Direction: NE
Distance: 0.765 mi.
Actual: 4036.903 ft.
Elevation: 0.075 mi. / 397.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Decimal Latitude:	39.75427704
Decimal Longitude:	-75.84521750
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	394
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-08
Ground Water End Date:	2000-06-08
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 105
Direction: ENE
Distance: 0.793 mi.
Actual: 4186.555 ft.
Elevation: 0.019 mi. / 100.2 ft.
Relative: Higher

Site Name : 103649
39.7492843514, -75.831670088
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098242
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103649
Owner :	KIMBELOT CORP
Yield GPM :	40
Casing Top :	0 / 104 / 6
Licensee :	N/R
Local Well Number :	4741N
Date Drilled :	10/13/1977
Well Depth :	240
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	99
Site Type :	WELL
Elevation :	0
Latitude :	39.7492843514
Longitude :	-75.831670088
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 106
Direction: NE
Distance: 0.808 mi.
Actual: 4268.020 ft.
Elevation: 0.067 mi. / 353.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394509075501801
Site Name:	CH 6243
Site Type:	GW
DMS Latitude:	394509
DMS Longitude:	0755018
Decimal Latitude:	39.75261048
Decimal Longitude:	-75.83799488
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	352
Method Altitude Determined:	M

Map Id: 106
Direction: NE
Distance: 0.808 mi.
Actual: 4268.020 ft.
Elevation: 0.067 mi. / 353.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-10
Ground Water End Date:	2000-06-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 107
Direction: W
Distance: 0.813 mi.
Actual: 4290.795 ft.
Elevation: 0.076 mi. / 403.543 ft.
Relative: Higher

Site Name : 103571
39.7401145291, -75.8894400657
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097068
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103571
Owner :	MCKINNEY HOWARD
Yield GPM :	12
Casing Top :	0 / 43 / 6
Licensee :	BROWN BROS DRILLING INC

Map Id: 107
Direction: W
Distance: 0.813 mi.
Actual: 4290.795 ft.
Elevation: 0.076 mi. / 403.543 ft.
Relative: Higher

Site Name : 103571
39.7401145291, -75.8894400657
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342097068
EPA ID: N/R

WELLS - PA ***(cont.)***

Local Well Number :	X 4129
Date Drilled :	N/R
Well Depth :	83
Static Level :	25
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
Latitude :	39.7401145291
Longitude :	-75.8894400657
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW

Map Id: 108
Direction: ENE
Distance: 0.835 mi.
Actual: 4408.312 ft.
Elevation: 0.062 mi. / 326.001 ft.
Relative: Higher

Site Name : 103647
39.7512243223, -75.8333300767
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098040
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103647
Owner :	KIMBELOT CORP
Yield GPM :	7
Casing Top :	0 / 74 / 6
Licensee :	N/R
Local Well Number :	4739N
Date Drilled :	03/28/1978
Well Depth :	240
Static Level :	70
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	69
Site Type :	WELL
Elevation :	0
Latitude :	39.7512243223
Longitude :	-75.8333300767
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: J109
Direction: ENE
Distance: 0.858 mi.
Actual: 4532.728 ft.
Elevation: 0.023 mi. / 120.2 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394451075494401
Site Name:	CH 6299
Site Type:	GW
DMS Latitude:	394451
DMS Longitude:	0754944
Decimal Latitude:	39.74761065
Decimal Longitude:	-75.82854990
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	395
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000610
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-10
Ground Water End Date:	2000-06-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: J109
Direction: ENE
Distance: 0.858 mi.
Actual: 4532.728 ft.
Elevation: 0.023 mi. / 120.2 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 110
Direction: ENE
Distance: 0.858 mi.
Actual: 4530.506 ft.
Elevation: 0.067 mi. / 352.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394503075495701
Site Name:	CH 6242
Site Type:	GW
DMS Latitude:	394503
DMS Longitude:	0754957
Decimal Latitude:	39.75094390
Decimal Longitude:	-75.83216130
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	347
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1980
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 110
Direction: ENE
Distance: 0.858 mi.
Actual: 4530.506 ft.
Elevation: 0.067 mi. / 352.001 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-10
Ground Water End Date:	2000-06-10
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: J111
Direction: ENE
Distance: 0.863 mi.
Actual: 4557.277 ft.
Elevation: 0.022 mi. / 118.199 ft.
Relative: Higher

Site Name : 103668
39.7481744055, -75.828889972
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098045
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103668
Owner :	WOODARD N
Yield GPM :	7
Casing Top :	0 / 43 / 6
Licensee :	KENNETH L MADRON WELL DRILLING CO
Local Well Number :	4760N
Date Drilled :	05/01/1979
Well Depth :	208
Static Level :	0
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	38
Site Type :	WELL
Elevation :	0
Latitude :	39.7481744055
Longitude :	-75.828889972
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 112
Direction: ENE
Distance: 0.876 mi.
Actual: 4626.833 ft.
Elevation: 0.022 mi. / 117.201 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394445075493901
Site Name:	CH 6298
Site Type:	GW
DMS Latitude:	394445
DMS Longitude:	0754939
Decimal Latitude:	39.74594400
Decimal Longitude:	-75.82716099
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	389
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1972
Date Site Established:	20000607
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	130
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-07
Ground Water End Date:	2000-06-07
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 112
Direction: ENE
Distance: 0.876 mi.
Actual: 4626.833 ft.
Elevation: 0.022 mi. / 117.201 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 113
Direction: WNW
Distance: 0.882 mi.
Actual: 4656.645 ft.
Elevation: 0.069 mi. / 361.877 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394433075532201
Site Name:	CH 1783
Site Type:	GW
DMS Latitude:	394433
DMS Longitude:	0755322
Decimal Latitude:	39.74261017
Decimal Longitude:	-75.88910800
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	370
Method Altitude Determined:	M
Altitude Accuracy:	20
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	N/R
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	19720602
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYYNNNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	83
Hole Depth:	N/R

Map Id: 113
Direction: WNW
Distance: 0.882 mi.
Actual: 4656.645 ft.
Elevation: 0.069 mi. / 361.877 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	N/R
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	1974-10-15
Water Quality End Date:	1974-10-15
Water Quality Count:	1
Ground Water Begin Date:	1972-06-02
Ground Water End Date:	1972-06-02
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 114
Direction: NNW
Distance: 0.880 mi.
Actual: 4646.168 ft.
Elevation: 0.05 mi. / 265 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394527075515601
Site Name:	CH 5450
Site Type:	GW
DMS Latitude:	394527
DMS Longitude:	0755156
Decimal Latitude:	39.75761010
Decimal Longitude:	-75.86521839
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	265
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02040205
Drainage Basin Code:	N/R

Map Id: 114
Direction: NNW
Distance: 0.880 mi.
Actual: 4646.168 ft.
Elevation: 0.05 mi. / 265 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	19990817
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYYNYNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	000PGMT
Local Aquifer Type Code:	N/R
Well Depth:	302
Hole Depth:	N/R
Source of Depth Data:	O
Project Number:	444200342
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	2000-09-11
Water Quality End Date:	2000-09-13
Water Quality Count:	2
Ground Water Begin Date:	2000-09-11
Ground Water End Date:	2000-09-11
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 115
Direction: E
Distance: 0.895 mi.
Actual: 4726.643 ft.
Elevation: 0.02 mi. / 105.6 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394403075492901
Site Name:	CH 6271
Site Type:	GW
DMS Latitude:	394403
DMS Longitude:	0754929
Decimal Latitude:	39.73427750
Decimal Longitude:	-75.82438300
Latitude-Longitude Method:	M

Map Id: 115
Direction: E
Distance: 0.895 mi.
Actual: 4726.643 ft.
Elevation: 0.02 mi. / 105.6 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	342
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000607
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-07
Ground Water End Date:	2000-06-07
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: K116
Direction: ENE
Distance: 0.899 mi.
Actual: 4748.325 ft.
Elevation: 0.064 mi. / 336.001 ft.
Relative: Higher

Site Name : 103648
39.7503944128, -75.8302800026
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098377
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103648
Owner :	KIMBELOT CORP
Yield GPM :	20
Casing Top :	0 / 63 / 6
Licensee :	N/R
Local Well Number :	4740N
Date Drilled :	02/01/1980
Well Depth :	300
Static Level :	60
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	58
Site Type :	WELL
Elevation :	0
Latitude :	39.7503944128
Longitude :	-75.8302800026
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 117
Direction: ENE
Distance: 0.901 mi.
Actual: 4758.645 ft.
Elevation: 0.068 mi. / 360 ft.
Relative: Higher

Site Name : 103645
39.7517843868, -75.8322200285
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098250
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103645
Owner :	KIMBELOT CORP
Yield GPM :	40
Casing Top :	0 / 70 / 6
Licensee :	N/R
Local Well Number :	4737N
Date Drilled :	03/25/1978
Well Depth :	340
Static Level :	100
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	65
Site Type :	WELL
Elevation :	0
Latitude :	39.7517843868
Longitude :	-75.8322200285
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 118
Direction: W
Distance: 0.906 mi.
Actual: 4786.270 ft.
Elevation: 0.075 mi. / 395.341 ft.
Relative: Higher

Site Name : 103577
39.7387245062, -75.8919400196
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098017
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103577
Owner :	MALONEY JOHN
Yield GPM :	2
Casing Top :	0 / 20 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4135
Date Drilled :	N/R
Well Depth :	253
Static Level :	24
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	STOCK
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	13
Site Type :	WELL
Elevation :	0
Latitude :	39.7387245062
Longitude :	-75.8919400196
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW

Map Id: 119
Direction: NE
Distance: 0.916 mi.
Actual: 4836.479 ft.
Elevation: 0.072 mi. / 382.001 ft.
Relative: Higher

Site Name : 103608
39.7556742671, -75.8427800499
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098016
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103608
Owner :	TAITT WM R BLDR
Yield GPM :	20
Casing Top :	0 / 50 / 6
Licensee :	N/R
Local Well Number :	4700N
Date Drilled :	08/12/1981
Well Depth :	292
Static Level :	85
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	44
Site Type :	WELL
Elevation :	0
Latitude :	39.7556742671
Longitude :	-75.8427800499
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: K120
Direction: ENE
Distance: 0.925 mi.
Actual: 4886.031 ft.
Elevation: 0.065 mi. / 343.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394502075494901
Site Name:	CH 6241
Site Type:	GW
DMS Latitude:	394502
DMS Longitude:	0754949
Decimal Latitude:	39.75066615
Decimal Longitude:	-75.82993890
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	367
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-12
Ground Water End Date:	2000-06-12
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: K120
Direction: ENE
Distance: 0.925 mi.
Actual: 4886.031 ft.
Elevation: 0.065 mi. / 343.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: L121
Direction: NE
Distance: 0.928 mi.
Actual: 4900.661 ft.
Elevation: 0.061 mi. / 320 ft.
Relative: Higher

Site Name : 103646
39.7534543567, -75.8347199933
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098022
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103646
Owner :	KIMBELOT CORP
Yield GPM :	8
Casing Top :	0 / 75 / 6
Licensee :	N/R
Local Well Number :	4738N
Date Drilled :	10/12/1977
Well Depth :	320
Static Level :	90
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	70
Site Type :	WELL
Elevation :	0
Latitude :	39.7534543567
Longitude :	-75.8347199933
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 122
Direction: NNW
Distance: 0.930 mi.
Actual: 4910.172 ft.
Elevation: 0.057 mi. / 302.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394531075520501
Site Name:	CH 6250
Site Type:	GW
DMS Latitude:	394531
DMS Longitude:	0755205

Map Id: 122
Direction: NNW
Distance: 0.930 mi.
Actual: 4910.172 ft.
Elevation: 0.057 mi. / 302.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Decimal Latitude:	39.75872117
Decimal Longitude:	-75.86771850
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	297
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000603
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-03
Ground Water End Date:	2000-06-03
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 123
Direction: NE
Distance: 0.933 mi.
Actual: 4925.708 ft.
Elevation: 0.078 mi. / 413.999 ft.
Relative: Higher

Site Name : 103658
39.7565042622, -75.8438900819
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098381
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103658
Owner :	ROY A
Yield GPM :	15
Casing Top :	0 / 45 / 6
Licensee :	N/R
Local Well Number :	4750N
Date Drilled :	06/19/1978
Well Depth :	200
Static Level :	40
Well Finish :	N/R
Use of Site :	N/R
Use of Water :	N/R
Formation :	N/R
WQ Data :	0
Depth to Bed :	40
Site Type :	WELL
Elevation :	0
Latitude :	39.7565042622
Longitude :	-75.8438900819
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 124
Direction: NW
Distance: 0.938 mi.
Actual: 4950.559 ft.
Elevation: 0.079 mi. / 418.963 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394512075530201
Site Name:	CH 6145
Site Type:	GW
DMS Latitude:	394512
DMS Longitude:	0755302
Decimal Latitude:	39.75333330
Decimal Longitude:	-75.88388889
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD83
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	OXFORD
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	420
Method Altitude Determined:	M

Map Id: 124
Direction: NW
Distance: 0.938 mi.
Actual: 4950.559 ft.
Elevation: 0.079 mi. / 418.963 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	H
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000527
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	330
Hole Depth:	N/R
Source of Depth Data:	D
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-05-27
Ground Water End Date:	2000-05-27
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 125
Direction: ENE
Distance: 0.943 mi.
Actual: 4981.283 ft.
Elevation: 0.07 mi. / 367.001 ft.
Relative: Higher

Site Name : 103639
39.7515043334, -75.8305599805
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097344
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103639
Owner :	BOYLE E
Yield GPM :	6
Casing Top :	0 / 60 / 6
Licensee :	N/R

Map Id: 125
Direction: ENE
Distance: 0.943 mi.
Actual: 4981.283 ft.
Elevation: 0.07 mi. / 367.001 ft.
Relative: Higher

Site Name : 103639
39.7515043334, -75.8305599805
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342097344
EPA ID: N/R

WELLS - PA ***(cont.)***

Local Well Number :	4731N
Date Drilled :	10/09/1981
Well Depth :	260
Static Level :	80
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	55
Site Type :	WELL
Elevation :	0
Latitude :	39.7515043334
Longitude :	-75.8305599805
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 126
Direction: NE
Distance: 0.945 mi.
Actual: 4989.875 ft.
Elevation: 0.073 mi. / 386.001 ft.
Relative: Higher

Site Name : 103607
39.7553942992, -75.8413900597
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097007
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103607
Owner :	CERISOLI + MORRISON
Yield GPM :	6
Casing Top :	0 / 60 / 6
Licensee :	N/R
Local Well Number :	4699N
Date Drilled :	01/06/1981
Well Depth :	208
Static Level :	46
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	54
Site Type :	WELL
Elevation :	0
Latitude :	39.7553942992
Longitude :	-75.8413900597
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 127
Direction: E
Distance: 0.953 mi.
Actual: 5031.004 ft.
Elevation: 0.02 mi. / 103.901 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394350075492501
Site Name:	CH 6295
Site Type:	GW
DMS Latitude:	394348.7
DMS Longitude:	0754922.9
Decimal Latitude:	39.73019444
Decimal Longitude:	-75.82302778
Latitude-Longitude Method:	G
Latitude-Longitude Accuracy:	5
Latitude-Longitude Datum:	NAD83
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	341
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1978
Date Site Established:	20000627
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYY Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	160
Hole Depth:	N/R
Source of Depth Data:	D
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-27
Ground Water End Date:	2005-06-14
Ground Water Count:	2
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 127
Direction: E
Distance: 0.953 mi.
Actual: 5031.004 ft.
Elevation: 0.02 mi. / 103.901 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 128
Direction: E
Distance: 0.958 mi.
Actual: 5057.670 ft.
Elevation: 0.02 mi. / 106.801 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394401075492301
Site Name:	CH 6484
Site Type:	GW
DMS Latitude:	394401.0
DMS Longitude:	0754923.2
Decimal Latitude:	39.73361110
Decimal Longitude:	-75.82311110
Latitude-Longitude Method:	G
Latitude-Longitude Accuracy:	5
Latitude-Longitude Datum:	NAD83
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	350
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02040205
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20050614
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R

Map Id: 128
Direction: E
Distance: 0.958 mi.
Actual: 5057.670 ft.
Elevation: 0.02 mi. / 106.801 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Source of Depth Data:	N/R
Project Number:	247600261
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2005-06-14
Ground Water End Date:	2005-06-14
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 129
Direction: NE
Distance: 0.955 mi.
Actual: 5042.136 ft.
Elevation: 0.06 mi. / 318.999 ft.
Relative: Higher

Site Name : 103603
39.7548343428, -75.8380600391
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097118
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103603
Owner :	TAITT BLDRS
Yield GPM :	12
Casing Top :	0 / 20 / 6
Licensee :	N/R
Local Well Number :	4695N
Date Drilled :	06/03/1982
Well Depth :	128
Static Level :	16
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	9
Site Type :	WELL
Elevation :	0
Latitude :	39.7548343428
Longitude :	-75.8380600391
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 130
Direction: NNW
Distance: 0.962 mi.
Actual: 5081.980 ft.
Elevation: 0.061 mi. / 323.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394533075521201
Site Name:	CH 6251
Site Type:	GW
DMS Latitude:	394533
DMS Longitude:	0755212
Decimal Latitude:	39.75927670
Decimal Longitude:	-75.86966300
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	328
Method Altitude Determined:	M
Altitude Accuracy:	5
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	20000603
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-03
Ground Water End Date:	2000-06-03
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA

Map Id: 130
Direction: NNW
Distance: 0.962 mi.
Actual: 5081.980 ft.
Elevation: 0.061 mi. / 323.999 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: L131
Direction: NE
Distance: 0.965 mi.
Actual: 5095.941 ft.
Elevation: 0.058 mi. / 307.001 ft.
Relative: Higher

Site Name : 103644
39.7537243571, -75.8338900146
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098240
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103644
Owner :	KIMBELOT CORP
Yield GPM :	5
Casing Top :	0 / 55 / 6
Licensee :	N/R
Local Well Number :	4736N
Date Drilled :	07/15/1978
Well Depth :	320
Static Level :	60
Well Finish :	N/R
Use of Site :	N/R
Use of Water :	N/R
Formation :	N/R
WQ Data :	0
Depth to Bed :	50
Site Type :	WELL
Elevation :	0
Latitude :	39.7537243571
Longitude :	-75.8338900146
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 132
Direction: W
Distance: 0.971 mi.
Actual: 5127.838 ft.
Elevation: 0.08 mi. / 420.276 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394426075533501
Site Name:	CH 4931
Site Type:	GW
DMS Latitude:	394425.5
DMS Longitude:	0755333.0

Map Id: 132
Direction: W
Distance: 0.971 mi.
Actual: 5127.838 ft.
Elevation: 0.08 mi. / 420.276 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Decimal Latitude:	39.74041667
Decimal Longitude:	-75.89250000
Latitude-Longitude Method:	G
Latitude-Longitude Accuracy:	5
Latitude-Longitude Datum:	NAD83
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	410
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	F
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	199211
Date Site Established:	19931215
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYYNYNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCK
Local Aquifer Type Code:	U
Well Depth:	132
Hole Depth:	N/R
Source of Depth Data:	D
Project Number:	444220700
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	1994-07-21
Water Quality End Date:	2000-11-27
Water Quality Count:	2
Ground Water Begin Date:	1993-12-15
Ground Water End Date:	1994-07-21
Ground Water Count:	3
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 133
Direction: NE
Distance: 0.971 mi.
Actual: 5125.714 ft.
Elevation: 0.07 mi. / 371.001 ft.
Relative: Higher

Site Name : 103606
39.7553942854, -75.8402799819
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097296
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103606
Owner :	HANNON C
Yield GPM :	4
Casing Top :	0 / 45 / 6
Licensee :	N/R
Local Well Number :	4698N
Date Drilled :	10/15/1981
Well Depth :	208
Static Level :	57
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	38
Site Type :	WELL
Elevation :	0
Latitude :	39.7553942854
Longitude :	-75.8402799819
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 134
Direction: W
Distance: 0.977 mi.
Actual: 5157.512 ft.
Elevation: 0.068 mi. / 359.908 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394354075533901
Site Name:	CH 6377
Site Type:	GW
DMS Latitude:	394354
DMS Longitude:	0755339
Decimal Latitude:	39.73177700
Decimal Longitude:	-75.89383040
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	BAY VIEW
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	362
Method Altitude Determined:	M

Map Id: 134
Direction: W
Distance: 0.977 mi.
Actual: 5157.512 ft.
Elevation: 0.068 mi. / 359.908 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02060002
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	N/R
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YY Y Y
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	444200241
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	--
Water Quality End Date:	--
Water Quality Count:	0
Ground Water Begin Date:	2000-06-13
Ground Water End Date:	2000-06-13
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: M135
Direction: ENE
Distance: 0.977 mi.
Actual: 5160.256 ft.
Elevation: 0.072 mi. / 378.999 ft.
Relative: Higher

Site Name : 103643
39.7503943852, -75.8283300637
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098238
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103643
Owner :	KIMBELOT CORP
Yield GPM :	8
Casing Top :	0 / 52 / 6
Licensee :	N/R

Map Id: M135
Direction: ENE
Distance: 0.977 mi.
Actual: 5160.256 ft.
Elevation: 0.072 mi. / 378.999 ft.
Relative: Higher

Site Name : 103643
39.7503943852, -75.8283300637
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342098238
EPA ID: N/R

WELLS - PA ***(cont.)***

Local Well Number :	4735N
Date Drilled :	01/30/1980
Well Depth :	200
Static Level :	45
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	47
Site Type :	WELL
Elevation :	0
Latitude :	39.7503943852
Longitude :	-75.8283300637
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 136
Direction: ENE
Distance: 0.977 mi.
Actual: 5159.200 ft.
Elevation: 0.073 mi. / 386.001 ft.
Relative: Higher

Site Name : 103638
39.7523343884, -75.8308300644
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098371
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103638
Owner :	KIMBELOT
Yield GPM :	7.5
Casing Top :	0 / 102 / 6
Licensee :	N/R
Local Well Number :	4730N
Date Drilled :	08/03/1977
Well Depth :	240
Static Level :	60
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	97
Site Type :	WELL
Elevation :	0
Latitude :	39.7523343884
Longitude :	-75.8308300644
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 137
Direction: NE
Distance: 0.980 mi.
Actual: 5173.697 ft.
Elevation: 0.064 mi. / 338.999 ft.
Relative: Higher

Site Name : 103605
39.7553942626, -75.8391700199
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097005
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103605
Owner :	HANNON C
Yield GPM :	6
Casing Top :	0 / 52 / 6
Licensee :	N/R
Local Well Number :	4697N
Date Drilled :	02/10/1982
Well Depth :	208
Static Level :	47
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	40
Site Type :	WELL
Elevation :	0
Latitude :	39.7553942626
Longitude :	-75.8391700199
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 138
Direction: ENE
Distance: 0.984 mi.
Actual: 5194.838 ft.
Elevation: 0.022 mi. / 114.8 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394456075493801
Site Name:	CH 1829
Site Type:	GW
DMS Latitude:	394456
DMS Longitude:	0754938
Decimal Latitude:	39.74899954
Decimal Longitude:	-75.82688320
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	F
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	NEWARK WEST
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	410
Method Altitude Determined:	M

Map Id: 138
Direction: ENE
Distance: 0.984 mi.
Actual: 5194.838 ft.
Elevation: 0.022 mi. / 114.8 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02040205
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	N/R
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	19660101
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYYNNNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	300WSCKO
Local Aquifer Type Code:	N/R
Well Depth:	165
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	N/R
Realtime-Data Flag:	0
Peak Begin Date:	--
Peak End Date:	--
Peak Count:	0
Water Quality Begin Date:	1995-08-31
Water Quality End Date:	1995-08-31
Water Quality Count:	1
Ground Water Begin Date:	1966-11-01
Ground Water End Date:	1966-11-01
Ground Water Count:	1
Site Visit Begin Date:	--
Site Visit End Date:	--
Site Visit Count:	0
State:	PA
Classcode:	NWIS

Map Id: 139
Direction: NE
Distance: 0.988 mi.
Actual: 5216.223 ft.
Elevation: 0.077 mi. / 405 ft.
Relative: Higher

Site Name : 103657
39.7567842822, -75.8425000064
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097389
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103657
Owner :	ROY A
Yield GPM :	7
Casing Top :	0 / 42 / 6
Licensee :	N/R

Map Id: 139
Direction: NE
Distance: 0.988 mi.
Actual: 5216.223 ft.
Elevation: 0.077 mi. / 405 ft.
Relative: Higher

Site Name : 103657
39.7567842822, -75.8425000064
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342097389
EPA ID: N/R

WELLS - PA ***(cont.)***

Local Well Number :	4749N
Date Drilled :	06/20/1978
Well Depth :	200
Static Level :	50
Well Finish :	N/R
Use of Site :	N/R
Use of Water :	N/R
Formation :	N/R
WQ Data :	0
Depth to Bed :	37
Site Type :	WELL
Elevation :	0
Latitude :	39.7567842822
Longitude :	-75.8425000064
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 140
Direction: ENE
Distance: 0.991 mi.
Actual: 5230.932 ft.
Elevation: 0.024 mi. / 126.601 ft.
Relative: Higher

Site Name : 103666
39.7467844394, -75.8252800103
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342098278
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103666
Owner :	WIER C
Yield GPM :	5
Casing Top :	0 / 37 / 6
Licensee :	N/R
Local Well Number :	4758N
Date Drilled :	06/01/1980
Well Depth :	121
Static Level :	25
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	34
Site Type :	WELL
Elevation :	0
Latitude :	39.7467844394
Longitude :	-75.8252800103
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST

Map Id: M141
Direction: ENE
Distance: 0.991 mi.
Actual: 5231.872 ft.
Elevation: 0.022 mi. / 114.075 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS]

Envirosite ID: N/R
EPA ID: N/R

NWIS

Agency:	USGS
Site Identification Number:	394500075494101
Site Name:	CH 1866
Site Type:	GW
DMS Latitude:	394500
DMS Longitude:	0754941
Decimal Latitude:	39.75011060
Decimal Longitude:	-75.82771659
Latitude-Longitude Method:	M
Latitude-Longitude Accuracy:	S
Latitude-Longitude Datum:	NAD27
Decimal Latitude/Longitude Datum:	NAD83
District Code:	42
State Code:	42
County Code:	029
Country Code:	US
Land Net Location Description:	N/R
Name of Location Map:	WEST GROVE
Scale of Location Map:	24000
Altitude of Gage/Land Surface:	370
Method Altitude Determined:	M
Altitude Accuracy:	10
Altitude Datum:	NGVD29
Hydrologic Unit Code:	02040205
Drainage Basin Code:	N/R
Topographic Setting Code:	S
Data Types:	N/R
Instruments:	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Construction Date:	1955
Date Site Established:	N/R
Drainage Area:	N/R
Contributing Drainage Area:	N/R
Time-zone Abbreviation:	EST
Daylight Saving Time:	Y
Data Reliability Code:	C
Data-Other GW File:	YYYYNNNN
National Aquifer Code:	N400PDMBRX
Local Aquifer Code:	N/R
Local Aquifer Type Code:	N/R
Well Depth:	N/R
Hole Depth:	N/R
Source of Depth Data:	N/R
Project Number:	N/R
Realtime-Data Flag:	N/R
Peak Begin Date:	N/R
Peak End Date:	N/R
Peak Count:	N/R
Water Quality Begin Date:	N/R
Water Quality End Date:	N/R
Water Quality Count:	N/R
Ground Water Begin Date:	N/R
Ground Water End Date:	N/R
Ground Water Count:	N/R
Site Visit Begin Date:	N/R
Site Visit End Date:	N/R
Site Visit Count:	N/R
State:	PA

Map Id: M141
Direction: ENE
Distance: 0.991 mi.
Actual: 5231.872 ft.
Elevation: 0.022 mi. / 114.075 ft.
Relative: Lower

Site Name : N/R

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: N/R
EPA ID: N/R

NWIS ***(cont.)***

Classcode:	NWIS

Map Id: 142
Direction: NE
Distance: 0.990 mi.
Actual: 5227.066 ft.
Elevation: 0.066 mi. / 350 ft.
Relative: Higher

Site Name : 103602
39.7551143199, -75.836940051
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097675
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103602
Owner :	TAITT BLDRS
Yield GPM :	12
Casing Top :	0 / 43 / 6
Licensee :	N/R
Local Well Number :	4694N
Date Drilled :	12/02/1982
Well Depth :	208
Static Level :	38
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	34
Site Type :	WELL
Elevation :	0
Latitude :	39.7551143199
Longitude :	-75.836940051
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 143
Direction: W
Distance: 0.995 mi.
Actual: 5251.227 ft.
Elevation: 0.065 mi. / 341.535 ft.
Relative: Higher

Site Name : 103491
39.7306745983, -75.8938900178
PA

Database(s) : [WELLS - PA]

Envirosite ID: 342097002
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103491
Owner :	BUCHANAN MARSHALL
Yield GPM :	10
Casing Top :	0 / 78 / 6
Licensee :	N/R

Map Id: 143
Direction: W
Distance: 0.995 mi.
Actual: 5251.227 ft.
Elevation: 0.065 mi. / 341.535 ft.
Relative: Higher

Site Name : 103491
39.7306745983, -75.8938900178
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 342097002
EPA ID: N/R

WELLS - PA ***(cont.)***

Local Well Number :	4648N
Date Drilled :	09/25/1984
Well Depth :	135
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	72
Site Type :	WELL
Elevation :	0
Latitude :	39.7306745983
Longitude :	-75.8938900178
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW

RADON DATA:

STATE SOURCE: No Available Data

FEDERAL AREA RADON INFORMATION FOR: CHESTER PA

NUMBER OF SAMPLE SITES: 33

Area:	Average Activity:	% <4 pCi/L:	% 4-20 pCi/L:	% >20 pCi/L:
basement	10.7643 pCi/L	57.14%	25%	17.86%
first floor	2.1 pCi/L	100%	0%	0%

INACTIVE PCS
Inactive Permit Compliance Facilities
Environmental Protection Agency
(202) 564-6582
Inactive Permitted facilities to discharge wastewater

NWIS
National Water Information Systems
United States Geological Society
(703) 648-5953
Information on all water resources for the United States. This database contains all current and historical data for the nation.

PCS ENF
Enforced Permit Compliance Facilities
Environmental Protection Agency
(202) 564-6582
Permitted facilities to discharge wastewater (Federal equivalent to NPDES)

PCS FACILITY
Permit Compliance Facilities
Environmental Protection Agency
(202) 564-6582
Permitted facilities to discharge wastewater (Federal equivalent to NPDES)

PWS
Public Water Supply
Environmental Protection Agency
(800) 426-4791
Safe drinking water information Systems

PWS ENF
Public Water Supply locations with Enforcement Violations
Environmental Protection Agency
(800) 426-4791
Safe drinking water information Systems with enforcememnt violations

STORMWATER
Storm Water Permits
Environmental Protection Agency
(202) 566-1667
Permitted storm water sites

NPDES - PA
National Pollutant Discharge Elimination System
Department of Environmental Protection
(717) 787-2043
Inventory of NPDES Permits

WELLS - PA
Water Well Locations
DEPARTMENT OF ENVIRONMENTAL PROTECTION
(717)772-2199
PAGWIS Well Water Well Inventory

FLOOD Q3
Flood data
Environmental Protection Agency
(202) 566-1667
Q3 Flood Data

HYDROLOGIC UNIT
Hydrologic Unit Maps
USGS
The United States Geological Survey created a hierarchical system of hydrologic units originally called regions, sub-regions, accounting units, and cataloging units. Each unit was assigned a unique Hydrologic Unit Code (HUC). As first implemented the system had 21 regions, 221 subregions, 378 accounting units, and 2,264 cataloging units. Over time the system was changed and expanded. As of 2010 there are six levels in the hierarchy, represented by hydrologic unit codes from 2 to 12 digits long, called regions, subregions, basins, subbasins, watersheds, and subwatersheds. The table below describes the system's hydrologic unit levels and their characteristics, along with example names and codes.

WETLANDS NWI
National Wetland Inventory
U.S. Fish and Wildlife Service
(703) 358-2171
Wetland Inventory for the United States

SSURGO
Detailed Soil Data Map
Natural Resources Conservation Service: U.S. Department of Agriculture
(202) 690-4985
Detailed Soil Data Map

STATSGO & MUI
General Soil Data Map
Natural Resources Conservation Service: U.S. Department of Agriculture
(202) 690-4985
General Soil Data Map

USGS GEOLOGIC AGE
USGS Digital Data Series DDS
Natural Resources Conservation Service: U.S. Department of Agriculture
(202) 690-4985
USGS Digital Data Series DDS: Geologic Age and Rock Stratigraphic Unit

RADON
National Radon Database
USGS
703-605-6008
A study of the EPA/State Residential Radon Survey and the National Residential Radon Survey.

OIL & GAS WELLS - PA
Oil & Gas Wells
Department of Environmental Protection
(717)772-2199
Oil & Gas Wells Directory

AIRPORT FACILITIES
Airport landing facilities
Federal Aviation Administration
(866) 835-5322
Airport landing facilities

BASINS
Better Assessment Science Integrating point & Non-point Sources
U.S. Environmental Protection Agency
855-246-3642
Integrated geographical information system national watershed data and environmental assessment known as Better Assessment Science Integrating point & Non-point Sources

EPICENTERS
National Geographical Data Center
National Geographical Data Center
303-497-6826
Data on over four million earthquakes dating from 2100 B.C. to 1995 A.D.

FLOOD DFIRM
National Flood Hazard Layer Database
Federal Emergency Management Agency
The National Flood Hazard Layer Database (NFHL) is a computer database that contains the flood hazard map information from FEMAs Flood Map Modernization program. These map data are from Digital Flood Insurance Rate Map (DFIRM) databases and Letters of Map Revision.

APPENDIX C

ENVIRONMENTAL LIEN SEARCH REPORT

The NETR Environmental Lien and AUL Search Report

STRAWBRIDGE PROPERTY
MOUNT OLIVET ROAD AND WALKER ROAD
LANDENBERG, PENNSYLVANIA

Thursday, June 22, 2017

Project Number: L17-01092

2055 East Rio Salado Parkway
Tempe, Arizona 85281

Telephone: 480-967-6752
Fax: 480-966-9422

ENVIRONMENTAL LIEN AND AUL REPORT

The NETR Environmental LienSearch Report provides results from a search of available current land title records for environmental cleanup liens and other activity and use limitations, such as engineering controls and institutional controls.

A network of professional, trained researchers, following established procedures, uses client supplied property information to:

- search for parcel information and/or legal description;
- search for ownership information;
- research official land title documents recorded at jurisdictional agencies such as recorders' office, registries of deed, county clerks' offices, etc.;
- access a copy of the deed;
- search for environmental encumbering instrument(s) associated with the deed;
- provide a copy of any environmental encumbrance(s) based upon a review of key words in the instrument(s) (title, parties involved and description); and
- provide a copy of the deed or cite documents reviewed;

Thank you for your business
Please contact NETR at 480-967-6752
with any questions or comments

Disclaimer - Copyright and Trademark Notice

This report was prepared for the use of Nationwide Environmental Title Research, and Ten Bears Environmental, exclusively. This report is neither a guarantee of title, a commitment to insure, nor a policy of title insurance. **NO WARRANTY, EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT.** Nationwide Environmental Title Research (NETR) specifically disclaims the making of any such warranties, including without limitation, merchantability or fitness for a particular use or purpose. The information contained in this report is retrieved as it is recorded from the various agencies that make it available. The total liability is limited to the fee paid for this report.

Copyright 2006 by Nationwide Environmental Title Research. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Nationwide Environmental Title Research, or its affiliates, is prohibited without prior written permission

NETR and its logos are trademarks of Nationwide Environmental Title Research or its affiliates. All other trademarks used herein are the property of their respective owners.

ENVIRONMENTAL LIEN AND AUL REPORT

The NETR Environmental Lien Search Report is intended to assist in the search for environmental liens filed in land title records.

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: New Deed Type

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

LEGAL DESCRIPTION

All that certain piece or parcel of land being 63.5 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 72-6-10

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: New Deed Type

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

LEGAL DESCRIPTION

All that certain piece or parcel of land being 370.1 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 72-6-4

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: New Deed Type

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

LEGAL DESCRIPTION

All that certain piece or parcel of land being 346.7 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 70-5-8

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: New Deed Type

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

LEGAL DESCRIPTION

All that certain piece or parcel of land being 71.9 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 70-5-7

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: New Deed Type

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

LEGAL DESCRIPTION

All that certain piece or parcel of land being 96.7 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 70-5-6

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Individual Deed

Grantor: Jane F. Trimble

Grantee: George Strawbridge, Jr

Deed Dated: 03/31/1997
Deed Recorded: 04/02/1997
Book: 4158
Page: 1495

LEGAL DESCRIPTION

All that certain piece or parcel of land being 14.4 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 72-6-1

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Individual Deed

Grantor: Jane F. Trimble

Grantee: George Strawbridge, Jr

Deed Dated: 03/31/1997
Deed Recorded: 04/02/1997
Book: 4158
Page: 1495

LEGAL DESCRIPTION

All that certain piece or parcel of land being 19.3 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 71-4-32.3

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

14755

RECORDER OF DEEDS
CHESTER COUNTY, PA.
'84 AUG 23 P2:05

AFFIDAVIT

CERTIFICATE OF AWARD OF REAL ESTATE

TRUST INTER VIVOS: GEORGE STRAWBRIDGE, JR., SETTLOR

NO. 84664

Award of Real Estate to: Delaware Trust Company, George Strawbridge, and William C. Lickle, of 900 Market Street Mall, Wilmington, Delaware 19801, Trustees under Deed of George Strawbridge, Jr. dated January 20, 1971, thirty percent interest.

Commonwealth of Pennsylvania :
ss
County of Montgomery :

I, Nancy Moorley, 1st Asst Assistant Clerk of the Orphans' Court Division of the Court of Common Pleas for the County of Montgomery, in the Commonwealth of Pennsylvania, do hereby certify the attached to be a true and correct excerpt from the schedule of distribution filed in conformity with adjudication of the Orphans' Court Division of the Court of Common Pleas of Montgomery County upon the first account of Girard Bank, George Strawbridge and Charles H. Norris, Jr., Trustees under Deed of George Strawbridge, Jr., dated January 20, 1971, filed and conformed nisi February 17, 1983, as the same remains on file and is of record in said court.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seal of said Court at Norristown this 7th day of August, 1984.

Nancy Moorley

Assistant Clerk of the Orphans' Court Division

B 64 175

Form 553354

EXHIBIT "A"

To Delaware Trust Company and George Strawbridge and William C. Lickle, Trustees Under Deed of George Strawbridge, Jr. dated January 20, 1971 their Successors & assigns Premises .30 Int. Springlawn, Chester County, Pa. valued @ and more fully described as follows:

155 200 97

ALL THOSE TWO CERTAIN tracts of ground Situate partly in the Townships of London Britain, Franklin and Elk, County of Chester and State of Pennsylvania described according to a Plan of Property of Springlawn Corp. dated 8-24-1978 made by M[illegible] Engineering Assoc. Engineers and Surveyors, Oxford, Pa. as follows, to wit:

PREMISES "A"

BEGINNING at a spike set in the title line of Public Road LR 15020 known as Fairview Elkton Road said road leading in a Northerly direction to Pennsylvania Route 896 and a Southerly direction to Elkton, Md. said spike marking a Northeasterly corner of this about to be described tract and a corner of R. Vannoy; thence leaving said spike by the title line of said road South 01 degree 30 minutes 06 seconds West 463.95 feet to a spike marking a corner of this and a Northwesterly corner of S. Eschus; thence by said lands of Eschus South 87 degrees 27 minutes 56 seconds West 349.22 feet to an iron pin marking a corner of this and a corner of lands of Eschus; thence partly by lands of S. Eschus, J. Luckett, J. Evans, and R. Swan South 03 degrees 55 minutes 54 seconds East 1085.49 feet to an old iron pin marking a corner of this and a corner of lands of R. Swan; thence by said lands of Swan the following four courses and distances to wit: (1) South 20 degrees 39 minutes 45 seconds West 679.70 feet to an iron pin (2) South 04 degrees 36 minutes 49 seconds West 341.47 feet to an iron pin (3) South 00 degrees 35 minutes 04 seconds West 1295.24 feet to an iron pin (4) South 04 degrees 04 minutes 41 seconds East 147.79 feet to an iron pin marking a Southeasterly corner of this and set on the line dividing the State of Pennsylvania from the State of Maryland; thence by the State of Maryland due West crossing over Township line dividing Elk Township from Franklin Township 11371.55 feet to a post marking a Southwesterly corner of this and a Southeasterly corner of R. M. Thompson; thence by said lands of Thompson the following two courses and distances to wit: (1) North 05 degrees 02 minutes 01 second East 1509.75 feet to an iron pin (2) North 87 degrees 52 minutes 04 seconds West 354.76 feet to a spike set in the title line of Public Road LR 15016 known as Lewisville Strickerville Road said road leading in an Easterly direction to Strickerville and a westerly direction to Lewisville said spike marking a Southeasterly corner of lands of M. P. Dougherty; thence by said lands of Dougherty the following three courses and distances to wit:

1 - North 11 degrees 57 minutes 12 seconds East 1765.62' to a stone
2 - South 87 degrees 41 minutes 21 seconds West 1539.62' to a point
3 - South 87 degrees 36 minutes 49 seconds West 1350.72' to a spike marking a corner of this and set in the title line of Pennsylvania Route 841, leading in a northerly direction to Pennsylvania Route 896 and a southerly direction to Lewisville; thence leaving said spike and by the title line of said Pennsylvania Route 841 the following four courses and distances to wit:

1 - North 08 degrees 35 minutes 11 seconds West 498.86' to a spike
2 - North 13 degrees 38 minutes 41 seconds West 418.53' to a spike
3 - North 16 degrees 54 minutes 38 seconds West 251.55' to a spike
4 - North 06 degrees 48 minutes 19 seconds East 476.20' to a spike set for a northwesterly corner of this and a corner of lands of L. T. Steele, Jr.; thence by said lands of Steele and also along the southerly side of the water rights right of way conveyed to Springlawn Corporation the following 14 courses and distances to wit:

1 - North 81 degrees 34 minutes 21 seconds East 321.87' to an iron pin
2 - North 47 degrees 27 minutes 26 seconds East 150.43' to an iron pin
3 - North 43 degrees 51 minutes 26 seconds East 242.61' to an iron pin
4 - North 57 degrees 31 minutes 26 seconds East 152.98' to an iron pin
5 - North 40 degrees 11 minutes 26 seconds East 155.16' to an iron pin
6 - North 47 degrees 49 minutes 26 seconds East 187.97' to an iron pin
7 - North 50 degrees 15 minutes 26 seconds East 90.78' to an iron pin
8 - North 38 degrees 02 minutes 26 seconds East 125.30' to an iron pin
9 - North 39 degrees 24 minutes 26 seconds East 214.76' to an iron pin
10 - North 46 degrees 15 minutes 26 seconds East 139.98' to an iron pin
11 - North 44 degrees 09 minutes 26 seconds East 227.40' to an iron pin
12 - North 39 degrees 04 minutes 26 seconds East 360.43' to an iron pin
13 - North 42 degrees 03 minutes 26 seconds East 288.73' to an iron pin
14 - North 55 degrees 03 minutes 26 seconds East 209.01' to an iron pin; thence crossing township line dividing Elk Township, Franklin Township, and partly by lands of aforementioned L. T. Steele, Jr. and lands of J. R. Frederick North 46 degrees 25 minutes 26 seconds East 858.48' to an iron pin marking a corner of this and a corner of lands of J. R. Frederick;

B 64 176

thence by lands of Frederick North 60 degrees 21 minutes 26 seconds East 387.37' to an iron pin; thence still by Frederick and partly by the water rights right of way granted to Springlawn Corporation by Frederick North 51 degrees 47 minutes 26 seconds East 302.81' to a tree; thence still by lands of Frederick and the southerly side of said right of way North 84 degrees 32 minutes 26 seconds East 294.70' to an iron pin marking a corner of Francis Hill; thence by said lands of Hill the following four courses and distances to wit:

1 - North 48 degrees 29 minutes 26 seconds East 291.01' to an iron pin
2 - North 52 degrees 01 minute 26 seconds East 187.62' to an iron pin
3 - North 68 degrees 47 minutes 26 seconds East 231.82' to an iron pin
4 - North 83 degrees 35 minutes 35 seconds East 1584.88' to an old iron pin marking a corner of J. Rowe; thence partly by lands of Rowe and partly by lands of T. Davis North 81 degrees 06 minutes 58 seconds East 779.23' to a point marking a northwesterly corner of lands of R. Riale; thence by said lands of Riale the following two courses and distances to wit:

1 - South 05 degrees 17 minutes 30 seconds West 534.84' to a point
2 - South 01 degrees 09 minutes 30 seconds west 225.12' to a point; thence still partly by lands of Riale and partly by lands of C. Thomas South 09 degrees 10 minutes 30 seconds West 196.00' to a point marking a corner of lands of Thomas; thence by said lands of Thomas South 04 degrees 58 minutes 30 seconds West 455.15' to an old iron pin marking a corner of said lands of Thomas; thence still partly by lands of Thomas and partly by lands of Riale South 87 degrees 56 minutes 30 seconds East 626.16' to an iron pin; thence by lands of Riale South 87 degrees 22 minutes 30 seconds East 580.03' to an old iron pin; thence passing through the title line of Public Road T-303 known as Mt. Olivet Road said road leading in a northerly direction to Peacedale Road and an easterly direction to Pennsylvania Route 896 South 88 degrees 03 minutes 00 seconds East 1201.27' to an iron pin marking a corner of Mt. Olivet School; thence by said lands of Mt. Olivet School the following five courses and distances to wit:

1 - South 00 degrees 06 minutes 57 seconds West 80.89' to an iron pin
2 - North 88 degrees 55 minutes 57 seconds East 270.00' to an iron pin
3 - North 26 degrees 32 minutes 33 seconds West 76.20' to a stone
4 - North 36 degrees 21 minutes 33 seconds West 96.89' to a stump
5 - North 88 degrees 32 minutes 03 seconds West 112.37' to a point set in the title line of aforementioned Public Road T-303; thence by said title line the following three courses and distances to wit:

1 - North 47 degrees 24 minutes 27 seconds East 131.16' to a point
2 - North 79 degrees 45 minutes 27 seconds East 93.81' to a point
3 - South 82 degrees 22 minutes 33 seconds East 56.76' to an iron pin; thence leaving said title line and by lands of B. Johnson the following three courses and distances to wit:

1 - South 37 degrees 09 minutes 33 seconds East 439.64' to an iron pin
2 - South 08 degrees 52 minutes 27 seconds West 1043.47' to an iron pin
3 - South 41 degrees 14 minutes 37 seconds East 536.41' to an iron pin marking a corner of this and a corner of lands of said Johnson; thence partly by said lands of Johnson and partly by lands of A. Del Duca South 06 degrees 44 minutes 00 seconds East 2116.95' to a spike set in the title line of aforementioned Public Road LR-15016; thence by said title line the following four courses and distances to wit:

1 - South 78 degrees 28 minutes 13 seconds East 112.74' to a point
2 - South 77 degrees 59 minutes 13 seconds East 273.31' to a point
3 - South 89 degrees 54 minutes 13 seconds East 137.50' to a point
4 - North 80 degrees 30 minutes 32 seconds East 59.47' to a spike marking a corner of this and a corner of lands of T. R. Crossan; thence by said lands of Crossan South 41 degrees 03 minutes 14 seconds East 614.04' to an iron pin; thence partly by lands of Crossan and partly by lands of aforementioned Vannoy North 72 degrees 34 minutes 16 seconds East 4070.69' to a spike being the first mentioned point and place of beginning.

CONTAINING 1,684.938 Acres be the same more or less.

TOGETHER with the water rights right of way as granted to Springlawn Corporation by L. T. Staats, Jr. situate in Elk Township and New London Township, Chester County, Pennsylvania described as follows.

BEGINNING at a spike set for a northwesterly corner of lands of Springlawn Corporation said spike being set in the title line of Pennsylvania Route 841 said road leading in a southerly direction to Lewisville and a northerly direction to Pennsylvania Route 896; thence leaving said point of beginning and by the title line of Pennsylvania Route 841 North 07 degrees 45 minutes 22 seconds East 256.93' to a point; thence leaving said title line and passing through lands of L. T. Staats, Jr. the following three courses and distances to wit:

1 - North 47 degrees 08 minutes 47 seconds East 1175.88' to a point
2 - North 45 degrees 03 minutes 56 seconds East 740.01' to a point
3 - North 48 degrees 24 minutes 25 seconds East 580.00' to a point set in line of lands of J. R. Frederick also set on Township Line dividing Franklin Township from New London Township; thence by lands of Frederick South 78 degrees 13 minutes 04 seconds East 295.95' to a point set in line of lands of Springlawn Corporation. Thence by said lands the following 15 courses and distances to wit:

1 - South 46 degrees 25 minutes 26 seconds West 67.79' to a point
2 - South 55 degrees 03 minutes 26 seconds West 209.01' to an iron pin
3 - South 42 degrees 03 minutes 26 seconds West 268.73' to an iron pin
4 - South 39 degrees 04 minutes 26 seconds West 360.43' to an iron pin
5 - South 44 degrees 09 minutes 26 seconds West 227.40' to an iron pin
6 - South 46 degrees 15 minutes 26 seconds West 189.98' to an iron pin
7 - South 39 degrees 24 minutes 26 seconds West 214.76' to an iron pin
8 - South 38 degrees 02 minutes 26 seconds West 125.30' to an iron pin
9 - South 50 degrees 15 minutes 26 seconds West 90.76' to an iron pin
10 - South 47 degrees 49 minutes 26 seconds West 187.97' to an iron pin
11 - South 40 degrees 11 minutes 26 seconds West 155.16' to an iron pin
12 - South 57 degrees 31 minutes 26 seconds West 102.98' to an iron pin
13 - South 43 degrees 51 minutes 26 seconds West 242.61' to an iron pin
14 - South 47 degrees 27 minutes 26 seconds West 150.43' to an iron pin
15 - South 81 degrees 34 minutes 21 seconds West 321.87' to point and place of beginning.

CONTAINING 18.451 acres be the same more or less.

ALSO TOGETHER with the use of water rights right of way as granted to Springlawn Corporation by J. R. Frederick situate in Franklin Township described as follows.

BEGINNING at a point set in line of lands of Springlawn Corporation said point being set South 84 degrees 32 minutes 26 seconds West from an iron pin marking a corner of J. R. Frederick, Francis Hill, and Springlawn Corporation 49.42'; thence leaving said point of beginning and by lands of Springlawn Corporation the following two courses and distances to wit:

1 - South 84 degrees 32 minutes 26 seconds West 245.58' to a tree
2 - South 51 degrees 47 minutes 26 seconds West 135.09' to a point thence leaving said lands of Springlawn Corporation and passing through lands of J. R. Frederick the following five courses and distances to wit:

1 - North 44 degrees 25 minutes 26 seconds West 311.47' to a point
2 - North 73 degrees 27 minutes 56 seconds West 265.84' to a point
3 - North 17 degrees 21 minutes 26 seconds West 343.95' to a point
4 - North 13 degrees 13 minutes 34 seconds East 248.22' to a point
5 - North 20 degrees 01 minutes 26 seconds West 506.78' to a point set in the title line Pennsylvania Route 841 said road leading in an easterly direction to Pennsylvania Route 896 and a Westerly direction to Lewisville thence by the title line of said road north 76 degrees 00 minutes 34 seconds East 45.00' to a point set for a northeasterly corner of this; thence leaving said title line passing through lands of J. R. Frederick the following five courses and distances to wit:

1 - South 19 degrees 02 minutes 26 seconds East 583.01' to a point
2 - South 50 degrees 53 minutes 56 seconds East 383.69' to a point
3 - South 63 degrees 09 minutes 26 seconds East 346.11' to a point
4 - South 45 degrees 30 minutes 26 seconds East 174.22' to a point
5 - South 23 degrees 51 minutes 26 seconds East 893.10' to the point and place of beginning,

CONTAINING 8.260 acres be the same more or less.

EXCEPTING AND RESERVING thereout and therefrom 4.283 acres as granted and conveyed onto R. Nachuba in Deed Book U-30 page 471, S. Greene in Deed Book L-35 page 593, and K. Wells in Deed Book R-52 page 597, situate in Franklin Township, Chester County, Pennsylvania, bounded and described as follows to wit:

BEGINNING at a post set in the intersection of Public Road LR 15016 known as Strickerville Lewisville Road with Public Road T-356 known as Mt. Olivet Road said road leading in a northerly direction to Walker Road, said point being set the following eight courses and distances to wit from a spike set for a southwesterly corner of A. Del Duca and a corner of Springlawn Corporation said point being set in the title line of LR 15016.

1 - North 78 degrees 28 minutes 13 seconds West 520.54' to a point
2 - North 82 degrees 59 minutes 43 seconds West 470.28' to a point
3 - North 84 degrees 03 minutes 22 seconds West 119.76' to an old spike
4 - South 89 degrees 12 minutes 22 seconds West 118.24' to an old spike
5 - South 74 degrees 56 minutes 22 seconds West 83.82' to a point
6 - South 40 degrees 54 minutes 21 seconds West 9.31' to a point

7 - South 81 degrees 00 minutes 26 seconds West 38.37' to a point
8 - South 56 degrees 49 minutes 44 seconds West 22.86' to said post of beginning; thence leaving said post of beginning and by the title line of aforementioned Public Road LR 15016 the following five courses and distances to wit:

1 - South 44 degrees 57 minutes 36 seconds East 41.00' to a point
2 - South 49 degrees 48 minutes 58 seconds West 149.50' to a point
3 - South 43 degrees 10 minutes 10 seconds West 300.23' to a point
4 - South 75 degrees 48 minutes 56 seconds West 270.00' to a spike
5 - South 67 degrees 36 minutes 37 seconds West 244.60' to a point set in the centerline of a metal bridge; thence leaving said title line and by lands of Springlawn Corporation the following 11 courses and distances to wit:

1 - North 53 degrees 36 minutes 07 seconds East 44.00' to a point
2 - North 37 degrees 31 minutes 07 seconds East 43.00' to a point
3 - North 00 degrees 41 minutes 03 seconds East 30.00' to a point
4 - North 18 degrees 51 minutes 07 seconds East 15.00' to a point
5 - North 33 degrees 21 minutes 07 seconds East 25.00' to a point
6 - North 19 degrees 46 minutes 07 seconds East 52.00' to a point
7 - North 03 degrees 18 minutes 13 seconds West 48.70' to a point
8 - North 22 degrees 54 minutes 53 seconds West 131.82' to a point
9 - North 44 degrees 32 minutes 28 seconds East 90.80' to a post
10 - North 80 degrees 47 minutes 08 seconds East 88.07' to a point
11 - North 81 degrees 12 minutes 24 seconds East 588.35' to a post being the first mentioned point and place of beginning.

CONTAINING 4.283 acres be the same more or less.

ALSO EXCEPTING AND RESERVING thereout and therefrom 4.324 acres granted and conveyed to P. Rowland in Deed Book R-36 page 293, W. Worth in Deed Book W-23 page 234 and A. Jezyk in Deed Book Y-37 page 298 situate in Franklin Township, Chester County, Pennsylvania.

BEGINNING at a point set for a corner of this and set in the title line of Public Road LR-15016 known as Strickerville Lewisville Road said road leading in an easterly direction to Public Road LR-15020 and a westerly direction to Lewisville, said point of beginning being set the following two courses and distances from a spike set for a southwesterly corner of A. Del Duca to wit:

1 - North 78 degrees 28 minutes 13 seconds west 520.54' to a point
2 - North 82 degrees 59 minutes 43 seconds West 470.28' to said point of beginning; thence leaving said point of beginning and by lands of Springlawn Corporation the following four courses and distances to wit:

1 - South 7 degrees 31 minutes 13 seconds West 188.93' to an iron pin
2 - North 82 degrees 56 minutes 28 seconds West 221.17' to an iron pin
3 - North 52 degrees 17 minutes 38 seconds West 97.26' to an iron pin
4 - North 02 degrees 13 minutes 38 seconds West 82.65' to a point set in the title line of aforementioned Public Road LR-15016; thence by said title line South 81 degrees 00 minutes 26 seconds West 38.37' to a point set in the title line of Public Road T-356 known as Mt. Olivet Road, said road leading in a northerly direction to Public Road T-303; thence by the title line of Public Road T-356 North 03 degrees 21 minutes 04 seconds West 426.15' to a point set for a northwesterly corner of this and a corner of Springlawn Corporation thence by said lands of Springlawn Corporation the following two courses and distances to wit:

1 - South 75 degrees 33 minutes 04 seconds East 437.50' to an old iron pin
2 - South 07 degrees 06 minutes 56 seconds West 294.48' to the point and place of beginning.

CONTAINING 4.324 acres be the same more or less.

ALSO EXCEPTING AND RESERVING thereout and therefrom 5.005 acres granted and conveyed onto W. Worth in Deed Book X-29 page 565, and W. Worth in Deed Book W-35 page 576 situate in Elk Township, Chester County, Pennsylvania.

BEGINNING at a spike set for a northwesterly corner of this and a corner of Springlawn Corporation, said point being set in the title line of Public Road LR 15016 known as Lewisville Strickerville Road, said point being set north 73 degrees 49 minutes 15 seconds East from an iron pin marking the northeasterly corner of lands of R. M. Thompson 1213.79' to said point of beginning; thence leaving said point of beginning and by the title line the aforementioned Public Road LR 15016 the following two courses and distances to wit:

1 - North 77 degrees 38 minutes 22 seconds East 381.00' to a spike
2 - North 76 degrees 08 minutes 02 seconds East 271.17' to a spike marking a northeasterly corner of this and a corner of Springlawn Corporation; thence by said lands of Springlawn Corporation the following three courses and distances to wit:

1 - South 12 degrees 21 minutes 58 seconds East 314.52' to a point
2 - South 73 degrees 08 minutes 27 seconds West 654.09' to a post
3 - North 12 degrees 21 minutes 38 seconds West 358.50' to the point and place of beginning.

CONTAINING 5.005 acres be the same more or less.

PREMISES "B"

BEGINNING at a spike set in the title line of Public Road T-301 known as Elbow Lane leading in an westerly direction to Public Road LR-15020 and a easterly direction to Pennsylvania Route 896 said spikes marking a westerly corner of this about to be described tract; thence leaving spike of beginning and by the title line of Public Road T-301 the following eight courses and distances to wit:

1 - North 76 degrees 09 minutes 24 seconds East 876.50' to a spike
2 - North 75 degrees 56 minutes 00 seconds East 750.81' to a spike
3 - North 76 degrees 45 minutes 00 seconds East passing over the township line dividing London Britain and Franklin Township 360.17' to a spike.
4 - South 85 degrees 05 minutes 09 seconds East 300.21' to a spike
5 - South 54 degrees 58 minutes 30 seconds East 147.03' to a spike
6 - South 48 degrees 25 minutes 00 seconds East 496.85' to a spike
7 - South 86 degrees 36 minutes 30 seconds East 318.43' to a spike
8 - South 89 degrees 56 minutes 30 seconds East 814.80' to a spike marking an easterly corner of this; thence leaving said title line due south 15.61' to a milestone set on the line dividing the State of Pennsylvania from the State of Maryland; thence by said state line due west crossing over the township line dividing London Britain Township from Franklin Township 3453.74' to a spike being the first mentioned point and place of beginning.

CONTAINING 16.906 acres be the same more or less.

AS TO PREMISES "A"
BEING as to part the same premises which John P. F. Blackstone, Singleman by Deed dated April 17, 1948 and recorded in Chester County in Deed Book Q-24 page 101 conveyed unto Springlawn Corporation, (Pa. Corp.).

BEING as to another part the same premises which Richard T. Swan and Anne M. Swan, by Deed dated July 7, 1959 and recorded in Chester County in Deed Book G-31 page 394 conveyed unto Springlawn Corporation (Pa. Corp.).

AND BEING as to the remaining part, of the same premises which Center Square, Inc. by Deed dated December 27, 1946 and recorded in Chester County in Deed Book G-22 page 231 conveyed unto Springlawn Corporation, (Pa. Corp.).

AS TO PREMISES "B"
BEING part of the same premises which Center Square, Inc. by Deed dated December 27, 1946 and recorded in Chester County in Deed Book G-22 page 231 conveyed unto Springlawn Corporation, (Pa. Corp.).

UNDER AND SUBJECT to certain Reservations, Rights, Covenants, as of record.

BEING as to Premises A, Premises B, and the flooding rights as aforesaid the same premises which Springlawn Corporation, a Pennsylvania Corporation, conveyed unto George Strawbridge Jr., Individually, and Girard Bank, George Strawbridge, Sr., and Charles N. Morris, Jr., Trustees Under the Deed of Trust of George Strawbridge, Jr., Dated January 20, 1971: by Indenture dated the eighteenth day of October, 1978 and recorded in Chester County Deed Book W53 page 573.

AND BEING as to the flooding rights aforesaid the same premises which Delaware Trust Company, Jean Ellen duPont McConnell and William S. Potter, Trustees Under the Will of William duPont Jr., deceased, conveyed unto George Strawbridge Jr., Individually and Girard Bank, George Strawbridge, Sr., and Charles N. Morris, Jr., Trustees under the Deed of Trust of George Strawbridge Jr., dated January 20, 1971; by Indenture dated the twentieth of November, 1978 and recorded in Chester County Deed Book E54 page 291.

Rec in Chester Co. Pa
in Deed Bk # B64
Pg 175
Elaine S. Weil
Recorder of Deeds

RECORDER'S OFFICE CHESTER COUNTY, PA.

B 64 180

REV-183 FD (7-80)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF REVENUE
BUREAU OF FIELD OPERATIONS

REALTY TRANSFER TAX
AFFIDAVIT OF VALUE

B 025-172nd

FOR RECORDER'S USE ONLY
BOOK NUMBER 1964
PAGE NUMBER 187
DATE RECORDED 6/03/86

COMPLETE APPLICABLE SECTIONS IN FULL AND FILE IN DUPLICATE WITH RECORDER OF DEEDS WHEN (1) THE FULL CONSIDERATION IS NOT SET FORTH IN THE DEED, (2) THE TRANSFER IS WITHOUT CONSIDERATION OR A GIFT, OR (3) A TAX EXEMPTION IS CLAIMED. (REFER SECT. 8, RTT ACT OF DEC. 27, 1951, P.L. 1742 AS AMENDED)

SECTION I
(COMPLETE FOR ALL TRANSACTIONS)

Girard Bank, George Strawbridge, Sr. Trustees u/d 1/20/71 — GRANTOR (S)
Broad & Chestnut Streets, Phila., PA 19101 — ADDRESS, ZIP CODE

Delaware Trust Co., George Strawbridge, Sr. & William C. Lickle, Trustees u/d 1/20/71 — GRANTEE (S)
Market Street Mall, Wilmington, DE 19801 — ADDRESS, ZIP CODE

LOCATION OF LAND, TENEMENTS AND HEREDITAMENTS:

30% interest 1688 acres — P.O. STREET & NUMBER OR OTHER DESCRIPTION
London, Britain, Franklin & Elk — NAME OF LOCAL GOVERNMENTAL UNIT
Chester County — COUNTY

FULL CONSIDERATION $ -0-
HIGHEST ASSESSED VALUE $ 158140.00
FAIR MARKET VALUE $ 825,000.00
REALTY TRANSFER TAX PAID $

TAX EXEMPT TRANSACTIONS: IF TRANSFER IS PARTIALLY OR WHOLLY EXEMPT, SHOW AMOUNT EXEMPT, REASON (S) AND CITE PORTION OF LAW. This is a transfer by law from one set of trustees to new trustees under same deed of trust.

IF THIS IS A TRANSFER FROM A STRAW, AGENT OR TRUST AGREEMENT, COMPLETE THE REVERSE SIDE.

SECTION II
(COMPLETE ONLY IF PROPERTY WAS SUBJECT TO LIEN OR MORTGAGE AT THE TIME OF TRANSFER)

EXISTING MORTGAGE: $ ~~510,000.00~~ DISPOSITION
Delaware Trust Co., Trustee — MORTGAGEE
Market Street Mall, Wilmington, DE 19801 — ADDRESS

EXISTING MORTGAGE: $ DISPOSITION
MORTGAGEE — ADDRESS

EXISTING LIEN OR OBLIGATION: $ DISPOSITION
LIENHOLDER — ADDRESS

EXISTING LIEN OR OBLIGATION: $ DISPOSITION
LIENHOLDER — ADDRESS

SECTION III
(COMPLETE ONLY IF TRANSFER IS RESULT OF JUDICIAL SALE)

OFFICIAL CONDUCTING SALE — NAME, ADDRESS, TITLE
SUCCESSFUL BIDDER — NAME, ADDRESS, TITLE

	JUDGEMENT PLUS PRIOR LIENS	BID PRICE	HIGHEST ASSESSED VALUE
HIGHEST ASSESSED VALUE			$
JUDGEMENT PLUS INTEREST	$		
BID PRICE		$	
PRIOR RECORDED LIEN	$	$	
PRIOR RECORDED MORTGAGE	$	$	
PRIOR RECORDED MORTGAGE	$	$	
UNPAID REAL ESTATE TAXES	$	$	
WATER RENT DUE	$	$	
SEWAGE RENT DUE	$	$	
ATTORNEY FEES	$	$	
OTHER (COSTS, ETC.)	$	$	
TOTAL	$	$	

NOTE: CALCULATIONS MUST BE SHOWN IN ALL COLUMNS.

SWORN AND SUBSCRIBED BEFORE ME THIS 25th DAY OF August 19 86
Nita Goodilow
NOTARY PUBLIC
MY COMMISSION EXPIRES
NITA GOODILOW
Notary Public, Phila., Phila. Co.
My Commission Expires Sept. 17, 1987

ALL OF THE INFORMATION ENTERED ON BOTH SIDES OF THIS AFFIDAVIT IS TRUE, FULL AND COMPLETE TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF.

Henry T. Dunn

☐ GRANTEE ☒ AGENT FOR GRANTEE
☐ GRANTOR ☐ AGENT FOR GRANTOR
☐ STRAW ☐ TRUSTEE

B 64 187

Tax Parcel # 72-6-1 & Part of 71-4-32

Prepared By: Benjamin J. Berger
Prickett, Jones, Elliott, Kristol & Schnee
1310 King Street, P.O. Box 1328
Wilmington, DE 19899

Return to:
Prickett, Jones, Elliott, Kristol & Schnee
1310 King Street, P.O. Box 1328
Wilmington, DE 19899

INDIVIDUAL DEED

THIS DEED, MADE THIS 31st day of **March** in the year of our LORD one thousand nine hundred and ninety-seven (1997).

BETWEEN **Jane F. Trimble**, party of the first part,

- A N D -

George Strawbridge, Jr., party of the second part,

WITNESSETH, that the said party of the first part for and in consideration of the sum of **TWO HUNDRED SIXTY NINE THOUSAND NINE HUNDRED DOLLARS AND 00 CENTS ($269,900.00)**, lawful money of the United States of America, the receipt whereof is hereby acknowledged, hereby grants and conveys unto the said party of the second part, His Heirs and Assigns.

ALL that certain tract of ground, situate in New London and Franklin Townships, Chester County, State of Pennsylvania, and being more particularly bounded and described in accordance with a Plan prepared by George E. Regester, Jr. & Sons, Inc., dated September 1, 1982, as follows, to-wit:

BEGINNING at a point in the bed of Public Road TR841 known as Lewisville-Chesterville Road, said road leading in an Easterly direction to Chesterville and in a Southerly direction to Lewisville, said point of Beginning marking a corner of this about to be described tract and a corner of other lands of J. Robert Frederick, being Parcel A on said Plan, said point of Beginning being the following three (3) described courses and distances to wit along the Lewisville-Chesterville Road from a point marking a corner of said Parcel A and a corner of lands now or formerly of Charles G. Woods: (1) North 80 degrees 12 minutes 00 seconds East, 129.48 feet to a point; (2) North 55 degrees 56 minutes 00 seconds East, 366.29 feet to a point; and (3) North 73 degrees 18 minutes 00 seconds East, 340.81 feet to said point of Beginning; thence leaving said point of Beginning and continuing along said Lewisville-Chesterville Road, North 73 degrees 18 minutes 00 seconds East, 265.91 feet to a point marking a corner of this and a corner of other lands now or formerly of J. Robert Frederick; thence leaving said Lewisville-Chesterville Road and along said other lands now or formerly of J. Robert Frederick, South 31 degrees 19 minutes 00 seconds East, crossing the township line dividing New London Township from Franklin Township, 1605.87 feet to a point marking a corner of this and a corner of lands of George Strawbridge, Jr., thence along said lands now or formerly of George Strawbridge, Jr., South 47 degrees 01 minute 00 seconds West, 790.69 feet to a point in the bed of the Big Elk Creek marking a corner of this, a corner of said lands now or formerly of George Strawbridge, Jr., and a corner of lands now or formerly of Louis T. Staats, Jr.; thence along said lands now or formerly of Louis T. Staats, Jr., North 77 degrees 37 minutes 30 seconds West, recrossing the aforementioned township line dividing New London Township from Franklin Township, 804.30 feet to a point marking a corner of this and a corner of the aforementioned lands now or formerly of Charles G. Woods, North 04 degrees 10 minutes 00 seconds West, 667.00 feet to a point marking a corner of this and a corner of the aforementioned Parcel A; thence along said Parcel A, the following two (2) described courses and distances, to-wit: (1) South 74 degrees 00 minutes 00 seconds West, 476.33 feet to a point; and (2) South 09 degrees 00 minutes 00 seconds East, 881.53 feet to the first mentioned point and place of **BEGINNING**. Be the contents thereof what they may.

EXCEPTING THEREOUT AND THEREFROM all that certain premises which J. Robert Frederick and Marion B. Frederick, his wife, by Deed dated October 3, 1984, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book Z-64, Page 132, did grant and convey unto Department of Transportation, in fee.

SUBJECT to Rights as granted to Southern Pennsylvania Power Company, of record in the Office of the Recorder of Deeds, in and for Commonwealth of Pennsylvania, in Deed Book 86, Page 43.

BEING a part of the same lands and premises which J. Robert Frederick, Executor of the Estate of Marion B. Frederick, deceased, by Deed dated July 15, 1989, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book 1631, Page 290, did grant and convey unto Jane F. Trimble, in fee. (As to a one-half interest therein).

BK1158PG1495

BEING a part of the same lands and premises which J. Robert Frederick, Executor of the Estate of Marion B. Frederick, deceased, by Deed dated July 25, 1989, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book 1631, Page 299, did grant and convey unto J. Robert Frederick and Jane F. Trimble, as joint tenants with right of survivorship, in fee. (As to the remaining one-half interest therein).

AND the said J. Robert Frederick, did depart this life on or about February 8, 1993, leaving a will dated June 22, 1982, duly probated April 19, 1993 and remaining of record in the Office of the Register of Wills, in and for Chester County and Commonwealth of Pennsylvania, File No. 15-93-0467, wherein he appointed Jane F. Trimble and David L. Myers, Executor to whom Letters Testamentary were granted.

TOGETHER with all and singular the buildings improvements, ways, streets, alleys, driveways, passages, waters, water-courses, rights, liberties, privileges, hereditaments and appurtenances, whatsoever unto the hereby granted premises belonging, or in anywise appertaining, and the reversions and remainders, rents, issues, and profits thereof; and all the estate, right, title, interest, property, claim and demand whatsoever of the said grantors, as well as law as in equity, of, in and to the same.

TO HAVE AND TO HOLD the said lot or piece of ground described hereditaments and premises hereby granted, or mentioned and intended to be so, with the appurtenances, unto the said Grantee, his heirs and assigns, to and for the only proper use and behoof of the said Grantee, his heirs and assigns, forever.

AND the said Grantors, their heirs, successors, executors and administrators do covenant, promise and agree, to and with the said Grantee, his heirs and assigns, by these presents, that the said Grantors and their heirs, all and singular the hereditaments and premises hereby granted or mentioned and intended so to be, with appurtenances, unto the said Grantee, his heirs and assigns, against the said Grantors and their heirs, and against all and every person and persons whosever lawfully claiming or to claim the same or any part thereof, by, from or under or any of them, shall and will

Transfer tax for Franklin and New London Townships are based on $8000.90 per acre.

Franklin Township = $8000.90 x 14.4 acres = $115,328.16 or $1,153.28 in transfer tax.

New London Township = $8000.90 x 19.3 acres = $154,571.77 or $1,545.72 in transfer tax.

BK4158PG1496

Grantees Address:
2003 Chesterville Road
Lincoln University,PA 19352

Grantees Address:
3801 Kennett Pike
Wilmington, DE 19807

BEING a part of the same lands and premises which J. Robert Frederick, Executor of the Estate of Marion B. Frederick, deceased, by Deed dated July 15, 1989, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book 1631, Page 290, did grant and convey unto Jane F. Trimble. in fee. (As to a one-half interest therein).

BEING a part of the same lands and premises which J. Robert Frederick, Executor of the Estate of Marion B. Frederick, deceased, by Deed dated July 25, 1989, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book 1631, Page 299, did grant and convey unto J. Robert Frederick and Jane F. Trimble, as joint tenants with right of survivorship, in fee. (As to the remaining one-half interest therein).

AND the said J. Robert Frederick, did depart this life on or about February 8, 1993, leaving a will dated June 22, 1982, duly probated April 19, 1993 and remaining of record in the Office of the Register of Wills, in and for Chester County and Commonwealth of Pennsylvania, File No. 15-93-0467, wherein he appointed Jane F. Trimble and David L. Myers, Executor to whom Letters Testamentary were granted.

BK11580P0149

IN WITNESS WHEREOF, the said party of the first part has put her hand and seal the day and year first above written.

SEALED AND DELIVERED IN THE PRESENCE OF:

_____ } Jane F. Trimble (SEAL)
Witness }
}
_____ } _____ (SEAL)
Witness

STATE OF PENNSYLVANIA }
} SS.
COUNTY OF CHESTER }

BE IT REMEMBERED, that on this 31st day of March in the year of our **LORD** one thousand nine hundred and ninety-seven (1997) personally came before me, the Subscriber, a Notary Public for the State and County aforesaid, Jane F. Trimble, party to this Indenture, known to me personally to be such, and acknowledged this Indenture to be her act and Deed.

GIVEN under my Hand and Seal of Office, the day and year aforesaid.

My Commission Expires:
December 16, 2001

_____ _____
~~Notary Public~~
Commissioner of Deeds

BK4158PG149B

DEED

Received for Record

A.D., 19

Recorder

Fee for Recording, &c., $

THIS DEED
PREPARED BY

PRICKETT
JONES
ELLIOTT
KRISTOL
&
SCHNEE

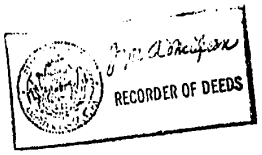
RETURN TO

1310 KING STREET
P.O. BOX 1328
WILMINGTON, DE 19899
(302) 888-6500

State of Delaware,
)
) ss.
County)

Recorded in the Office for the Recording of Deeds, &c., at .....in and for the said County of ..... in Deed Record ..... Vol. ..... Page ..... &c. the ..... day of ..... A.D. 19...
WITNESS my Hand and the Seal of said Office.

.....
Recorder.



17229

DATE: 04/02/1997 TIME: 11:33A INST NO.: 17229

CHESTER COUNTY, PA
OFFICE OF THE RECORDER OF DEEDS

RECEIPT NO : 008547 TYPE DOC : DEED
REC FEE : 13.00
LOC RTT : 1545.72
ST RTT : 2699.00
WRIT TAX : 0.50
DATE: 04/02/1997 TIME: 11:33A INST NO.:

CHESTER COUNTY, PA
OFFICE OF THE RECORDER OF DEEDS

RECEIPT NO : 008547 TYPE DOC : HOUSING
REC FEE : 13.00
LOC RTT : 0.00
ST RTT : 0.00
WRIT TAX : 0.00
DATE: 04/02/1997 TIME: 11:33A INST NO.: R17229

CHESTER COUNTY, PA
OFFICE OF THE RECORDER OF DEEDS

RECEIPT NO : 008547 TYPE DOC : DEED
REC FEE : 0.00
LOC RTT : 1153.28
ST RTT : 0.00
WRIT TAX : 0.00
DATE: 04/02/1997 TIME: 11:33A INST NO.:

CHESTER COUNTY, PA
OFFICE OF THE RECORDER OF DEEDS

RECEIPT NO : 008547 TYPE DOC : HOUSING
REC FEE : 0.00
LOC RTT : 0.00
ST RTT : 0.00
WRIT TAX : 0.00

BK4158PG1499

APPENDIX D

SANBORN FIRE INSURANCE MAPS
NO COVERAGE REPORT

Fire Insurance Maps No Coverage Statement

Site Location
Strawbridge II Property
99 Bullock Road
Landenberg, PA

Requested by
Envirosite Corporation
1175 Post Road E
Westport, CT

HIG Project #
2006959
Client Project #
17-1726.A
Date Created
06/20/2017

Historical Information Gatherers

The HIG Historical Map Collection and the United States Library of Congress Map Collection were searched for fire insurance maps (FIM), real estate atlases and similar maps for the site location and adjoining properties. No FIMs or similar maps were identified for the site location and/or adjacent properties.

APPENDIX E

HISTORICAL AERIAL PHOTOGRAPHS

ENVIROSITE Corporation

Historical Aerial Photo Report | 2017

Order Number: 13094
Report Generated: 06/21/2017

Project Name: Strawbridge II Property
Project Number: 17-1726.A

Strawbridge II Property
99 Bullock Road
Landenberg, PA 19350

1175 Post Road East
Westport, CT 06880
Toll Free: 866-211-2028
www.envirositecorp.com

Historical Aerial Photo Report 2017

Envirosite's Aerial Report is designed to assist in evaluating a subject property resulting from past activities. Envirosite's Aerial Map Report includes a search of USGS historical aerial maps, dating back to the early 1900s.

ENVIROSITE SEARCHED SOURCES

SUBJECT PROPERTY:
Strawbridge II Property
99 Bullock Road
Landenberg, PA 19350

YEAR:	***SCALE:***	***SOURCE:***
1952	1" = 1,000'	U.S.G.S.
1968	1" = 1,000'	U.S.G.S.
1976	1" = 1,000'	U.S.G.S.
1982	1" = 1,000'	U.S.G.S.
1987	1" = 1,000'	U.S.G.S.
1992	1" = 1,000'	U.S.G.S.
1999	1" = 1,000'	U.S.G.S.
2008	1" = 1,000'	U.S.G.S.
2011	1" = 1,000'	U.S.G.S.
2015	1" = 1,000'	U.S.G.S.

Disclaimer - Copyright and Trademark Notice

All information contained in this report are based on data available from various public, government and other sources and are based upon the best data available from those sources. The information available in this report may be available from other sources and is not exclusive or the exclusive property of Envirosite Corporation.

NO WARRANTY EXPRESSED OR IMPLIED, IS MADE IN CONNECTION WITH THIS REPORT, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ALL RISK IS ASSUMED BY USER AND Envirosite assumes no liability for faulty or inaccurate information. The Reports may utilize a variety of public and other sources reasonably available to Envirosite. Envirosite cannot, and does not assure, warrant, guarantee or assume any liability for the correctness, comprehensiveness, timeliness or completeness of any of such information, nor is the information in any Report to be construed as legal advice with respect to environmental risks associated with any property. Envirosite shall not be liable to anyone for any claims, causes of action, suits, damages, losses, costs and expenses (including, without limitation, attorneys' fees and costs) arising out of or caused by this report regardless of the acts, errors or omissions, or negligence of Envirosite. Any damages shall be limited to the purchase price of the report.

Purchaser of the report accepts the report "As Is". The report is intended only to provide information only and should not be considered as providing any legal advice, prediction, forecast, or fact as to the environmental risk for any specific property. Reports are proprietary to Envirosite, and contain copyrighted material and trademarks of Envirosite. All other trademarks used herein are the property of their respective owners. All rights of Envirosite as to the Reports are reserved.

AERIAL PHOTO

FLIGHT YEAR:
1952

N
W E
S

Scale: 1" = 1,000'

AERIAL PHOTO

FLIGHT YEAR:
1968

N
W E
S

Scale: 1" = 1,000'

AERIAL PHOTO

FLIGHT YEAR:
1976

N
W E
S

Scale: 1" = 1,000'

AERIAL PHOTO

FLIGHT YEAR:
1982

N
W E
S

Scale: 1” = 1,000’

AERIAL PHOTO

FLIGHT YEAR:
1987

N
W E
S

Scale: 1” = 1,000’

AERIAL PHOTO

FLIGHT YEAR:
1992

N
W E
S

Scale: 1" = 1,000'

AERIAL PHOTO

FLIGHT YEAR:
1999

N
W E
S

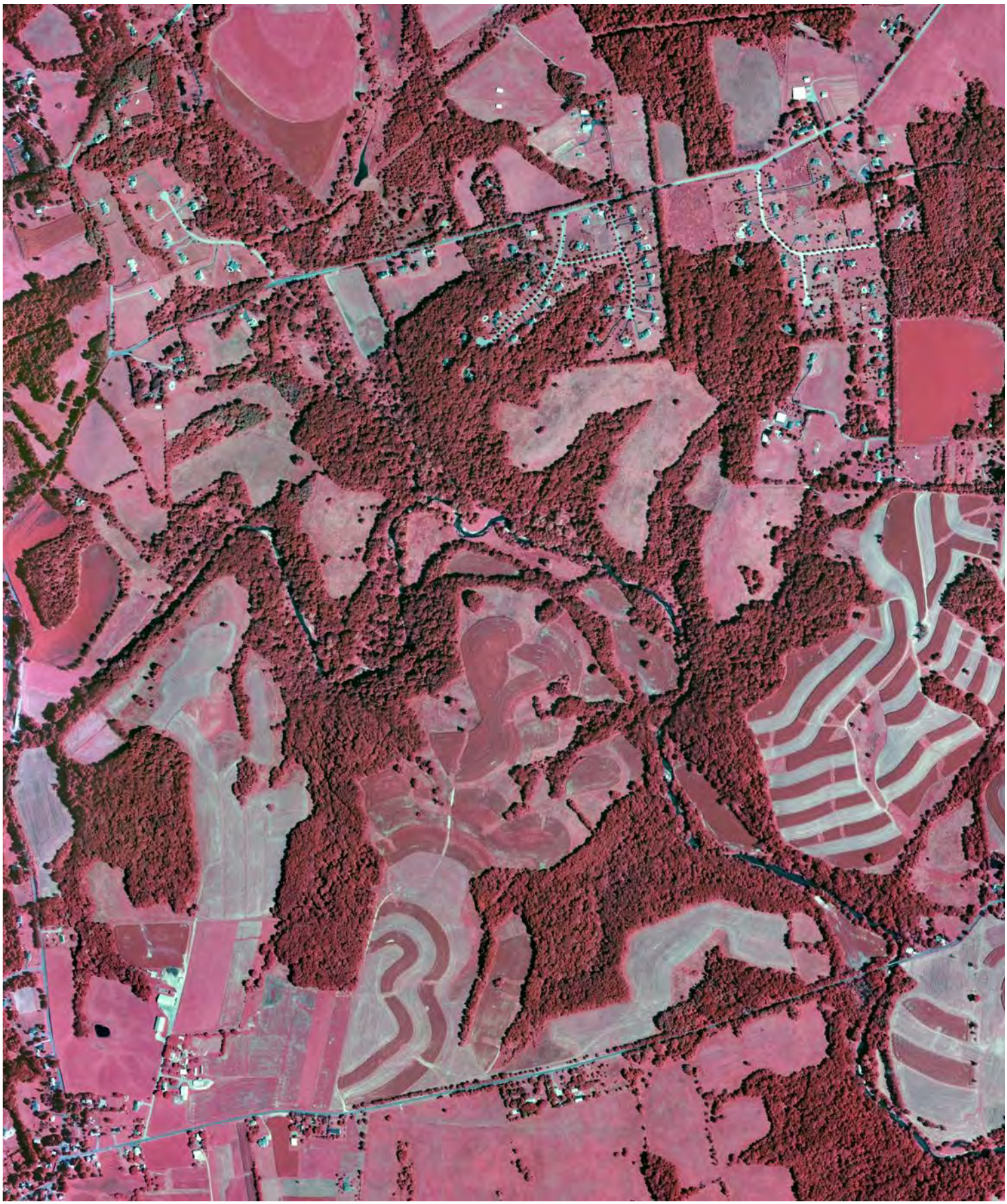
Scale: 1" = 1,000'

AERIAL PHOTO

FLIGHT YEAR:
2004

N
W E
S

Scale: 1" = 1,000'



AERIAL PHOTO

FLIGHT YEAR:
2008

N
W E
S

Scale: 1" = 1,000'

AERIAL PHOTO

FLIGHT YEAR:
2011

N
W E
S

Scale: 1" = 1,000'

AERIAL PHOTO

FLIGHT YEAR:
2015

N
W E
S

Scale: 1" = 1,000'

APPENDIX F

HISTORICAL TOPOGRAPHIC MAPS

Historical Topographic Map Report | 2017

Order Number: 13094

Report Generated: 06/19/2017

Project Name: Strawbridge II Property

Project Number: 17-1726.A

Strawbridge II Property
99 Bullock Road
Landenberg, PA 19350

1175 Post Road East
Westport, CT 06880
Toll Free: 866-211-2028
www.envirositecorp.com

Envirosite's Historical Topographic Map Report is designed to assist in evaluating a subject property resulting from past activities. Envirosite's Historical Topographic Map Report includes a search of USGS historical topographic maps, dating back to the early 1900s.

TOPOGRAPHIC MAPS FOUND:

	Map Name:	Year:	Revision Year:	Scale:	Series:
1.	Elkton	1898	N/R	1 : 62500	7.5
2.	Elkton	1900	N/R	1 : 62500	7.5
3.	Elkton	1917	N/R	1 : 62500	7.5
4.	Elkton	1942	N/R	1 : 62500	7.5
5.	Bay View	1953	1970	1 : 24000	7.5
6.	Bay View	1953	N/R	1 : 24000	7.5
7.	Newark West	1953	N/R	1 : 24000	7.5
8.	Newark West	1953	1970	1 : 24000	7.5
9.	Bay View	1992	N/R	1 : 24000	7.5
10.	Newark West	1992	N/R	1 : 24000	7.5
11.	Bay View	1997	N/R	1 : 24000	7.5
12.	Bay_View	2011	N/R	1 : 24000	7.5
13.	Newark_West	2011	N/R	1 : 24000	7.5
14.	Bay_View	2014	N/R	1 : 24000	7.5
15.	Newark_West	2014	N/R	1 : 24000	7.5
16.	Bay_View	2016	N/R	1 : 24000	7.5
17.	Newark_West	2016	N/R	1 : 24000	7.5

Disclaimer - Copyright and Trademark Notice

All information contained in this report are based on data available from various public, government and other sources and are based upon the best data available from those sources. The information available in this report may be available from other sources and is not exclusive or the exclusive property of Envirosite Corporation.

NO WARRANTY EXPRESSED OR IMPLIED, IS MADE IN CONNECTION WITH THIS REPORT, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ALL RISK IS ASSUMED BY USER AND Envirosite assumes no liability for faulty or inaccurate information. The Reports may utilize a variety of public and other sources reasonably available to Envirosite. Envirosite cannot, and does not assure, warrant, guarantee or assume any liability for the correctness, comprehensiveness, timeliness or completeness of any of such information, nor is the information in any Report to be construed as legal advice with respect to environmental risks associated with any property. Envirosite shall not be liable to anyone for any claims, causes of action, suits, damages, losses, costs and expenses (including, without limitation, attorneys' fees and costs) arising out of or caused by this report regardless of the acts, errors or omissions, or negligence of Envirosite. Any damages shall be limited to the purchase price of the report.

Purchaser of the report accepts the report "As Is". The report is intended only to provide information only and should not be considered as providing any legal advice, prediction, forecast, or fact as to the environmental risk for any specific property. Reports are proprietary to Envirosite, and contain copyrighted material and trademarks of Envirosite. All other trademarks used herein are the property of their respective owners. All rights of Envirosite as to the Reports are reserved.

SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

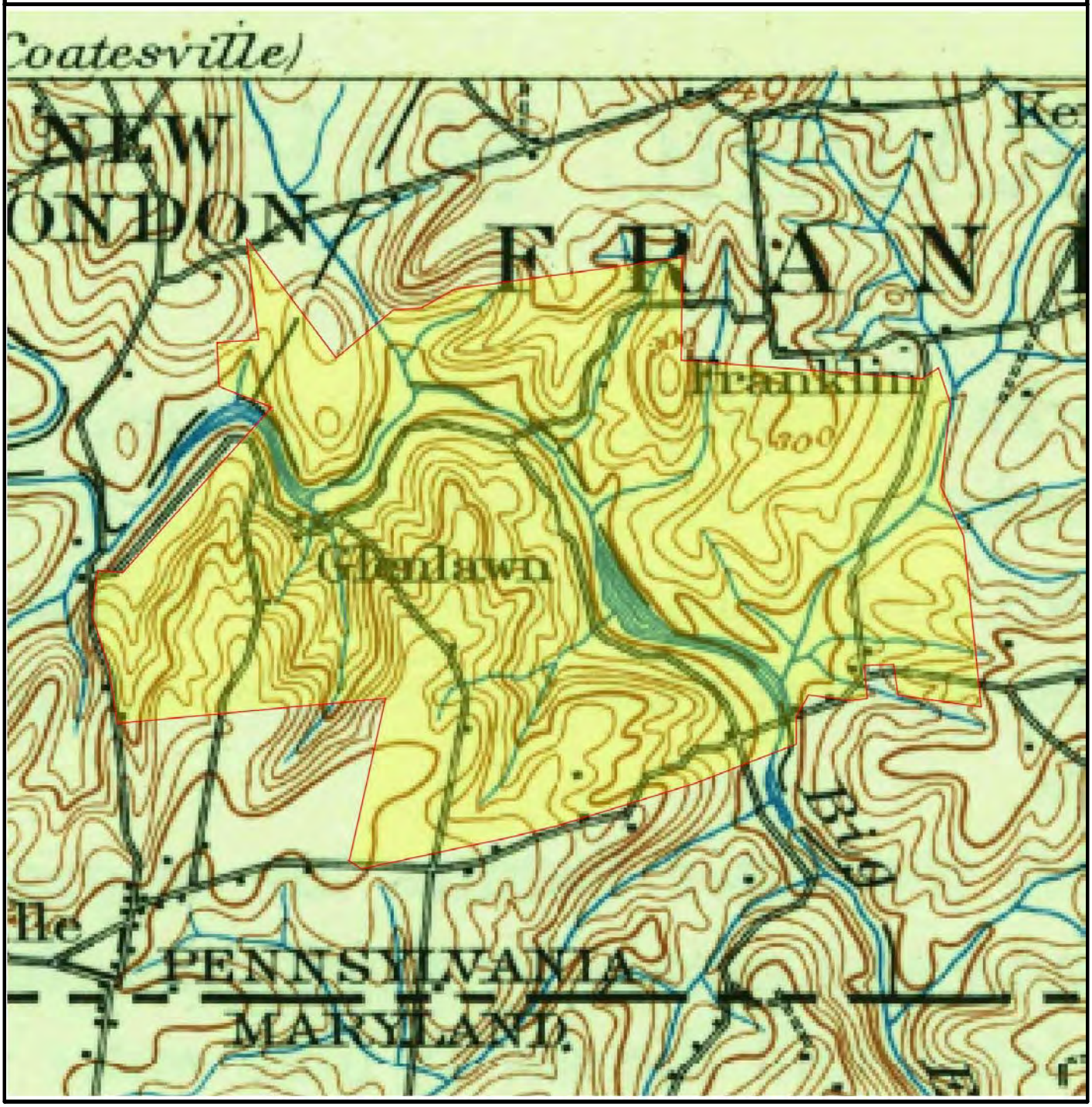
MAP NAME:	Elkton	MAP YEAR:	1898	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 62500	Part	1

SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Elkton	MAP YEAR:	1900	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 62500	Part	1



SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Elkton	MAP YEAR:	1917	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 62500	Part	1

SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

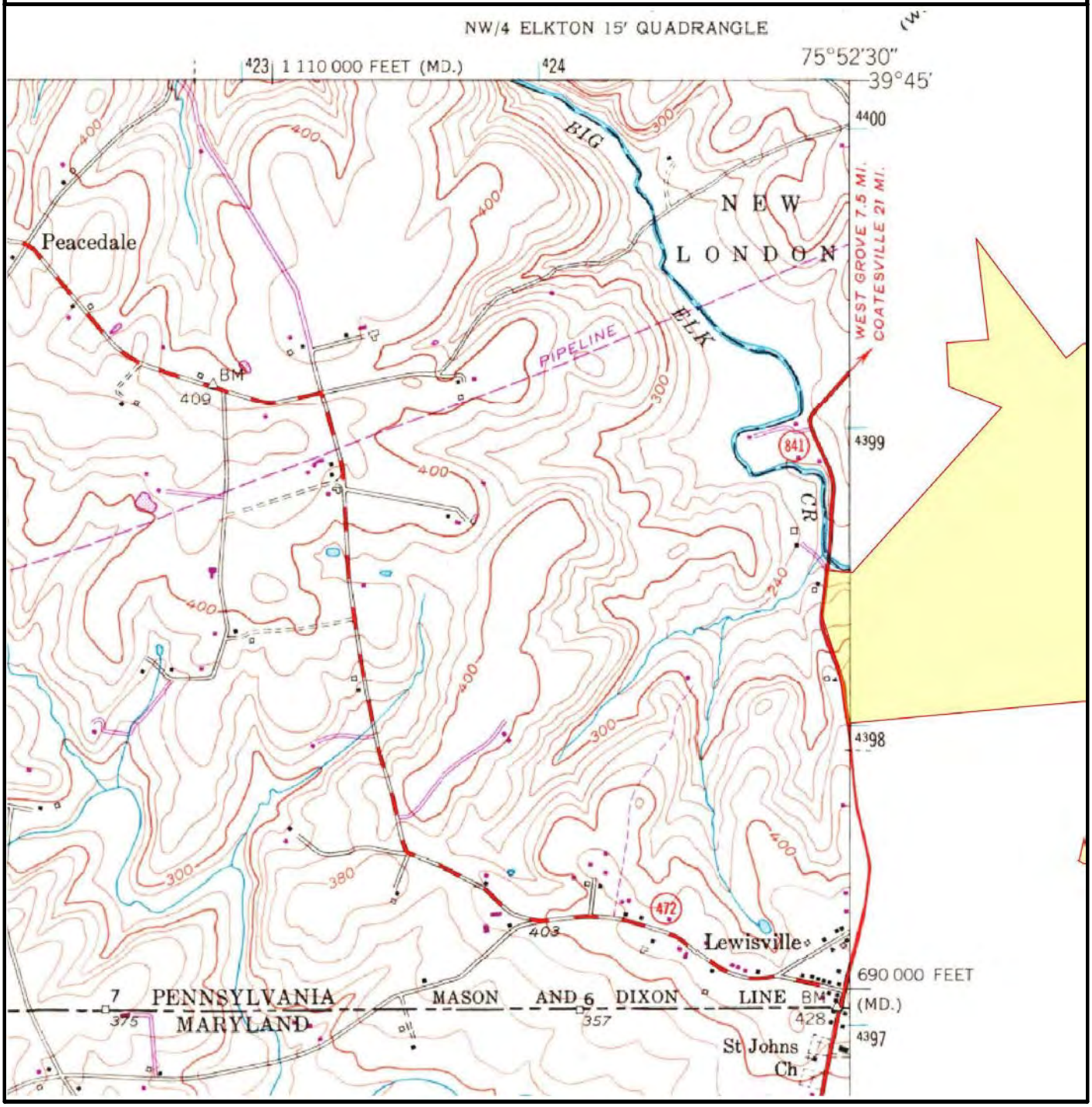
MAP NAME:	Elkton	MAP YEAR:	1942	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 62500	Part	1

SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Bay View	MAP YEAR:	1953	REVISION YEAR:	1970
SERIES:	7.5	SCALE:	1 : 24000	Part	1

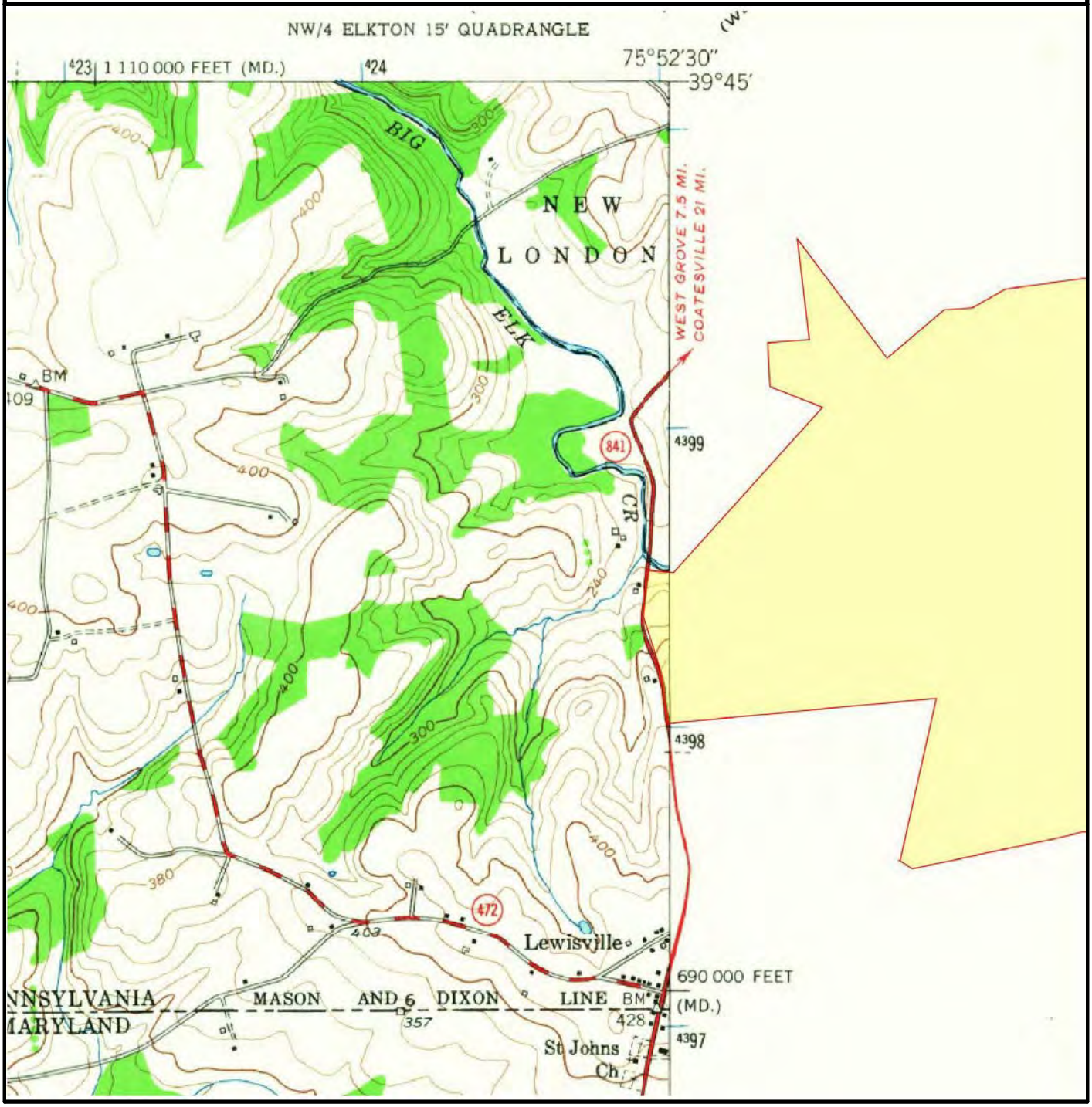


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Bay View	MAP YEAR:	1953	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

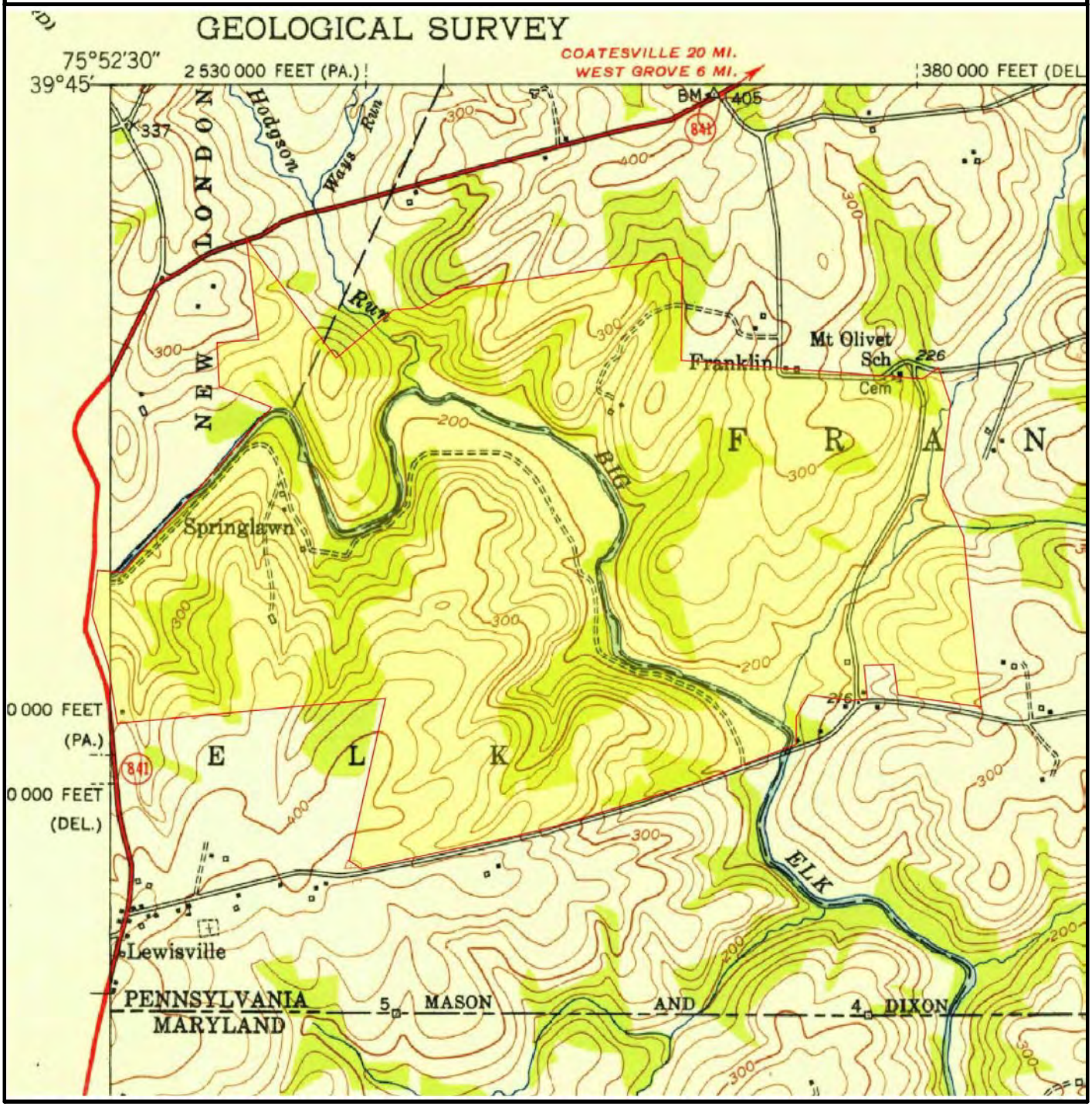


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Newark West	MAP YEAR:	1953	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

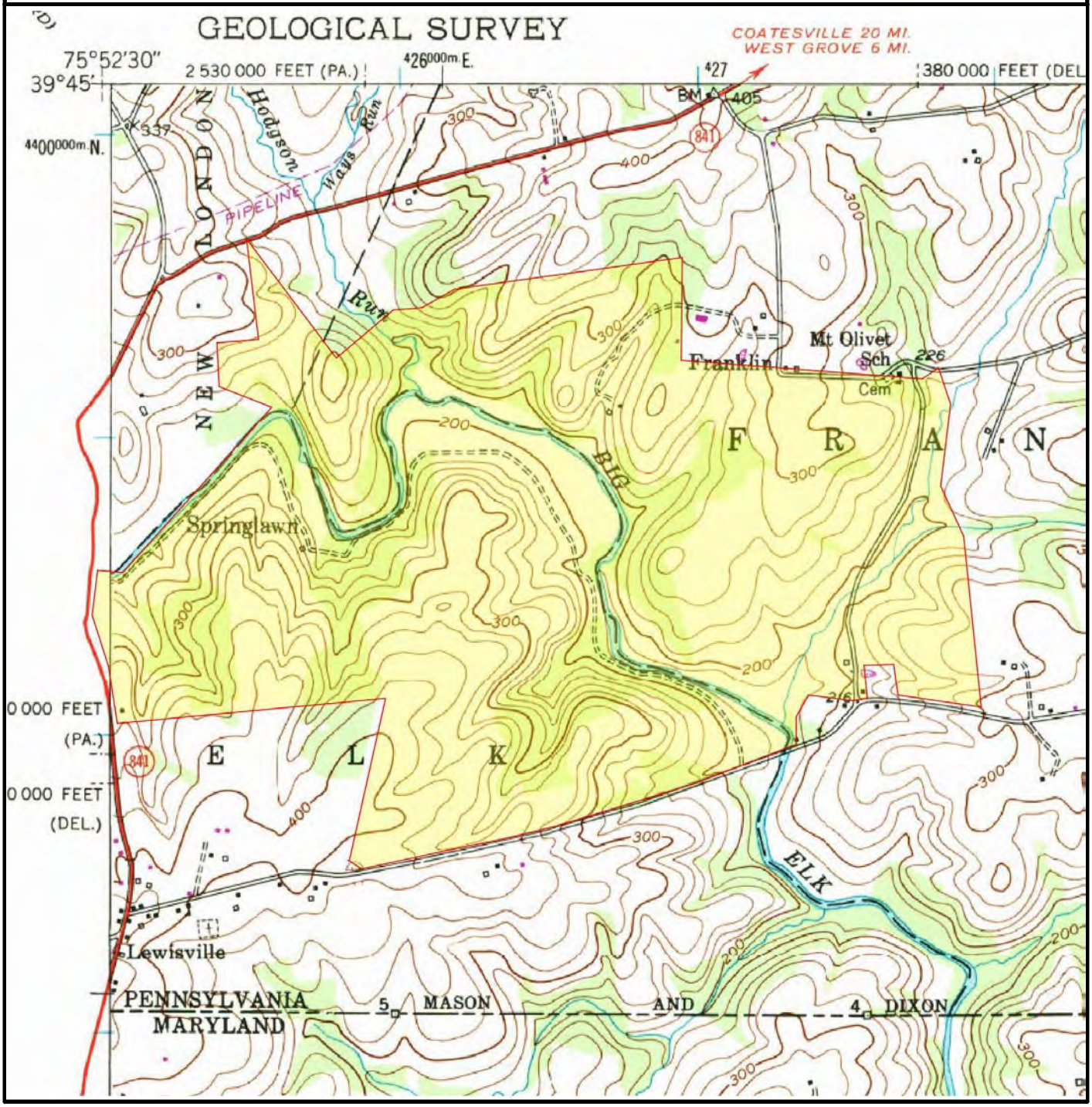


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Newark West	MAP YEAR:	1953	REVISION YEAR:	1970
SERIES:	7.5	SCALE:	1 : 24000	Part	1

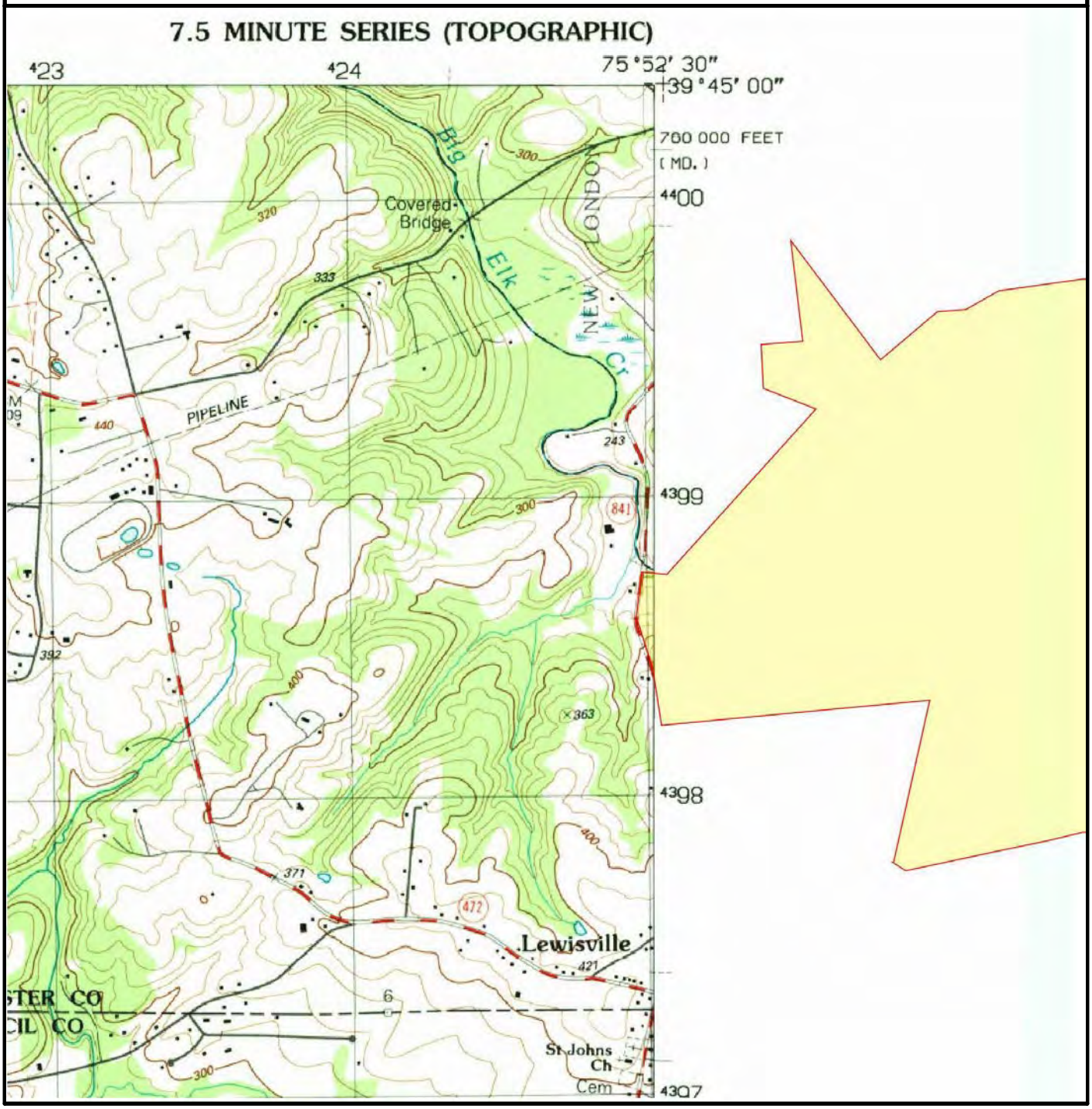


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Bay View	MAP YEAR:	1992	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

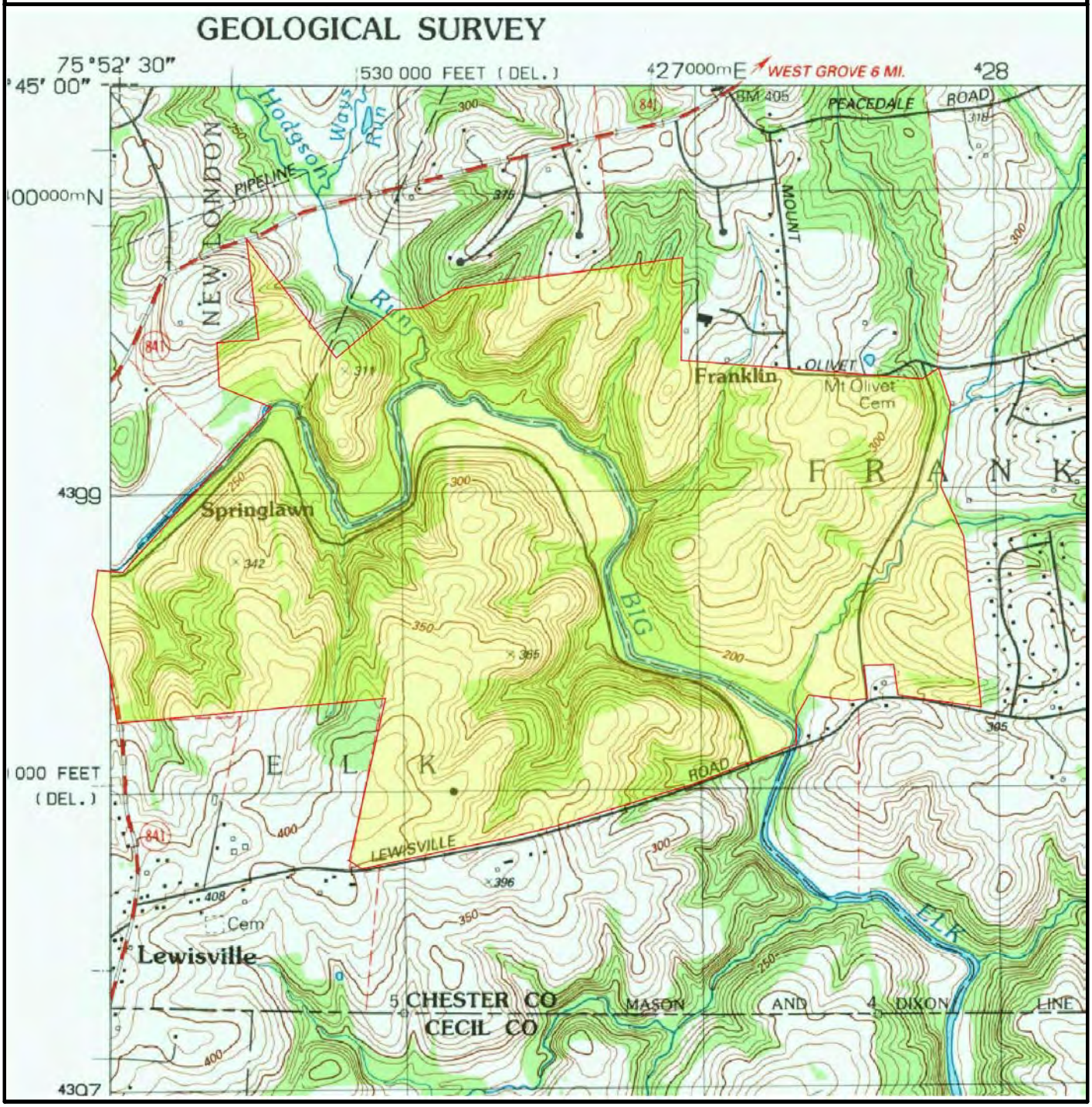


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Newark West	MAP YEAR:	1992	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

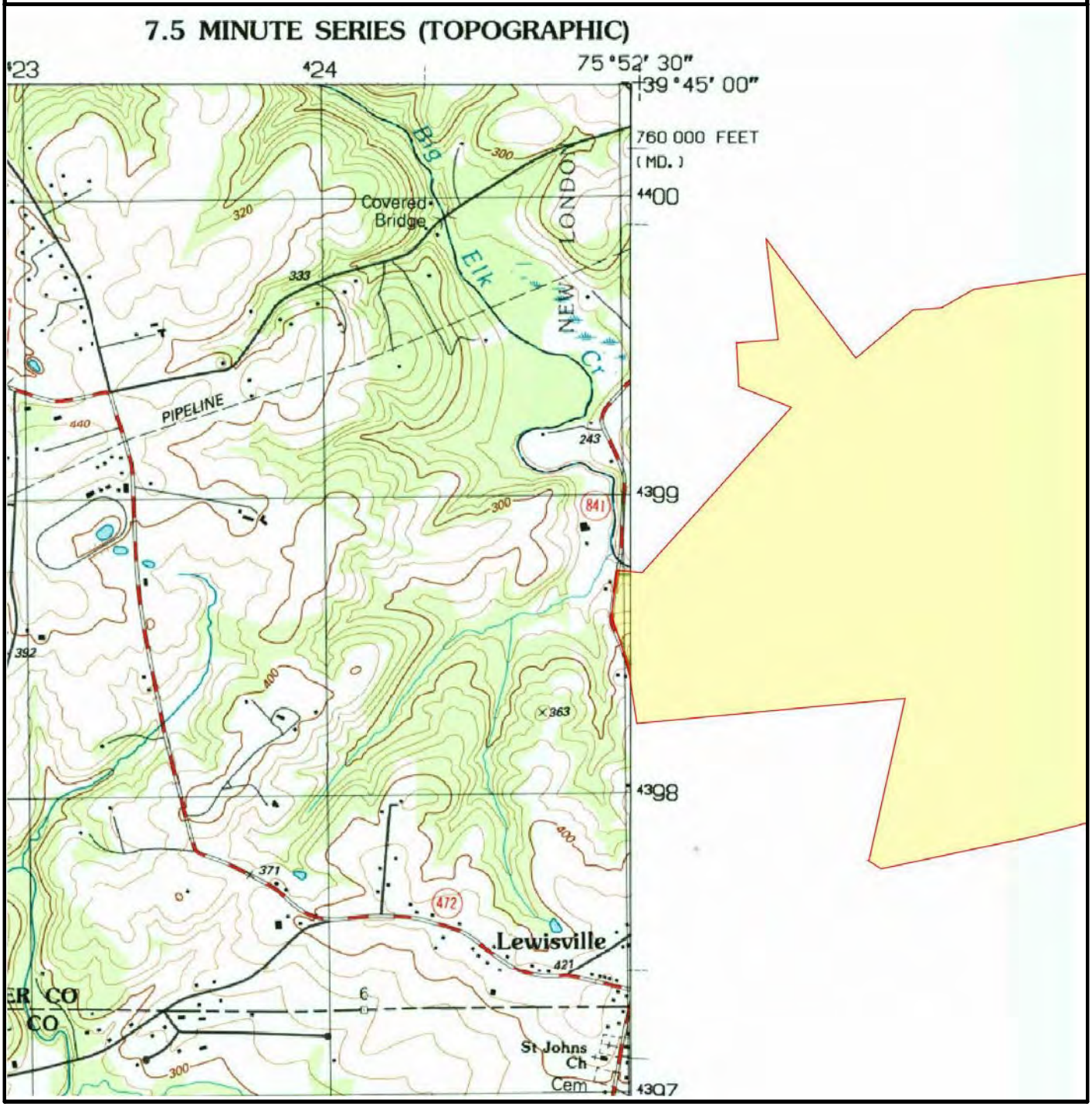


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Bay View	MAP YEAR:	1997	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

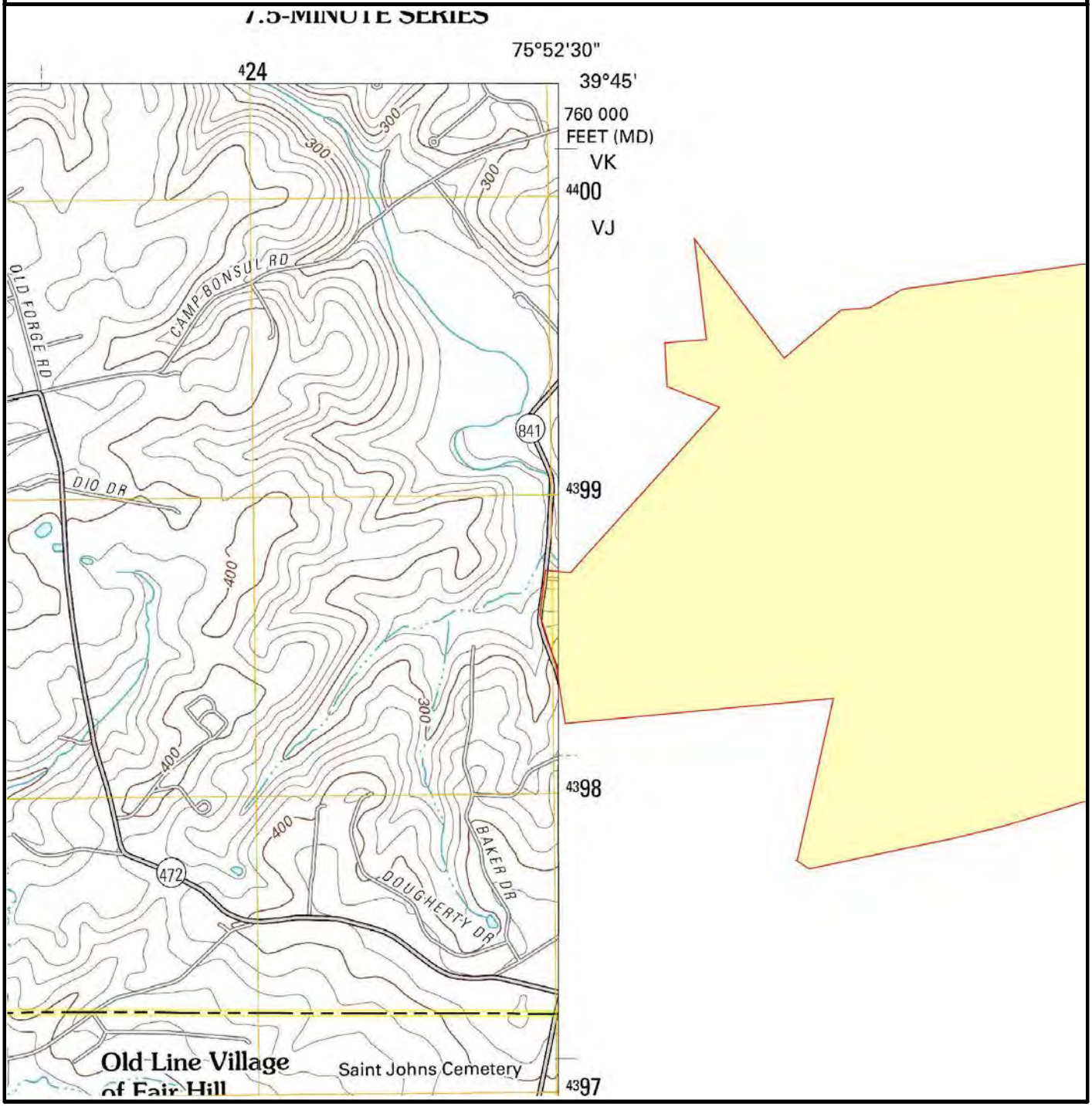


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Bay_View	MAP YEAR:	2011	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

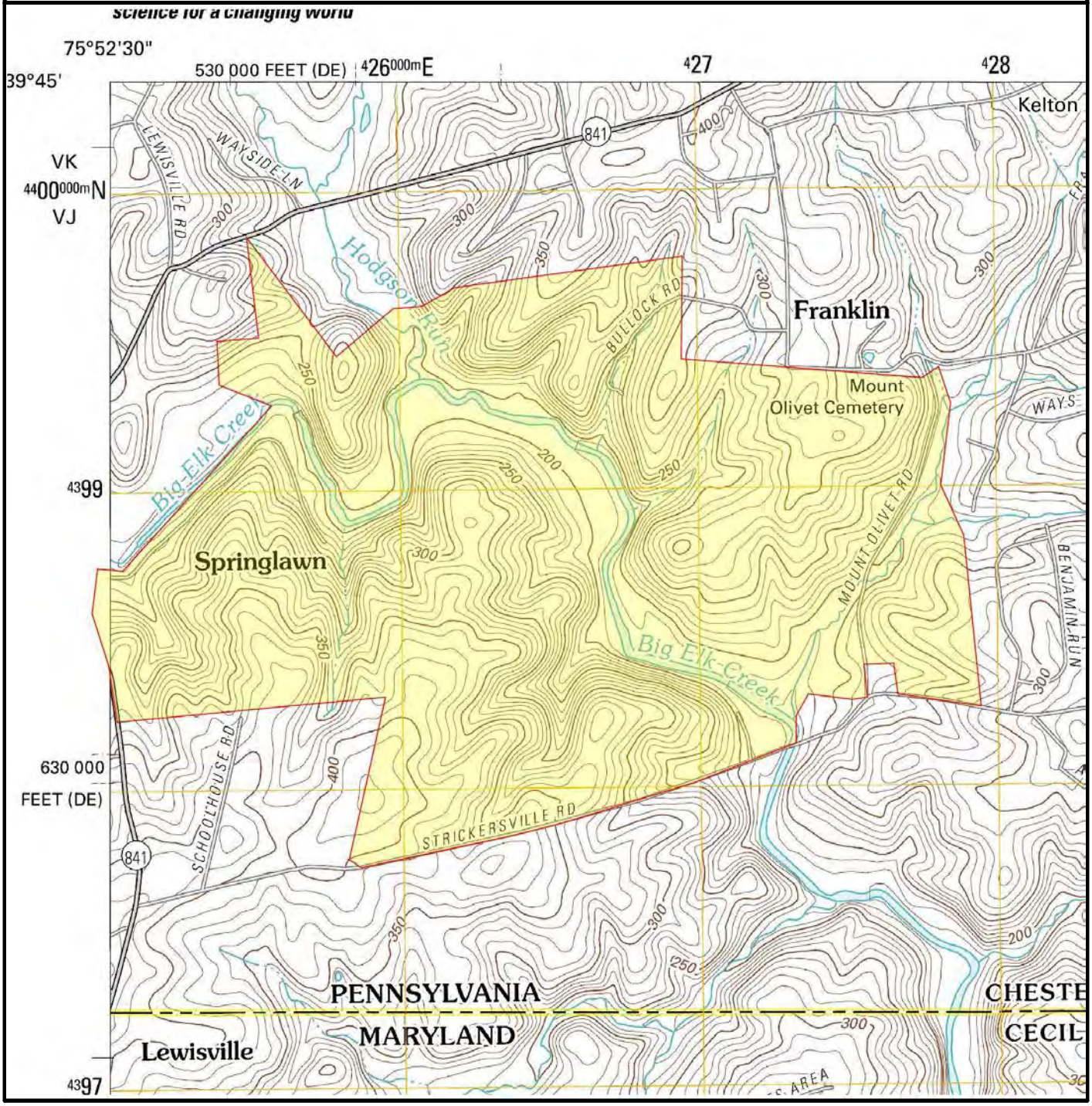


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Newark_West	MAP YEAR:	2011	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

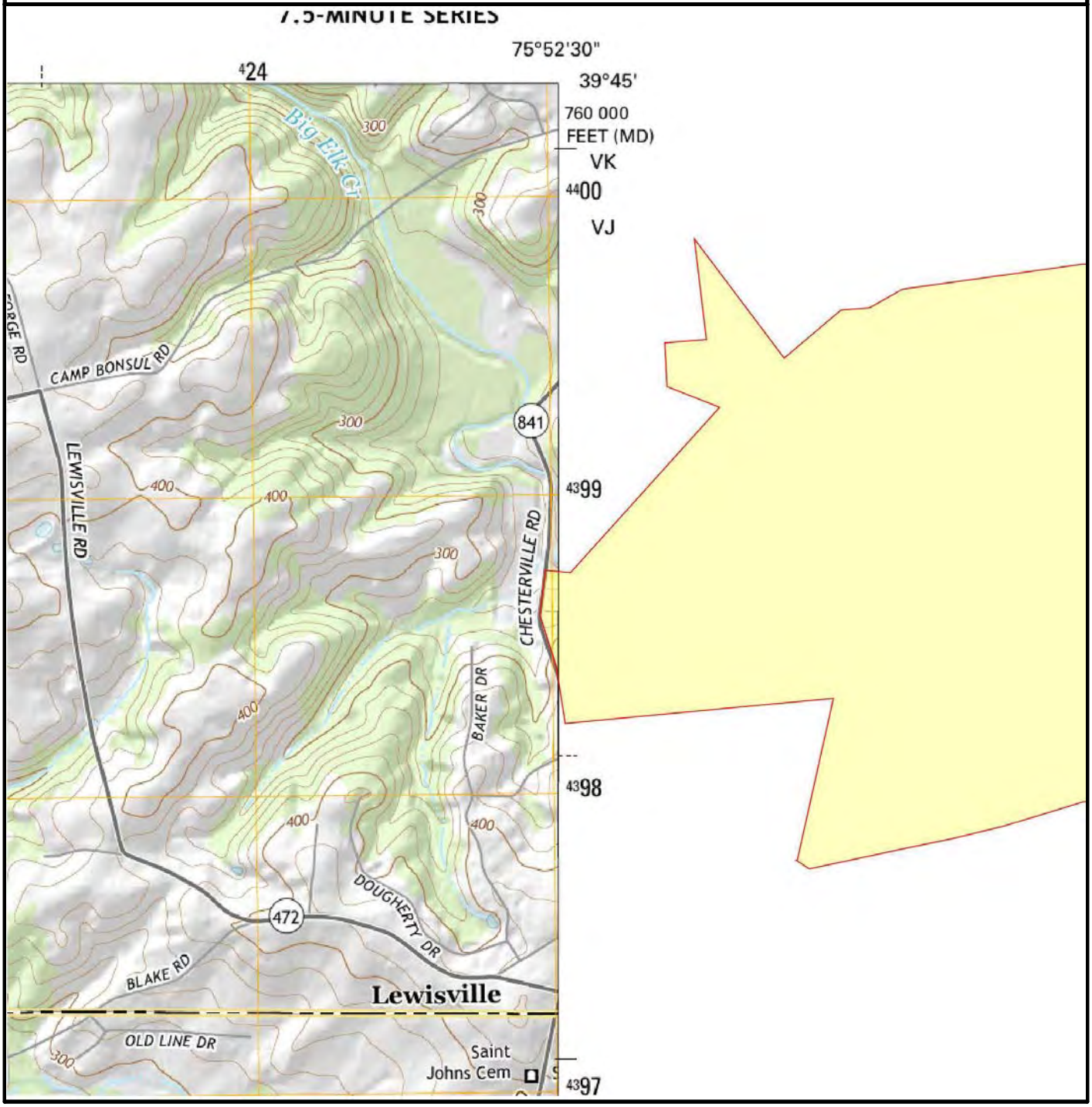


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Bay_View	MAP YEAR:	2014	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

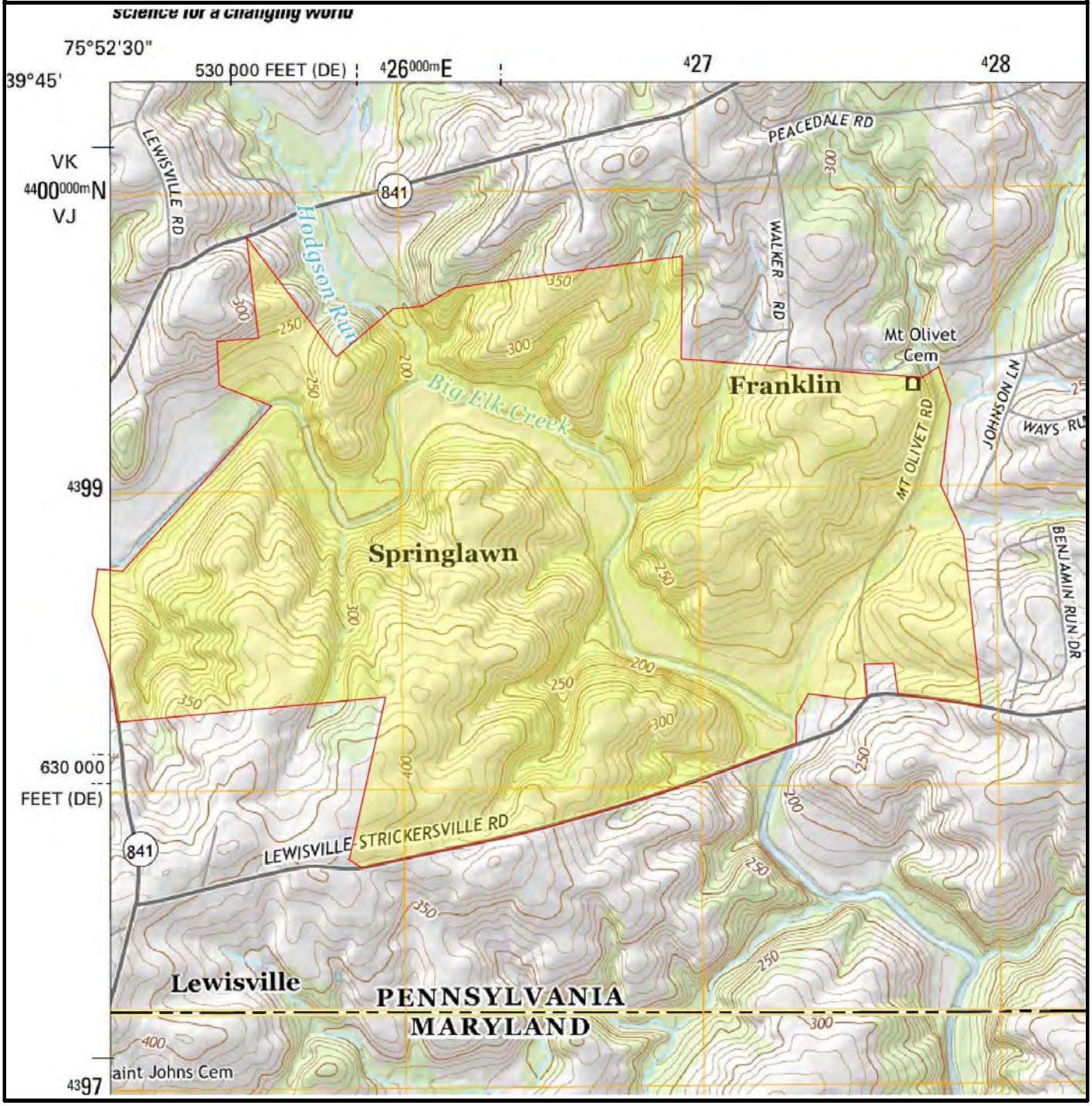


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Newark_West	MAP YEAR:	2014	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

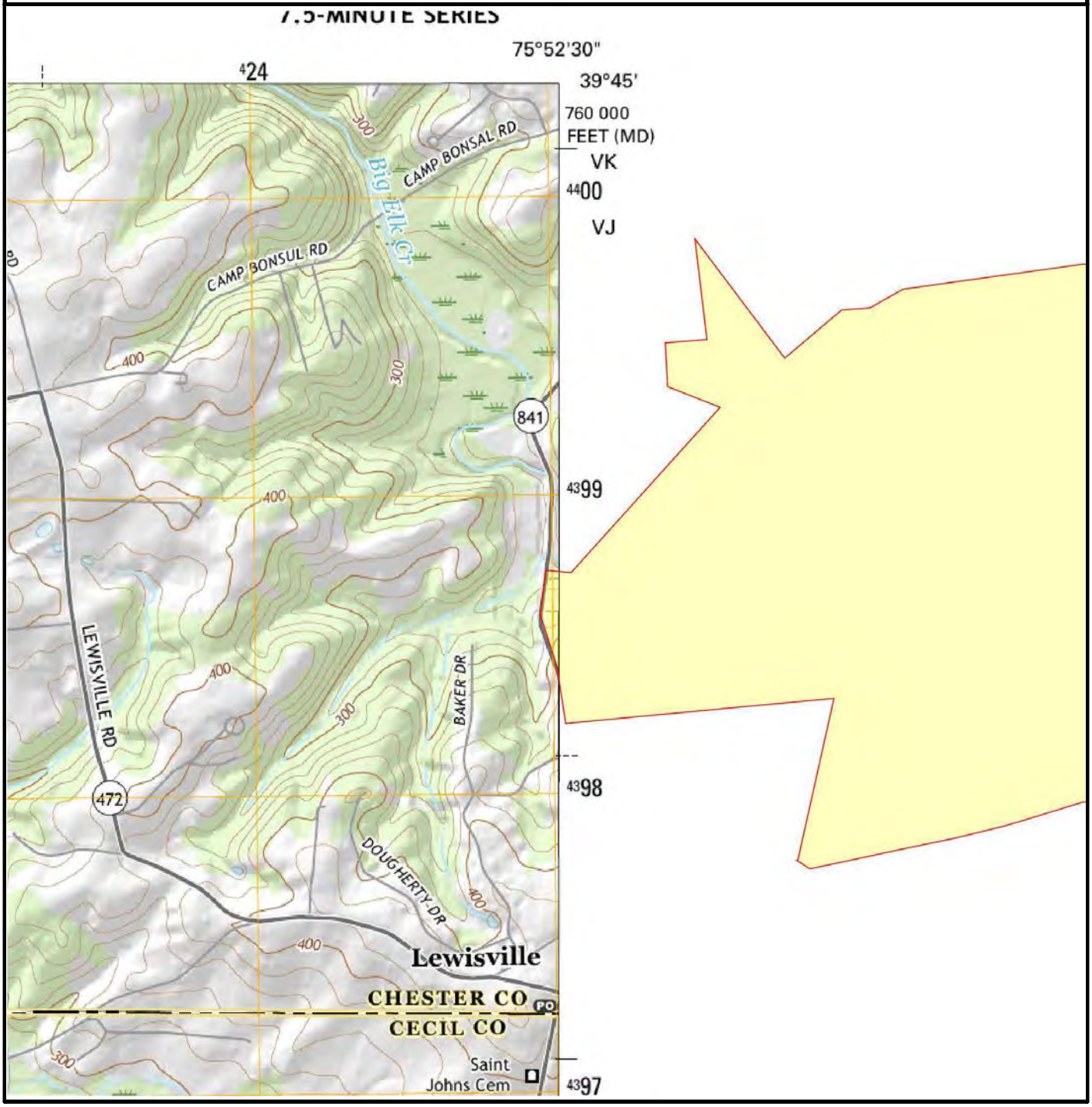


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Bay_View	MAP YEAR:	2016	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1

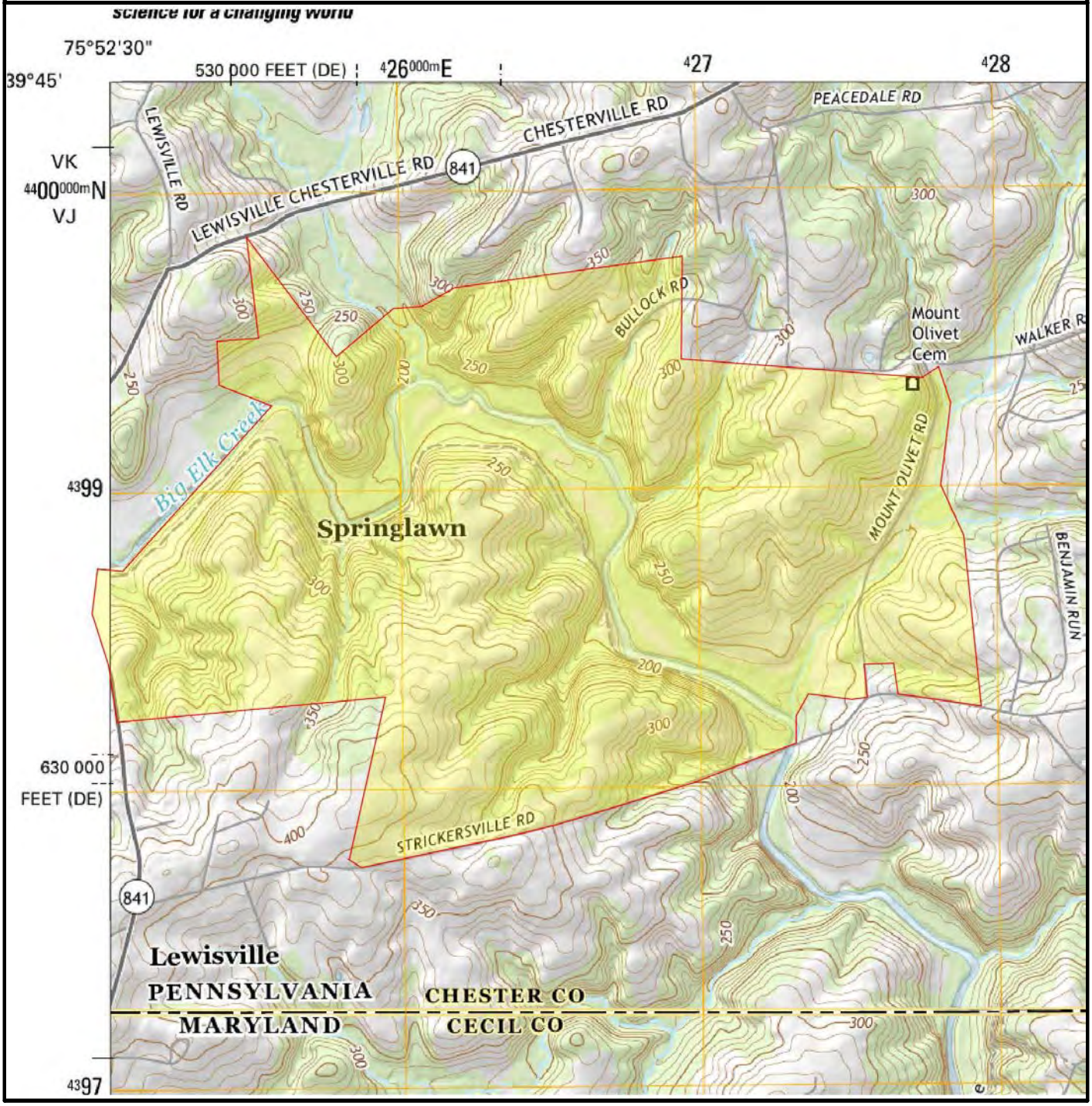


SUBJECT NAME: Strawbridge II Property
ADDRESS: 99 Bullock Road, Landenberg, PA 19350
LAT/LONG: 39.735822 / -75.858291

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 13094
REPORT DATE: 06/19/2017

SUBJECT QUAD:

MAP NAME:	Newark_West	MAP YEAR:	2016	REVISION YEAR:	N/R
SERIES:	7.5	SCALE:	1 : 24000	Part	1



APPENDIX G

CITY DIRECTORY ABSTRACT REPORT

ENVIROSITE Corporation

City Directory Report | 2017

Order Number: 13094

Report Generated: 06/20/2017

Strawbridge II Property
99 Bullock Road
Landenberg, PA 19350

1175 Post Road East
Westport, CT 06880
Toll Free: 866-211-2028
www.envirositecorp.com

City Directory Report 2017

Envirosite's City Directory report is a screening tool designed to assist in evaluating a subject property and possible adjacent properties resulting from past activities. It includes a search and abstract of available city directories and cross reference directories at five year intervals or the closest available intervals. Public map sources are reviewed to determine possible adjoining properties to the front, back, left and right of the property.

RESEARCH SUMMARY:

The following research sources were consulted in the preparation of this report:

SOURCE:	***YEAR:***
National Historic Address Archives	2015, 2010, 2006, 2001, 1998
City Directory	1995, 1990, 1985, 1980, 1975, 1970, 1965

National Historic Address Archives is Envirosite's proprietary comprehensive database of over 600 million commercial and residential records, business names and occupant records for every city and town in the United States.

CROSS STREETS: Chesterville Road (Lincoln University), Springlawn Road (Landenberg), Strickersville Road (Landenberg), Mt Olivet Road (Landenberg), Walker Road (Landenberg)

STREET NAME CHANGES:

OLD NAmE:	NEW NAmE:	YEAR NAmE CHANGE NOTED:
N/A	N/A	N/A

Disclaimer - Copyright and Trademark Notice

All information contained in this report is based on data available from various public, government and other sources and are based upon the best data available from those sources. The information available in this report may be available from other sources and is not exclusive or the exclusive property of Envirosite Corporation.

NO WARRANTY EXPRESSED OR IMPLIED, IS MADE IN CONNECTION WITH THIS REPORT, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ALL RISK IS ASSUMED BY USER AND Envirosite assumes no liability for faulty or inaccurate information. The Reports may utilize a variety of public and other sources reasonably available to Envirosite. Envirosite cannot, and does not assure, warrant, guarantee or assume any liability for the correctness, comprehensiveness, timeliness or completeness of any of such information, nor is the information in any Report to be construed as legal advice with respect to environmental risks associated with any property. Envirosite shall not be liable to anyone for any claims, causes of action, suits, damages, losses, costs and expenses (including, without limitation, attorneys' fees and costs) arising out of or caused by this report regardless of the acts, errors or omissions, or negligence of Envirosite. Any damages shall be limited to the purchase price of the report.

Purchaser of the report accepts the report "As Is". The report is intended only to provide information only and should not be considered as providing any legal advice, prediction, forecast, or fact as to the environmental risk for any specific property. Reports are proprietary to Envirosite, and contain copyrighted material and trademarks of Envirosite. All other trademarks used herein are the property of their respective owners. All rights of Envirosite as to the Reports are reserved.

SUBJECT PROPERTY Inf ORMaTIOn:

Subject Property: 99 Bullock Road (Landenberg)

SUBJECT PROPERTY fI nd Ing S:

YEa R(S):	fI nd Ing S:
2015	Address Not Listed
2010	Address Not Listed
2006	Street Not Listed
2001	Street Not Listed
1998	Street Not Listed

POSSIBLE adJOInIng PROPERTY Inf ORMaTIOn:

POSSIBLE ADJOINING STREET(S) & ADDRESSE(S): 985-1020 CHESTERVILLE ROAD (LINCOLN UNIVERSITY); 47-69 BULLOCK ROAD (LANDENBERG); SPRINGLAWN ROAD (LANDENBERG); 356-664 STRICKERSVILLE ROAD (LANDENBERG); 201-355 MT OLIVET ROAD (LANDENBERG); 208-224 WALKER ROAD (LANDENBERGE)

POSSIBLE adJOInIng P ROPERTY fI nd Ing S:

YEa R(S):	fI nd Ing S:
2015	**Chesterville Road (Lincoln University)** No Listings (985-1020) **Bullock Road (Landenberg)** No Listings (47-69) **Springlawn Road (Landenberg)** Street Not Listed **Strickersville Road (Landenberg)** Residence (420) Residence (421) Residence (423) Residence (507) Residence (511) Residence (638) Residence (644) Residence (660) Resdience (664) No Other Listings (356-664) **Mt. Olivet Road (Landenberg)** Street Not Listed **Walker Road (Landenberg)** Resdience (208) Residence (224) No Other Listings (208-224)
2010	**Chesterville Road (Lincoln University)** No Listings (985-1020) **Bullock Road (Landenberg)** No Listings (47-69) **Springlawn Road (Landenberg)** Street Not Listed **Strickersville Road (Landenberg)** Residence (420) Residence (421) Residence (423) Residence (507) Residence (511) Residence (642) Residence (644) Residence (660) No Other Listings (356-664)

Mt. Olivet Road (Landenberg)
Street Not Listed

Walker Road (Landenberg)
Resdience (208)
Residence (224)
No Other Listings (208-224)

2006

Chesterville Road (Lincoln University)
No Listings (985-1020)

Bullock Road (Landenberg)
Street Not Listed

Springlawn Road (Landenberg)
Street Not Listed

Strickersville Road (Landenberg)
Street Not Listed

Mt. Olivet Road (Landenberg)
No Listings (201-355)

Walker Road (Landenberg)
No Listings (208-224)

2001

Chesterville Road (Lincoln University)
Street Not Listed

Bullock Road (Landenberg)
Street Not Listed

Springlawn Road (Landenberg)
Street Not Listed

Strickersville Road (Landenberg)
Residence (420)
Residence (421)
Residence (423)
Residence (642)
Residence (660)
No Other Listings (356-664)

Mt. Olivet Road (Landenberg)
No Listings (201-355)

Walker Road (Landenberg)
Residence (224)
No Other Listings (208-224)

1998

Chesterville Road (Lincoln University)
Street Not Listed

Bullock Road (Landenberg)
Street Not Listed

Springlawn Road (Landenberg)
Street Not Listed

Strickersville Road (Landenberg)
Street Not Listed

Mt. Olivet Road (Landenberg)

No Listings (201-355)

Walker Road (Landenberg)
No Listings (208-224)

APPENDIX H

SITE PHOTOGRAPHS

Photo 1: General view of Property, looking south towards Strickersville Road.

Photo 2: General view of fields, looking southeast.

Photo 3: View looking across Big Elk Creek towards Mt. Olivat Road.

Photo 4: Typical view of interior of woods.

Photo 5: View of Springlawn Road trail.

Photo 6: View of building ruins along Big Elk Creek.

Photo 7: View of barn ruins located in the central portion of the Property.

Photo 8: Typical configuration of wire mesh fencing observed within Property.

Photo 9: View of field showing steep topographic relief.

Photo 10: View across Property looking eastward.

APPENDIX I

ENVIRONMENTAL PROFESSIONAL
QUALIFICATIONS

David P. Bailey
Senior Environmental Scientist

EDUCATION

B.S., Agriculture, University of Delaware, 1997
Post Graduate Coursework, University of Maryland, Graduate Studies in Environmental Management

TRAINING

Wetlands Delineation, Cook College Rutgers University, 2003
Hydrology of Wetlands, Cook College Rutgers University, 2004
Advanced Wetland Delineation, Environmental Concern, Inc. 2005
Lake Management, Cook College, Rutgers University, 2007
Introduction to Groundwater Investigations, U.S. Environmental Protection Agency, 2008
Hazardous Waste Operations and Emergency Response (HAZWOPER) 40 Hour Training
8-Hour OSHA Annual Refresher Courses

Background / Skills

Mr. Bailey has been working as a project manager / senior environmental scientist in the field of environmental consulting for over 10 years. His project experience includes Preliminary Environmental Site Assessments, Phase I and II environmental site assessments, subsurface site investigations, hydrogeologic evaluations, stormwater recharge evaluations, underground storage tank investigations, environmental health and safety monitoring, asbestos surveys, and lead-based paint surveys. Mr. Bailey's typical job responsibilities include: writing proposals, work plans, health and safety plans, and reports; coordinating, performing, and supervising field sampling; and interpreting and modeling analytical data. His field experience includes soils identification and classification, monitoring-well installations, soil and groundwater sampling, and field investigations for vapor intrusion modeling.

SELECTED PROJECT EXPERIENCE

Project Manager – Environmental Site Assessments, Various Sites

Mr. Bailey has served as a Project Manager and Senior Environmental Scientist for environmental site assessments of multi-family residential, commercial (retail and office), and industrial facilities in over 18-states nationwide. His work on these types of projects included aerial photographic interpretation, participation in magnetic surveys to locate subsurface features such as tanks and piping, historical research, visual site reviews, and interaction with local and state agencies.

Senior Environmental Scientist – Industrial Facility, Salisbury, Maryland

Mr. Bailey served as a Senior Environmental Scientist on a large scale Remedial Investigation (RI) of an approximately 18-acre, 400,000 square foot facility which had manufactured gasoline pumps / dispensers for approximately 65 years. His work on this project consisted of performing historical research, reviewing environmental regulatory files provided by the U.S. Environmental Protection Agency (EPA) and the State of Maryland Department of the Environment (MDE), cataloging all relevant environmental documents, reviewing soil borings collected by direct-push and hollow-stem auger methods, providing oversight during the installation of groundwater monitoring wells, collecting soil and groundwater samples, and interpreting laboratory analysis data.

Senior Environmental Scientist – 22-Acre Parcel Environmental Site Assessment, Rehoboth Beach, Delaware

Mr. Bailey completed a Phase I Environmental Site Assessment and subsequent Limited Subsurface Evaluation of an approximately 22-acre undeveloped parcel located in Rehoboth Beach, Delaware. Historically the property had been undeveloped vacant land, however, the site investigation revealed that miscellaneous solid waste and containers of unknown contents had been left on-site and presented an environmental concern. In order to evaluate these conditions, Mr. Bailey performed a limited subsurface evaluation of the property which included a magnetometer survey, test pit excavations, soil sampling and laboratory analysis, and providing an estimated cost to properly dispose of the solid waste and impacted soils identified during the assessment. Through this limited evaluation, Mr. Bailey was able to provide a basis for which the prospective purchaser was able to renegotiate the selling price of the property.

Senior Environmental Scientist – Remedial Investigation / Feasibility Study (RI/FS), Wilmington, Delaware

Mr. Bailey assisted in preparing an Addendum to an existing RI/FS for a property that had previously entered into the State of Delaware's Voluntary Cleanup Program (VCP). Mr. Bailey's work on the project consisted of analyzing laboratory data generated during the addendum to evaluate a potential human health risk associated with the migration of vapors into the building from site soils and groundwater impacted with trichloroethene (TCE) and tetrachloroethene (PCE). The evaluation was performed using the EPA approved Johnson & Ettinger Model for Subsurface Vapor Intrusion in Buildings.

Senior Environmental Scientist – Health and Safety Monitoring, Wilmington, Delaware

Mr. Bailey served as a Senior Environmental Scientist on a federally funded construction site providing environmental health and safety monitoring to document site workers exposure to constituents of concerns. Mr. Bailey's work on the project included reviewing trenching, excavation, and other soil disturbance activities, and monitoring air vapors and dust, which posed a potential health and safety risk to site workers.

Senior Environmental Scientist - Wetland Delineations and Permitting, Statewide

Mr. Bailey has performed wetland delineations, for submittal to the United States Army Corps of Engineers, on properties ranging in size from 4-acres to approximately 300-acres. Mr. Bailey's work on these projects included identifying hydric soils, hydrology, and cataloguing wetland and upland plant species. Also prepared Nationwide Permits and / or Subaqueous Lands Permits for the United States Corps of Engineers / State of Delaware Department of Natural Resources and Environmental Control associated with residential subdivisions, commercial development, and improvements to existing commercial properties. Tasks included reviewing civil engineering construction drawings specific to potential wetland impacts,

Senior Environmental Scientist – Stormwater Recharge Evaluations, Statewide

Mr. Bailey has performed stormwater recharge evaluations in support of residential and commercial development for various projects within the State of Delaware. The evaluations generally consisted of classifying soils, estimating seasonal high-water, determining the depth to groundwater when not obvious, and the suitability of site soils for subsurface recharge capability.

Senior Environmental Scientist – Pond Restoration, Residential Subdivision, St. Georges, DE

Mr. Bailey assisted with evaluating a residential stormwater pond to improve its aesthetic qualities and ensure it maintained compliance with current New Castle County stormwater pond maintenance guidelines. The evaluation consisted of monitoring water quality parameters, collecting water samples, and devising a plan of action to achieve the goals of the neighborhood association. A power point presentation was presented to the neighborhood association outlying different steps they could take to achieve one or more of their goals.

Ten Bears Environmental

1080 S. Chapel St.
Suite 200
Newark, Delaware 19702
Tel: (302) 731-8633 Fax: (302) 731-8655

606 Federal Street
Milton, Delaware 19968
Tel: (302) 684-5080 Fax: (302) 684-5081

July 2, 2018

Via Email

Mr. Blaine T. Phillips, Jr.
The Conservation Fund
5807 Kennett Pike
Centreville, DE. 19807

RE: P.N. 18-1726.B
Phase I Environmental Site Assessment Update
Strawbridge II Property
Landenberg, Pennsylvania

Dear Mr. Phillips:

Ten Bears Environmental Associates Company has prepared this letter report to update our July 2017 Phase I Environmental Site Assessment (ESA), for the referenced property in Landenberg, Pennsylvania. The ESA update was completed in accordance with the minimum requirements of the American Society for Testing and Materials, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM E 1527-13), which also currently meets the minimum requirements of the U.S. Environmental Protection Agency's "All Appropriate Inquiries" (EPA AAI) regulations. The ESA was completed under the direction and review of an environmental professional, as defined by the EPA AAI regulations, and consisted of a review of the prior report, information provided by the user of the report, updated environmental database and environmental lien searches and historical documents, as well as a visual review of the site and adjoining areas. The following paragraphs summarize the findings of our update and associated recommendations.

BACKGROUND

The Strawbridge Property comprises seven (7) parcels (Chester County Tax Parcel No.'s 70-5-6, 70-5-7, 70-5-8, 71-4-32.3, 72-6-1, 72-6-4, and 72-6-10) containing approximately 982 acres located in Landenberg, Pennsylvania. A majority of the Property is currently utilized for farming with the remainder consisting of undeveloped woodland. While there are no currently occupied structures on the Property, a few residence and barn foundations were observed at various locations.

The Property is bounded by Lewisville / Strickersville Road to the south, Chesterville Road to the west, residential properties and a portion of Walker Road to the north, and agricultural land and residential properties to the east. Surrounding land use is primarily agricultural and residential.

USER PROVIDED INFORMATION

TBE requested that a representative of The Conservation Fund as the primary the user of this ESA, complete a Phase I Environmental Site Assessment User Questionnaire to provide information that may be pertinent to this assessment. A copy of the User Questionnaire was filled out by Mr. Blaine Phillips of The Conservation Fund, and was returned to TBE. The Questionnaire is intended to assist in meeting the User's Responsibilities outlined in Section 6 of the ASTM E 1527-13 standard.

Information provided in the Questionnaire does not suggest that the users are aware of indications of potential environmental issues associated with the Property that would warrant further evaluation. A copy of the User Questionnaire, which was prepared and signed by Mr. Phillips, dated June 27, 2018 is included as Appendix A.

UPDATED DATABASE SEARCH & ENVIRONMENTAL LIEN RESULTS

Ten Bears reviewed an environmental database search report prepared by our subcontractor, Envirosite, Inc. (EC) to evaluate environmental conditions reported to government agencies at and in the vicinity of the Property. The June 6, 2018 regulatory report (included in Appendix B) summarizes environmental regulatory agency information gathered from selected databases. For each database, EC reported on sites identified to be located within the distance prescribed by the ASTM E 1527-13 standard. According to the EC report, the Property was not identified on any of the databases searched. The database search for the July 2017 Phase I ESA did not identify any nearby sites of concern. However, the 2018 EC database search identified a former landfill / dump site on Walker Road, to the northeast of the Subject Property. A review of the historical aerial photography and topographic mapping do not indicate any surface disturbances, mapping notations, or other indicators of a potential landfill / dump in the area. Therefore, this listing may not be the actual location of the former landfill / dump and suggests minimal potential to impact conditions at the Property.

The June 4, 2018 Nationwide Environmental Title Research (NETR) Environmental Lien search did not identify any environmental liens or activity and use limitations (AULs) associated with the Property. This report is included as Appendix C.

HISTORICAL DOCUMENT REVIEW

Historical documents reviewed as part of the July 2017 ESA and this update indicated that the Property has been historically utilized as farmland. Sanborn Fire Insurance Maps were requested but are not available for this site.

SITE RECONNAISSANCE

Ten Bears personnel performed a site reconnaissance of the Property on July 2, 2018 to assess site environmental conditions. Photographs of the property taken during the reconnaissance are included in Appendix E.

The Strawbridge Property comprises seven (7) parcels (Chester County Tax Parcel No.'s 70-5-6, 70-5-7, 70-5-8, 71-4-32.3, 72-6-1, 72-6-4, and 72-6-10) containing approximately 982 acres located in Landenberg, Pennsylvania. A majority of the Property is currently utilized for farming with the

remainder consisting of undeveloped woodland. While there are no currently occupied structures on the Property, a few remnants of former residences and / or barns were observed at various locations. The building ruins consisted of stone foundation walls and brick exterior walls. The building ruins were generally limited to foundations with only one or two portions of the exterior walls remaining. No interior floors, stairs to basements, or other building structures were observed. No apparent heating sources were noted at the former residences / barns.

The site is located in a mixed-use area, with farmland intermixed with residential properties on all sides of the Property.

INTERVIEWS

Ten Bears spoke with Mr. Ronald Ayers, the caretaker for the property, as part of the 2017 ESA. Mr. Ayres indicated he has been working at the Property since 1959 and was not aware of any potential environmental issues associated with the property. He further stated that the structures noted on the historical documents were gone prior to his working there and the Property has been primarily in agricultural use the entire time. Mr. Ayers indicated that prior to 1959, portions of the site were used for cattle grazing.

CONCLUSIONS AND RECOMMENDATIONS

TBE has completed an update of our July 2017 Phase I ESA of the Strawbridge II Property in Landenberg, Pennsylvania. This update was performed in conformance with the scope and limitations of ASTM Practice E 1527-13. The findings of the update did not identify potential *recognized environmental conditions* (RECs) as defined by the ASTM E 1527-13 standard that, in TBE's opinion, would preclude the user from qualifying for the *innocent landowner, contiguous property owner* or *bona fide prospective purchaser* limitations to CERCLA (Federal Comprehensive Environmental Response, Compensation, and Liability Act) liability or trigger related regulatory obligations. No historical recognized environmental conditions (HRECs) or controlled recognized environmental conditions (CRECs) were identified at the Property. However, the assessment did identify a minor environmental condition that, while manageable, could present some liability if mishandled during the real estate transfer or in the future.

SECONDARY CONCERN

Solid Waste Debris / Stored Materials - Solid waste debris was observed at the Site, was primarily situated near the ruins of the former residences / barns. The debris consisted of brick, concrete, wood, metal, tires, and wire mesh fencing. TBE estimates the volume of surface solid waste observed at the Site as approximately 20 to 30 cubic yards.

TBE recommends that solid waste and stored materials not intended for reuse at the Property be transported to an appropriate permitted off-site facility for recycling or disposal in accordance with applicable regulations. Some of the observed waste materials, particularly tires may require separate disposal.

Floodplains and Wetlands - The July 2017 ESA identified mapped floodplains within the Property associated with Big Elk Creek and Hodgson Creek. In addition, Big Elk Creek and several smaller unnamed streams were mapped as regulated water-ways on the U.S. Fish and Wildlife Internet Mapping Service, but forested or emergent wetlands were not mapped within the Property. While a

formal wetland survey was not completed as part of the 2017 ESA or this update, wetlands may be present adjacent to the water-ways. Accordingly, restrictions on future development may be imposed in these areas.

This report is based on Ten Bears Environmental Associates Company's professional opinion regarding environmental conditions visually observed at the Property during the reconnaissance and our interpretation of the reviewed regulatory documentation. The observations, conclusions, and recommendations presented in this report are based solely on conditions encountered and available documents at the time of the reconnaissance effort. Latent conditions and other contingencies bearing upon the environmental condition of the site may be evident in the future. While this evaluation was performed in an effort to generally characterize the environmental condition of the Property, the scope of services was limited due to practicable budgetary constraints. As such, further investigation may identify conditions that were not encountered during this assessment.

This letter is intended for the exclusive use of The Conservation Fund and the Pennsylvania Department of Conservation and Natural Resources. The information contained in this letter may not be relied upon by parties other than The Conservation Fund and the Pennsylvania Department of Conservation and Natural Resources without the prior written consent of Ten Bears Environmental Associates Company.

Sincerely,
TEN BEARS ENVIRONMENTAL ASSOCIATES COMPANY

David P. Bailey
Senior Environmental Scientist

R. Clayton Greer, P.E.
President, Newark Office

Enclosures:

FIGURES

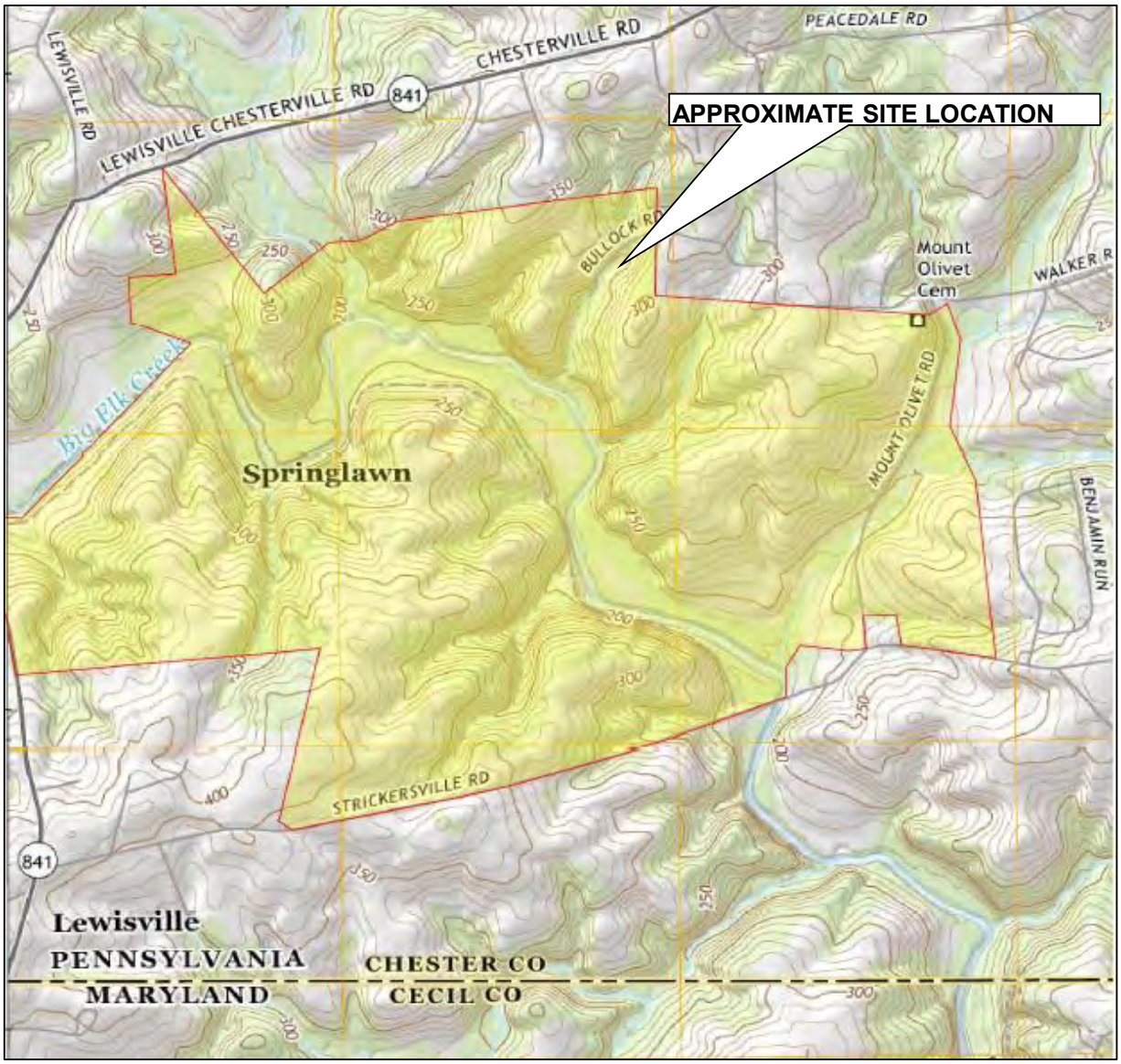
Figure 1 Site Location Sketch

APPENDICES

Appendix A Phase I Environmental Site Assessment User Questionnaire
Appendix B Environmental Database Search Report
Appendix C Environmental Lien Search Report
Appendix D Site Photographs
Appendix E Environmental Professional Qualifications

FIGURE 1

SITE LOCATION SKETCH



NOTE:
THIS LOCATION SKETCH WAS ADOPTED FROM THE USGS TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, FOR NEWARK - WEST, DE (2016)

Ten Bears Environmental

Ten Bears Environmental Associates Co.,
1080 South Chapel Street, Suite 200
Newark, DE 19702
Phone: (302) 731-8633 Fax: (302) 731-8655

FIGURE 1 - SITE LOCATION SKETCH

STRAWBRIDGE PROPERTY

STRICKERSVILLE ROAD

LANDENBERG, CHESTER COUNTY, PENNSYLVANIA

DATE:	7/13/2017	JOB NUMBER:	17-1726.A
DRAWN BY:	DPB	SCALE:	N.T.S.
CHECKED BY:		FIGURE NO:	1
FILE NO:	17-1726.A_FIG	SHEET	1 OF 1

APPENDIX A

PHASE I ENVIRONMENTAL SITE ASSESSMENT

USER QUESTIONNAIRE

PHASE I ENVIRONMENTAL SITE ASSESSMENT
USER QUESTIONNAIRE

TEN BEARS ENVIRONMENTAL ASSOCIATES COMPANY
NEWARK AND MILTON, DELAWARE

Property Name: Strawbridge Property
Property Use: Agricultural
Address: Strickersville Road
Landenberg, Pennsylvania

Project Number: 18-1726.B
Date: _____

To assist us with our Phase I Environmental Site Assessment (ESA), and in accordance with the American Society for Testing and Materials, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM E 1527-13), we request that you respond to the following questions to the best of your ability.

1. Are you aware of any environmental cleanup liens against the property that are filed or recorded under federal, tribal, or local law?

NO

2. Are you aware of any *Activity and Land Use Limitations* (ALUs), such as engineering controls, land use restrictions, or institutional controls that are in place at the site and / or have been filed or recorded in a registry under federal, tribal, state or local law?

NO

3. As the user of this ESA, do you have any specialized knowledge or experience related to the property or nearby properties? For example, are you involved in the same line of business as current or former occupants of the property or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by this type of business?

NO

PHASE I ENVIRONMENTAL SITE ASSESSMENT
USER QUESTIONNAIRE (continued)

4. If the ESA is being performed in preparation of a property transfer, does the purchase price being paid for the property reasonably reflect the fair market value of the property?

Yes

5. Are you aware of commonly known or reasonably ascertainable information about the property that would assist in identifying recognized environmental conditions associated with the property?

   a. What are the historical uses of the property? Agriculture

   b. Do you know of specific regulated substances that are present, or formerly were present, at the property?

NO

   c. Do you know of releases of regulated substances that have occurred at the property?

NO

   d. Do you know of any environmental remediation activities or cleanups that have taken place at the property?

No

6. Based on your knowledge and experience related to the property, are there any obvious indicators that point to the presence or likely presence of contamination at the property?

NO

7. Does the Property utilize a community septic sewerage system?

   a. Are there any known problems associated with the system? NOT AWARE

8. Are there any onsite drinking water wells and an associated water supply system?

   a. Are you aware of any problems associated with the drinking water wells, water quality, and / or the supply system? NOT AWARE

This Questionnaire was completed by:

Name: Blaine T. Phillips

Title: Mid-Atlantic Director

Phone No.: 302-656-1103

Company: Conservation Fund

Address: 5907 Kennett Pike
Centreville, DE 19807

By signing below, the preparer, as designated above, represents that, to the best of the preparer's knowledge, the above statements and facts are true and correct and to the best of the preparer's actual knowledge, not material facts have been suppressed or misstated.

Preparer's Signature: Blaine T. Phillips

Date: June 21, 2018

APPENDIX B

ENVIRONMENTAL DATABASE SEARCH REPORT

Government Records Report | 2018

Order Number: 21199

Report Generated: 06/28/2018

Project Name: Strawbridge Property

Project Number: 17-1726.B

Strawbridge Property
Walker Road and Mount Olivet Road
Franklin Township, PA 19350

2 Corporate Drive
Suite 450
Shelton, CT 06484
Toll Free: 866-211-2028
www.envirositecorp.com

Table of Contents 2018

Section	Page
Executive Summary	1
Executive Summary by Distance	2
Executive Summary by Database	3
Property Proximity Map	7
Area Map	8
Map Findings Summary	9
Map Findings	14
Unmappable Summary	17
Environmental Records Searched	18
Geological Landscape Section	33
Geological Landscape Section Summary	36
Geological Findings Map	39
Geological Landscape Section Map Findings	40
Geological Landscape Section Map Findings Radon	171
Geological Landscape Records Searched	172

Disclaimer - Copyright and Trademark Notice

All information contained in this report are based on data available from various public, government and other sources and are based upon the best data available from those sources. The information available in this report may be available from other sources and is not exclusive or the exclusive property of Envirosite Corporation.

NO WARRANTY EXPRESSED OR IMPLIED, IS MADE IN CONNECTION WITH THIS REPORT, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ALL RISK IS ASSUMED BY USER AND Envirosite assumes no liability for faulty or inaccurate information. The Reports may utilize a variety of public and other sources reasonably available to Envirosite. Envirosite cannot, and does not assure, warrant, guarantee or assume any liability for the correctness, comprehensiveness, timeliness or completeness of any of such information, nor is the information in any Report to be construed as legal advice with respect to environmental risks associated with any property. Envirosite shall not be liable to anyone for any claims, causes of action, suits, damages, losses, costs and expenses (including, without limitation, attorneys' fees and costs) arising out of or caused by this report regardless of the acts, errors or omissions, or negligence of Envirosite. Any damages shall be limited to the purchase price of the report.

Purchaser of the report accepts the report "As Is". The report is intended only to provide information only and should not be considered as providing any legal advice, prediction, forecast, or fact as to the environmental risk for any specific property. Reports are proprietary to Envirosite, and contain copyrighted material and trademarks of Envirosite. All other trademarks used herein are the property of their respective owners. All rights of Envirosite as to the Reports are reserved.

Envirosite Corporation has conducted a search of all reasonably ascertainable records in accordance with EPA's AAI (40 CFR Part 312) requirements and the ASTM E-1527-13 Environmental Site Assessments standard.

SUBJECT PROPERTY INFORMATION:

ADDRESS:

Strawbridge Property
Walker Road and Mount Olivet Road
Franklin Township, PA 19350

COORDINATES:

Latitude (North):	39.736396 - 39°44'11"
Longitude (West):	-75.858168 - -75°51'29.4"
Universal Transverse Mercator:	Zone 18N
UTM X (Meters):	426465.63
UTM Y (Meters):	4398852.52

ELEVATION:

Elevation:	248.169 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH SUBJECT PROPERTY:

Subject Property Map: 39075f7 NEWARK WEST, MD
Most Recent Revision: 2016

Subject Property Map: 39075f8 BAY VIEW, MD
Most Recent Revision: 2016

MAP ID	SITE NAME	ADDRESS	DATABASE(S)	RELATIVE ELEVATION	DIRECTION / DISTANCE
A1	FRANKLIN TWP DUMP	39.741666171281224, -75....	HIST LF INVENTORY - PA	Lower	ENE / 0.171 mi.
A2	FRANKLIN TWP. DUMP	N/R	EFACTS - PA	Lower	ENE / 0.171 mi.
A3	FRANKLIN TWP. DUMP	N/R	ABANDONED LF - PA	Lower	ENE / 0.171 mi.

SUBJECT PROPERTY SEARCH RESULTS:

The subject property was not listed in any of the databases searched by Envirosite Corporation.

SEARCH RESULTS:

STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS

ABANDONED LF - PA: Landfills that have been abandoned listed in the Abandoned Landfill Inventory **1 SITE FOUND WITHIN .5 MILE**

LOWER ELEVATION

MAP ID	SITE NAME	SITE ADDRESS	DIRECTION/DISTANCE	PAGE
A3	FRANKLIN TWP. DUMP		ENE / 0.171 mi.	*16*

HIST LF INVENTORY - PA: Listing of Historical landfills **1 SITE FOUND WITHIN .5 MILE**

LOWER ELEVATION

MAP ID	SITE NAME	SITE ADDRESS	DIRECTION/DISTANCE	PAGE
A1	FRANKLIN TWP DUMP	39.741666171281224, -75.8401674750721	ENE / 0.171 mi.	*14*

OTHER ASCERTAINABLE RECORDS

EFACTS - PA: Environment Facility Application Compliance Tracking System **1 SITE FOUND WITHIN .5 MILE**

LOWER ELEVATION

MAP ID	SITE NAME	SITE ADDRESS	DIRECTION/DISTANCE	PAGE
A2	FRANKLIN TWP. DUMP		ENE / 0.171 mi.	*14*

Following sites were unable to be mapped.

SITE NAME:	ADDRESS, CITY, ZIP:	DATABASE(S):
BELLA MUSHROOM FARMS	RR 1 BOX 165B, LANDENBERG 19350	EFACTS ENV Remediation - PA
CHESTER HILLS FARM	WICKERTON RD, LANDENBERG 19350	EFACTS ENV Remediation - PA
CURTIS GREER FARM	PENN GREEN RD, LANDENBERG 19350	EFACTS ENV Remediation - PA
CVS PHARMACY 7183	730 NEWARK RD, LANDENBERG 19350	BRS, RCRA_LQG
EASTERN SHORE NATURAL GAS LONDON...	LONDONDERRY TWP	EFACTS - PA, FRS
ESNG PIPELINE SEGMENTS 1 AND 1A	HIGHLAND TWP	EFACTS - PA
FISHER'S SANITARY SERVICE	RR 1, KUTZTOWN 19350	EFACTS - PA
GIOFFREDI MUSHROOMS INC	PENN GREEN RD, LANDENBURG 19350	EFACTS ENV Remediation - PA
LANDENBURG	1/4 MI S OF NEWARK &..., LANDENBURG 19350	EFACTS ENV Remediation - PA, LUST - PA
LAWRENCE FARM	RR 1 BOX 185, LANDENBERG 19350	EFACTS - PA
LEONE PIZZINI & SON	RR 1 BOX 96, LANDENBERG 19350	EFACTS ENV Remediation - PA
LOT B5 - NICHOLS SUBD	WALKER RD, LANDENBERG 19350	EFACTS - PA
MACKIE PROPERTY DEV	PEACEDALE RD, LANDENBERG 19350	EFACTS - PA
MANFREDINI MUSHROOM FARM	PENN GREEN RD, LANDENBERG 19350	EFACTS ENV Remediation - PA
SARANA PROPERTY	PA SR 841, LANDENBERG 19350	EFACTS - PA
SCHADD POND PESTICIDES	107 LAVENDER LANE, LANDENBERG 19350	EFACTS - PA
TURKEY HILL 168	735 NEWARK RD, LANDENBERG 19350	EFACTS ENV Remediation - PA, LUST - PA, UST - PA
TUTTLE & MANET	399C FLEETWOOD RD, COATESVILLE 19350	RCRA_NONGEN
US POSTAL SVC	PENN GREEN RD, LANDENBERG 19350	EFACTS ENV Remediation - PA

DATABASE(S) WITH NO MAPPED SITES:

FEDERAL RCRA NON-CORRACTS TSD FACILITIES LIST

ARCHIVED RCRA TSDF	Archived Resource Conservation and Recovery Act: Treatment Storage and Disposal Facilities
RCRA_TSDF	Resource Conservation and Recovery Act: Treatment Storage and Disposal Facilities

FEDERAL CERCLIS LIST

CERCLIS NFRAP	Comprehensive Environmental Response Compensation and Liability Act No Further Remedial Action Planned
CERCLIS-HIST	Comprehensive Environmental Response Compensation and Liability Act
FEDERAL FACILITY	Federal Facility sites
SEMS_8R_ACTIVE SITES	Sites on SEMS Active Site Inventory
SEMS_8R_ARCHIVED SITES	Sites on SEMS Archived Site Inventory

FEDERAL RCRA CORRACTS FACILITIES LIST

CORRACTS	Hazardous Waste Corrective Action

FEDERAL DELISTED NPL SITE LIST

DELISTED NPL	Delisted National Priority List
DELISTED PROPOSED NPL	Delisted proposed National Priority List
SEMS_DELETED NPL	Sites Deleted from National Priorities List

FEDERAL ERNS LIST

ERNS	Emergency Response Notification System

FEDERAL INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES

FED E C	Engineering Controls
FED I C	Institutional Controls
RCRA IC_EC	RCRA sites with Institutional and Engineering Controls
E C - PA	Engineering Controls

FEDERAL NPL SITE LIST

NPL	National Priority List
NPL EPA R1 GIS	GIS for EPA Region 1 NPL
NPL EPA R3 GIS	GIS for EPA Region 3 NPL
NPL EPA R6 GIS	GIS for EPA Region 6 NPL
NPL EPA R8 GIS	GIS for EPA Region 8 NPL
NPL EPA R9 GIS	GIS for EPA Region 9 NPL
PART NPL	Part National Priority List
PROPOSED NPL	Proposed National Priority List
SEMS_FINAL NPL	Sites included on the Final National Priorities List
SEMS_PROPOSED NPL	Sites Proposed to be Added to the National Priorities List

FEDERAL RCRA GENERATORS LIST

RCRA_CESQG	Resource Conservation and Recovery Act_Conditionally Exempt Small Quantity Generators
RCRA_FULL_DETAIL	Resource Conservation and Recovery Act_Full detail
RCRA_LQG	Resource Conservation and Recovery Act_ Large Quantity Generators
RCRA_NONGEN	Resource Conservation and Recovery Act_Non Generators
RCRA_SQG	Resource Conservation and Recovery Act_Small Quantity Generators

STATE AND TRIBAL REGISTERED STORAGE TANK LISTS

FEMA UST	FEMA Underground Storage Tanks
INDIAN UST R1	Underground Storage Tanks on Indian Land in EPA Region 1
INDIAN UST R10	Underground Storage Tanks on Indian Land in EPA Region 10
INDIAN UST R2	Underground Storage Tanks on Indian Land in EPA Region 2
INDIAN UST R4	Underground Storage Tanks on Indian Land in EPA Region 4
INDIAN UST R5	Underground Storage Tanks on Indian Land in EPA Region 5
INDIAN UST R6	Underground Storage Tanks on Indian Land in EPA Region 6

STATE AND TRIBAL REGISTERED STORAGE TANK LISTS *(cont.)*

INDIAN UST R7	Underground Storage Tanks on Indian Land in EPA Region 7
INDIAN UST R8	Underground Storage Tanks on Indian Land in EPA Region 8
INDIAN UST R9	Underground Storage Tanks on Indian Land in EPA Region 9
AST - PA	Aboveground Storage Tanks
UST - PA	Underground Storage Tanks

STATE AND TRIBAL LEAKING STORAGE TANK LISTS

INDIAN LUST R1	Leaking Underground Storage Tanks on Indian Land in EPA Region 1
INDIAN LUST R10	Leaking Underground Storage Tanks on Indian Land in EPA Region 10
INDIAN LUST R2	Leaking Underground Storage Tanks on Indian Land in EPA Region 2
INDIAN LUST R4	Leaking Underground Storage Tanks on Indian Land in EPA Region 4
INDIAN LUST R5	Leaking Underground Storage Tanks on Indian Land in EPA Region 5
INDIAN LUST R6	Leaking Underground Storage Tanks on Indian Land in EPA Region 6
INDIAN LUST R7	Leaking Underground Storage Tanks on Indian Land in EPA Region 7
INDIAN LUST R8	Leaking Underground Storage Tanks on Indian Land in EPA Region 8
INDIAN LUST R9	Leaking Underground Storage Tanks on Indian Land in EPA Region 9
LAST - PA	Leaking Aboveground Storage Tanks
LUST - PA	Leaking Underground Storage Tanks
URLT - PA	Unregulated Leaking Tanks

STATE BROWNFIELD LIST

TRIBAL BROWNFIELDS	Tribal Brownfields
BROWNFIELDS - PA	Brownfields
HIST BROWNFIELDS - PA	Historical Brownfields

STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS

INACTIVE LF - PA	Inactive Land Fills
SWF/LF - PA	Solid Waste Facilities and Landfills

STATE- AND TRIBAL - EQUIVALENT CERCLIS

HSCA - PA	Hazardous Site Cleanup Act
HSCA REM - PA	Hazardous Site Cleanup Act Remediation

STATE INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES

I C - PA	Institutional Controls

STATE AND TRIBAL VOLUNTARY CLEANUP SITES

VCP - PA	Voluntary Cleanup Program

LOCAL LISTS OF LANDFILL / SOLID WASTE DISPOSAL SITES

DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Sites
INDIAN ODI R8	Open Dump Inventory
ODI	Open Dump Inventory
TRIBAL ODI	Indian Open Dump Inventory Sites

LOCAL LISTS OF HAZARDOUS WASTE / CONTAMINATED SITES

FED CDL	DOJ Clandestine Drug Labs
US HIST CDL	Historical Clandestine Drug Labs

LOCAL BROWNFIELD LISTS

FED BROWNFIELDS	Federal Brownfields

RECORDS OF EMERGENCY RELEASE REPORTS

HMIRS (DOT)	Hazardous Materials Information Reporting Systems
SPILLS - PA	Chemical Spills

LOCAL LAND RECORDS

LIENS 2	CERCLA Lien Information

OTHER ASCERTAINABLE RECORDS

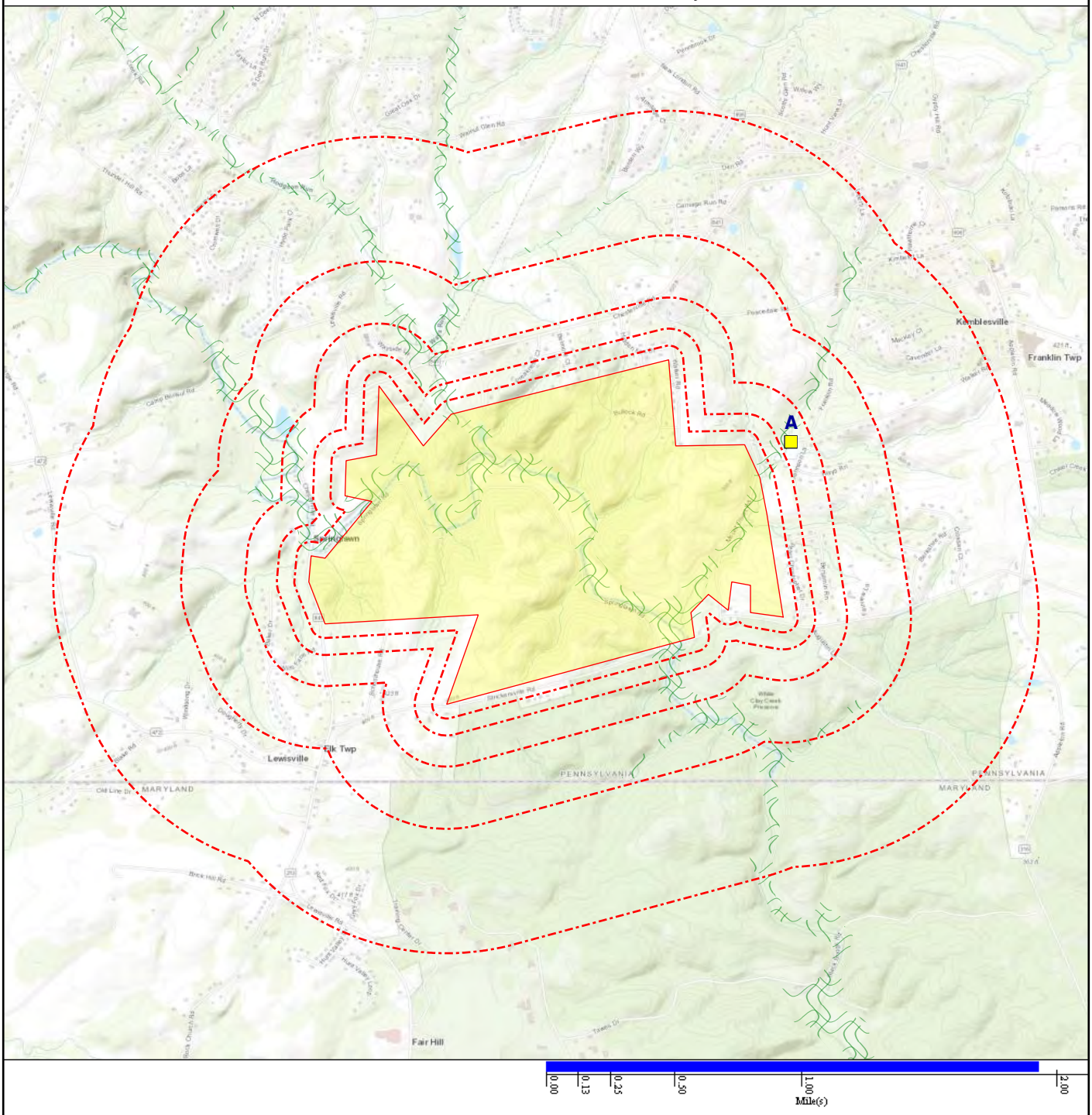
AFS	Air Facility Systems

OTHER ASCERTAINABLE RECORDS *(cont.)*

BRS	Biennial Reporting Systems
CDC HAZDAT	Hazardous Substance Release and Health Effects Information
COAL ASH DOE	Coal Ash: Department of Energy
COAL ASH EPA	Coal Ash: Environmental Protection Agency
COAL GAS	Coal Gas Plants
CONSENT (DECREES)	Superfund Consent Decree
CORRECTIVE ACTIONS_2020	Wastes - Hazardous Waste - Corrective Action
DIGITAL OBSTACLE	Obstacles of interest to aviation users
DOD	Department of Defense
DOT OPS	Department of Transportation Office of Pipeline Safety
ECHO	EPA Enforcement and Compliance History Online
ENOI	Electronic Notice of Intent
EPA FUELS	EPA Fuels Registration, Reporting, and Compliance List
EPA OSC	EPA On-Site Coordinator
EPA WATCH	EPA Watch List
FA HWF	Financial Assurance for Hazardous Waste Facilities
FEDLAND	Federal Lands
FRS	Facility Index Systems
FTTS	FIFRA/TSCA Tracking System
FTTS INSP	FIFRA/TSCA Tracking System: Inspections
FUDS	Formerly Used Defense Sites
HIST AFS	Historical Air Facility Systems
HWC DOCKET	Hazardous Waste Compliance Docket
ICIS	Integrated Compliance Information System
INDIAN RESERVATION	Indian Reservations
LEAD_SMELTER	Lead Smelter Sites
LUCIS	Land Use Control Information Systems
LUCIS 2	Land Use Control Information Systems 2
MINES	Mines
MLTS	Material Licensing Tracking Systems
NPL AOC	Areas related to NPL remediation sites
NPL LIENS	National Priority List Liens
OSHA	Occupational Safety & Health Administration
PADS	PCB Activity Database Systems
PCB TRANSFORMER	Polychlorinated Biphenyls Transformers
RAATS	RCRA Administrative Action Tracking Systems
RADINFO	Radiation Information Systems
RMP	Risk Management Plans
ROD	Record of Decision
SCRD DRYCLEANERS	SCRD Drycleaners
SEMS_SMELTER	Sites on SEMS Potential Smelter Activity
SSTS	Section 7 Tracking Systems
TOSCA-CHEMICAL	Toxic Substance Control Act: Chemicals
TOSCA-PLANT	Toxic Substance Control Act: Plants
TRIS	Toxic Release Inventory Systems
UMTRA	Uranium Mill Tailing Sites
ACT 2 DEED - PA	Deed Acknowledgment locations
AIRS - PA	Air Permits
ARCT - PA	Archived Storage Tanks
AUL - PA	Activity Use Limitations
DRYCLEANERS - PA	Drycleaners
EFACTS ENV REMEDIATION - PA	Environmental Cleanup & Brownfields records from the PA eFACTS.
EMI - PA	Air Emissions
MANIFEST - PA	Manifest information
UIC - PA	Underground Injection Controls

SUBJECT NAME: Strawbridge Property
ADDRESS: Walker Road and Mount Olivet Road, Franklin...
LAT/LONG: 39.736396 / -75.858168

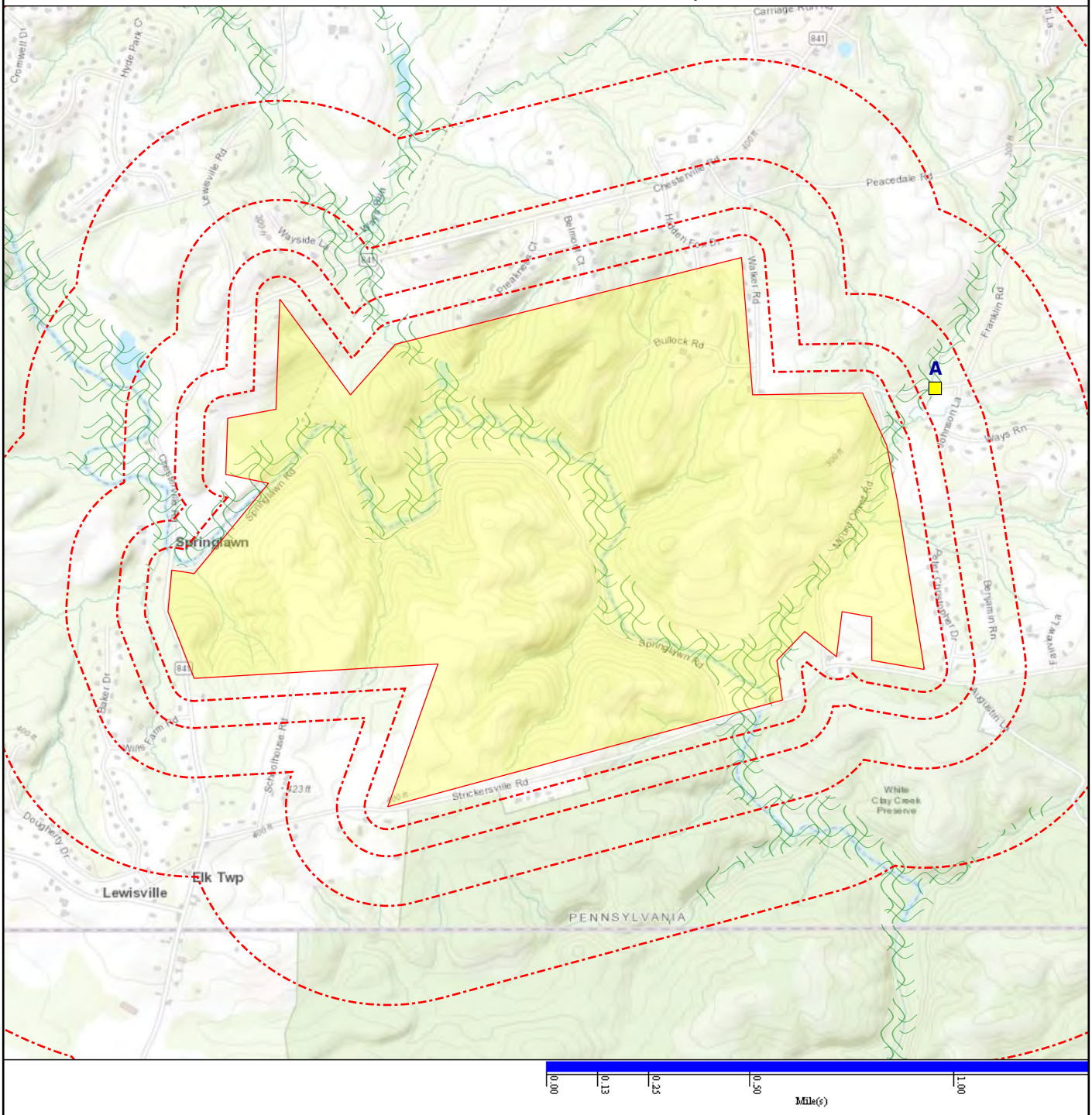
PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 21199
REPORT DATE: June 28, 2018



- Subject Property
- National Priority List (No Data)
- FEMA FloodZone 500 (No Data)
- Equal/Higher Elevation
- Federal Lands (No Data)
- Department of Defense (No Data)
- Lower Elevation
- CDC HAZDAT (No Data)
- DFIRM Floodzone 500 (No Data)
- FEMA FloodZone 100
- Indian Reservation (No Data)
- DFIRM Floodzone 100

SUBJECT NAME: Strawbridge Property
ADDRESS: Walker Road and Mount Olivet Road, Franklin...
LAT/LONG: 39.736396 / -75.858168

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 21199
REPORT DATE: June 28, 2018



- Subject Property
- Equal/Higher Elevation
- Lower Elevation
- FEMA FloodZone 100
- National Priority List (No Data)
- Federal Lands (No Data)
- CDC HAZDAT (No Data)
- Indian Reservation (No Data)
- FEMA FloodZone 500 (No Data)
- Department of Defense (No Data)
- DFIRM Floodzone 500 (No Data)
- DFIRM Floodzone 100

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
FEDERAL RCRA NON-CORRACTS TSD FACILITIES LIST								
ARCHIVED RCRA TSDF		0.500	0	0	0	--	--	0
RCRA_TSDF		0.500	0	0	0	--	--	0
FEDERAL CERCLIS LIST								
CERCLIS NFRAP		0.500	0	0	0	--	--	0
CERCLIS-HIST		0.500	0	0	0	--	--	0
FEDERAL FACILITY		1.000	0	0	0	0	--	0
SEMS_8R_ACTIVE SITES		0.500	0	0	0	--	--	0
SEMS_8R_ARCHIVED SITES		0.500	0	0	0	--	--	0
FEDERAL RCRA CORRACTS FACILITIES LIST								
CORRACTS		1.000	0	0	0	0	--	0
FEDERAL DELISTED NPL SITE LIST								
DELISTED NPL		1.000	0	0	0	0	--	0
DELISTED PROPOSED NPL		1.000	0	0	0	0	--	0
SEMS_DELETED NPL		1.000	0	0	0	0	--	0
FEDERAL ERNS LIST								
ERNS		SP	--	--	--	--	--	0
FEDERAL INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES								
FED E C		0.500	0	0	0	--	--	0
FED I C		0.500	0	0	0	--	--	0
RCRA IC_EC		0.250	0	0	--	--	--	0
E C - PA		0.500	0	0	0	--	--	0
FEDERAL NPL SITE LIST								
NPL		1.000	0	0	0	0	--	0
NPL EPA R1 GIS		1.000	0	0	0	0	--	0
NPL EPA R3 GIS		1.000	0	0	0	0	--	0
NPL EPA R6 GIS		1.000	0	0	0	0	--	0
NPL EPA R8 GIS		1.000	0	0	0	0	--	0
NPL EPA R9 GIS		1.000	0	0	0	0	--	0
PART NPL		1.000	0	0	0	0	--	0
PROPOSED NPL		1.000	0	0	0	0	--	0
SEMS_FINAL NPL		1.000	0	0	0	0	--	0
SEMS_PROPOSED NPL		1.000	0	0	0	0	--	0

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
FEDERAL RCRA GENERATORS LIST								
RCRA_CESQG		0.250	0	0	--	--	--	0
RCRA_FULL_DETAIL		0.250	0	0	--	--	--	0
RCRA_LQG		0.250	0	0	--	--	--	0
RCRA_NONGEN		0.250	0	0	--	--	--	0
RCRA_SQG		0.250	0	0	--	--	--	0
STATE AND TRIBAL REGISTERED STORAGE TANK LISTS								
FEMA UST		0.250	0	0	--	--	--	0
INDIAN UST R1		0.250	0	0	--	--	--	0
INDIAN UST R10		0.250	0	0	--	--	--	0
INDIAN UST R2		0.250	0	0	--	--	--	0
INDIAN UST R4		0.250	0	0	--	--	--	0
INDIAN UST R5		0.250	0	0	--	--	--	0
INDIAN UST R6		0.250	0	0	--	--	--	0
INDIAN UST R7		0.250	0	0	--	--	--	0
INDIAN UST R8		0.250	0	0	--	--	--	0
INDIAN UST R9		0.250	0	0	--	--	--	0
AST - PA		0.250	0	0	--	--	--	0
UST - PA		0.250	0	0	--	--	--	0
STATE AND TRIBAL LEAKING STORAGE TANK LISTS								
INDIAN LUST R1		0.500	0	0	0	--	--	0
INDIAN LUST R10		0.500	0	0	0	--	--	0
INDIAN LUST R2		0.500	0	0	0	--	--	0
INDIAN LUST R4		0.500	0	0	0	--	--	0
INDIAN LUST R5		0.500	0	0	0	--	--	0
INDIAN LUST R6		0.500	0	0	0	--	--	0
INDIAN LUST R7		0.500	0	0	0	--	--	0
INDIAN LUST R8		0.500	0	0	0	--	--	0
INDIAN LUST R9		0.500	0	0	0	--	--	0
LAST - PA		0.500	0	0	0	--	--	0
LUST - PA		0.500	0	0	0	--	--	0
URLT - PA		0.500	0	0	0	--	--	0
STATE BROWNFIELD LIST								
TRIBAL BROWNFIELDS		0.500	0	0	0	--	--	0
BROWNFIELDS - PA		0.500	0	0	0	--	--	0
HIST BROWNFIELDS - PA		0.500	0	0	0	--	--	0

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS								
ABANDONED LF - PA		0.500	0	1	0	--	--	1
HIST LF INVENTORY - PA		0.500	0	1	0	--	--	1
INACTIVE LF - PA		0.500	0	0	0	--	--	0
SWF/LF - PA		0.500	0	0	0	--	--	0
STATE- AND TRIBAL - EQUIVALENT CERCLIS								
HSCA - PA		1.000	0	0	0	0	--	0
HSCA REM - PA		1.000	0	0	0	0	--	0
STATE INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES								
I C - PA		0.500	0	0	0	--	--	0
STATE AND TRIBAL VOLUNTARY CLEANUP SITES								
VCP - PA		0.500	0	0	0	--	--	0
LOCAL LISTS OF LANDFILL / SOLID WASTE DISPOSAL SITES								
DEBRIS REGION 9		0.500	0	0	0	--	--	0
INDIAN ODI R8		0.500	0	0	0	--	--	0
ODI		0.500	0	0	0	--	--	0
TRIBAL ODI		0.500	0	0	0	--	--	0
LOCAL LISTS OF HAZARDOUS WASTE / CONTAMINATED SITES								
FED CDL		SP	--	--	--	--	--	0
US HIST CDL		SP	--	--	--	--	--	0
LOCAL BROWNFIELD LISTS								
FED BROWNFIELDS		0.500	0	0	0	--	--	0
RECORDS OF EMERGENCY RELEASE REPORTS								
HMIRS (DOT)		SP	--	--	--	--	--	0
SPILLS - PA		0.125	0	--	--	--	--	0
LOCAL LAND RECORDS								
LIENS 2		SP	--	--	--	--	--	0
OTHER ASCERTAINABLE RECORDS								
AFS		SP	--	--	--	--	--	0
BRS		SP	--	--	--	--	--	0
CDC HAZDAT		1.000	0	0	0	0	--	0
COAL ASH DOE		0.500	0	0	0	--	--	0
COAL ASH EPA		0.500	0	0	0	--	--	0

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
OTHER ASCERTAINABLE RECORDS *(cont.)*								
COAL GAS		1.000	0	0	0	0	--	0
CONSENT (DECREES)		1.000	0	0	0	0	--	0
CORRECTIVE ACTIONS_2020		0.500	0	0	0	--	--	0
DIGITAL OBSTACLE		1.000	0	0	0	0	--	0
DOD		1.000	0	0	0	0	--	0
DOT OPS		SP	--	--	--	--	--	0
ECHO		SP	--	--	--	--	--	0
ENOI		SP	--	--	--	--	--	0
EPA FUELS		SP	--	--	--	--	--	0
EPA OSC		0.125	0	--	--	--	--	0
EPA WATCH		SP	--	--	--	--	--	0
FA HWF		SP	--	--	--	--	--	0
FEDLAND		1.000	0	0	0	0	--	0
FRS		SP	--	--	--	--	--	0
FTTS		SP	--	--	--	--	--	0
FTTS INSP		SP	--	--	--	--	--	0
FUDS		1.000	0	0	0	0	--	0
HIST AFS		SP	--	--	--	--	--	0
HWC DOCKET		SP	--	--	--	--	--	0
ICIS		SP	--	--	--	--	--	0
INDIAN RESERVATION		1.000	0	0	0	0	--	0
LEAD_SMELTER		SP	--	--	--	--	--	0
LUCIS		0.500	0	0	0	--	--	0
LUCIS 2		0.500	0	0	0	--	--	0
MINES		0.250	0	0	--	--	--	0
MLTS		SP	--	--	--	--	--	0
NPL AOC		1.000	0	0	0	0	--	0
NPL LIENS		SP	--	--	--	--	--	0
OSHA		SP	--	--	--	--	--	0
PADS		SP	--	--	--	--	--	0
PCB TRANSFORMER		SP	--	--	--	--	--	0
RAATS		SP	--	--	--	--	--	0
RADINFO		SP	--	--	--	--	--	0
RMP		0.500	0	0	0	--	--	0
ROD		1.000	0	0	0	0	--	0
SCRD DRYCLEANERS		0.250	0	0	--	--	--	0

DATABASE	SUBJECT PROPERTY	SEARCH DISTANCE (MILES)	<1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	>1	TOTAL MAPPED
OTHER ASCERTAINABLE RECORDS *(cont.)*								
SEMS_SMELTER		SP	--	--	--	--	--	0
SSTS		SP	--	--	--	--	--	0
TOSCA-CHEMICAL		SP	--	--	--	--	--	0
TOSCA-PLANT		SP	--	--	--	--	--	0
TRIS		SP	--	--	--	--	--	0
UMTRA		0.500	0	0	0	--	--	0
ACT 2 DEED - PA		0.500	0	0	0	--	--	0
AIRS - PA		SP	--	--	--	--	--	0
ARCT - PA		0.250	0	0	--	--	--	0
AUL - PA		0.500	0	0	0	--	--	0
DRYCLEANERS - PA		0.250	0	0	--	--	--	0
EFACTS - PA		0.500	0	1	0	--	--	1
EFACTS ENV REMEDIATION - PA		0.500	0	0	0	--	--	0
EMI - PA		SP	--	--	--	--	--	0
MANIFEST - PA		0.250	0	0	--	--	--	0
UIC - PA		SP	--	--	--	--	--	0

Map Id: A1
Direction: ENE
Distance: 0.171 mi.
Actual: 902.337 ft.
Elevation: 0.043 mi. / 226.762 ft.
Relative: Lower

Site Name : FRANKLIN TWP DUMP
39.741666171281224,
-75.8401674750721
PA

Database(s) : [HIST LF INVENTORY - PA]

Envirosite ID: 398193880
EPA ID: N/R

HIST LF INVENTORY - PA

Site ID :	616602.0
Site Name :	FRANKLIN TWP DUMP
Organization :	FRANKLIN TWP DUMP
Site Status :	ABANDONED
Client ID :	999999.0
Client Name :	FRANKLIN TWP DUMP
Client Relationship :	N/A
Primary Facility ID :	637749.0
Primary Facility Name :	FRANKLIN TWP. DUMP
Primary Facility Status :	INACTIVE
Primary Facility Type :	MUNICIPAL WASTE OPERATION
Primary Facility Kind :	Unavailable
Sub Facility ID :	771479.0
Sub Other Facility ID :	1-131
Sub Facility Name :	FRANKLIN TWP. DUMP
Sub Facility Status :	ABANDONED
Sub Facility Type :	LANDFILL - ABANDONED
Other Facility ID :	1-131
Compliance :	YES

Map Id: A2
Direction: ENE
Distance: 0.171 mi.
Actual: 903.116 ft.
Elevation: 0.043 mi. / 226.762 ft.
Relative: Lower

Site Name : FRANKLIN TWP. DUMP
N/R
PA

Database(s) : [EFACTS - PA]

Envirosite ID: 321915140
EPA ID: N/R

EFACTS - PA

Facility ID :	637749
Status :	Inactive
DER Code :	132
Municipality :	Franklin Township
Program :	Waste Management

Sub-Facility Details

Sub Facility Name :	N/R
Status :	N/R
Type :	N/R
Other ID :	N/R

Permit Details

Date Received :	N/R
Permit Number :	N/R
Status :	N/R
Authorization :	N/R

Map Id: A2
Direction: ENE
Distance: 0.171 mi.
Actual: 903.116 ft.
Elevation: 0.043 mi. / 226.762 ft.
Relative: Lower

Site Name : FRANKLIN TWP. DUMP
N/R
PA

Database(s) : [EFACTS - PA] ***(cont.)***

Envirosite ID: 321915140
EPA ID: N/R

EFACTS - PA ***(cont.)***

Authorization Details

Date Received :	N/R
Authorization ID :	N/R
Permit Number :	N/R
Status :	N/R
Authorization Status :	N/R
Site :	N/R
Client :	N/R
Authorization Type :	N/R
Application Type :	N/R
Authorization is for :	N/R
Permit Decision Guarantee :	N/R
Elapsed Business Days :	N/R

Authorization Sub Facilities

Sub-Facility ID :	N/R
Sub-Facility Name :	N/R
Description :	N/R

Permit Review Standard Task Information

Start Date :	N/R
Target Date :	N/R
Completion Date :	N/R
Task :	N/R

Permit Review Notes

Date :	N/R
Review Note :	N/R

Inspection Details

Inspection Date :	N/R
Inspection Type :	N/R
Result :	N/R

Air Emission Details

Year :	N/R
Emission Amount (tons/year) :	N/R
Analyte :	N/R

Map Id: A3
Direction: ENE
Distance: 0.171 mi.
Actual: 903.116 ft.
Elevation: 0.043 mi. / 226.762 ft.
Relative: Lower

Site Name : FRANKLIN TWP. DUMP
N/R
PA

Database(s) : [ABANDONED LF - PA]

Envirosite ID: 360500595
EPA ID: N/R

ABANDONED LF - PA

Facility Name :	FRANKLIN TWP. DUMP
Facility Address :	N/R
County :	N/R
Primary Facility ID :	637749
Primary Facility Status Code ID :	N/R
Primary Facility Status Code :	N/R
Primary Facility Type ID :	N/R
Primary Facility Type :	N/R
County ID :	Chester
Site ID :	616602
Site Name :	FRANKLIN TWP DUMP
Primary Facility Type Code :	MWO
Primary Facility Status :	Inactive
Sub Facility ID :	771479
Sub Facility Other ID :	1-131
Sub Facility Name :	FRANKLIN TWP. DUMP
Sub Facility Type :	N/R
Sub Facility Type ID :	N/R
Sub Facility Type Code :	MWLF
Sub Facility Status :	Abandoned
Sub Facility Status Code ID :	1-131
Date of Closure :	N/R
Attribute Description :	N/R
Average Daily Volume :	N/R
Maximum Daily Volume :	N/R
Permitted Acres :	N/R
Municipality ID :	N/R
Municipality Name :	Franklin Twp
Latitude :	39.741674
Longitude :	-75.840169
Last Date in Agency List :	02/16/2018

ENVIROSITE ID	NAME	ADDRESS	CITY	ZIP	DATABASE(S)
333967915	BELLA MUSHROOM FARMS	RR 1 BOX 165B	LANDENBERG	19350	EFACTS ENV Remediat...
333979956	CHESTER HILLS FARM	WICKERTON RD	LANDENBERG	19350	EFACTS ENV Remediat...
333985364	CURTIS GREER FARM	PENN GREEN RD	LANDENBERG	19350	EFACTS ENV Remediat...
337158209	CVS PHARMACY 7183	730 NEWARK RD	LANDENBERG	19350	BRS, RCRA_LQG
27229570	EASTERN SHORE NATURAL GAS ...	LONDONDERRY TWP			EFACTS - PA, FRS
340646551	ESNG PIPELINE SEGMENTS 1 AN...	HIGHLAND TWP			EFACTS - PA
342441041	FISHER'S SANITARY SERVICE	RR 1	KUTZTOWN	19350	EFACTS - PA
354023603	GIOFFREDI MUSHROOMS INC	PENN GREEN RD	LANDENBURG	19350	EFACTS ENV Remediat...
354025645	LANDENBURG	1/4 MI S OF NEWARK & SUNNY DELL	LANDENBURG	19350	EFACTS ENV Remediat...
340698288	LAWRENCE FARM	RR 1 BOX 185	LANDENBERG	19350	EFACTS - PA
334019343	LEONE PIZZINI & SON	RR 1 BOX 96	LANDENBERG	19350	EFACTS ENV Remediat...
340709978	LOT B5 - NICHOLS SUBD	WALKER RD	LANDENBERG	19350	EFACTS - PA
340681149	MACKIE PROPERTY DEV	PEACEDALE RD	LANDENBERG	19350	EFACTS - PA
333994553	MANFREDINI MUSHROOM FARM	PENN GREEN RD	LANDENBERG	19350	EFACTS ENV Remediat...
340752986	SARANA PROPERTY	PA SR 841	LANDENBERG	19350	EFACTS - PA
340718950	SCHADD POND PESTICIDES	107 LAVENDER LANE	LANDENBERG	19350	EFACTS - PA
351351355	TURKEY HILL 168	735 NEWARK RD	LANDENBERG	19350	EFACTS ENV Remediat...
14510083	TUTTLE & MANET	399C FLEETWOOD RD	COATESVILLE	19350	RCRA_NONGEN
334035376	US POSTAL SVC	PENN GREEN RD	LANDENBERG	19350	EFACTS ENV Remediat...

FEDERAL RCRA NON-CORRACTS TSD FACILITIES LIST

ARCHIVED RCRA TSDF: Resource Conservation and Recovery Act hazardous waste transportation storage disposal and treatment facilities

Agency Version Date: 03/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 05/25/2018

RCRA_TSDF: Resource Conservation and Recovery Act hazardous waste transportation storage disposal and treatment facilities

Agency Version Date: 03/16/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 05/25/2018

FEDERAL CERCLIS LIST

CERCLIS NFRAP: The CERCLIS sites with No Further Remedial Action Planned from the CERCLIS program database. The Environmental Protection Agency decommissioned the CERCLIS data in 2014. The last update was November 12, 2013.

Agency Version Date: 10/25/2013
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 06/25/2018

CERCLIS-HIST: The CERCLIS program database contains information on the assessment and remediation of federal hazardous waste sites. The Environmental Protection Agency decommissioned the CERCLIS data in 2014. The last update was November 12, 2013.

Agency Version Date: 11/05/2016
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 06/25/2018

FEDERAL FACILITY: Sites where Federal Facilities Restoration and Reuse Office (FFRRO) arranged cleanup for Base Closure and Property Transfer at Federal Facilities

Agency Version Date: 01/02/2018
Agency Update Frequency: Varies
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8712
Most Recent Contact: 06/25/2018

SEMS_8R_ACTIVE SITES: The Active Site Inventory Report displays site and location information at active SEMS sites. An active site is one at which site assessment, removal, remedial, enforcement, cost recovery, or oversight activities are being planned or conducted. NPL sites include latitude and longitude information. For non-NPL sites, a brief site status is provided.

Agency Version Date: 12/11/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

SEMS_8R_ARCHIVED SITES: The Archived Site Inventory displays site and location information at sites archived from SEMS. An archived site is one at which EPA has determined that assessment has been completed and no further remedial action is planned under the Superfund program at this time.

Agency Version Date: 12/11/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

FEDERAL RCRA CORRACTS FACILITIES LIST

CORRACTS: List of facilities where Resource Conservation and Recovery Act Corrective Action Program used to investigate and remediate hazardous releases

Agency Version Date: 03/16/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-1667
Most Recent Contact: 05/25/2018

FEDERAL DELISTED NPL SITE LIST

DELISTED NPL: National Priority List of sites that were delisted and no longer require action

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

DELISTED PROPOSED NPL: Sites that have been delisted from the proposed National Priority List

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

SEMS_DELETED NPL: All Deleted National Priority List Sties

Agency Version Date: 12/11/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

FEDERAL ERNS LIST

ERNS: Emergency Response Notification System records of reported spills

Agency Version Date: 04/18/2018
Agency Update Frequency: Annually
Planned Next Contact: 09/05/2018
Agency: National Response Center United States Coast Guard
Agency Contact: N/R
Most Recent Contact: 06/27/2018

FEDERAL INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES

Fed E C: Federal listing of remediation sites with engineering controls

Agency Version Date: 02/21/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/11/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 05/02/2018

Fed I C: Federal listing of remediation sites with institutional controls

Agency Version Date: 02/21/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/11/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 05/02/2018

RCRA IC_EC: Sites with institutional or engineering controls related to Resource Conservation and Recovery Act

Agency Version Date: 03/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 05/25/2018

E C - PA: Sites with Engineering Controls

Agency Version Date: 12/01/2017
Agency Update Frequency: No update
Planned Next Contact: 06/29/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 04/20/2018

FEDERAL NPL SITE LIST

NPL: List of priority contaminated sites among identified releases or threatened releases of hazardous substances pollutants or contaminants nationally

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

NPL EPA R1 GIS: Geospatial data for the Environmental Protection Agency Region 1 National Priority List subject to environmental regulation

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/25/2018

NPL EPA R3 GIS: Geospatial data for the Environmental Protection Agency Region 3 National Priority List subject to environmental regulation

Agency Version Date: 04/09/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/14/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/05/2018

NPL EPA R6 GIS: Geospatial data for the Environmental Protection Agency Region 6 National Priority List subject to environmental regulation

Agency Version Date: 01/18/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/25/2018

NPL EPA R8 GIS: Geospatial data for the Environmental Protection Agency Region 8 National Priority List subject to environmental regulation

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/25/2018

NPL EPA R9 GIS: Geospatial data for the Environmental Protection Agency Region 9 National Priority List subject to environmental regulation

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-2132
Most Recent Contact: 06/25/2018

PART NPL: Sites that are a part of an National Priority List site referred to as the parent site

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

PROPOSED NPL: Sites that have been proposed for the National Priority List

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

SEMS_FINAL NPL: All Included National Priority List Sites

Agency Version Date: 10/10/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

FEDERAL NPL SITE LIST (cont.)

SEMS_PROPOSED NPL: All Proposed National Priority List Sites

Agency Version Date: 12/11/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

FEDERAL RCRA GENERATORS LIST

RCRA_CESQG: Resource Conservation and Recovery Act listing of licensed conditionally exempt small quantity generators

Agency Version Date: 03/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 05/25/2018

RCRA_FULL_DETAIL: Full detail of related sites to the Resource Conservation and Recovery Act

Agency Version Date: 03/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 05/25/2018

RCRA_LQG: Resource Conservation and Recovery Act listing of licensed large quantity generators

Agency Version Date: 03/16/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 05/25/2018

RCRA_NONGEN: Resource Conservation and Recovery Act listing of licensed non-generators

Agency Version Date: 03/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 05/25/2018

RCRA_SQG: Resource Conservation and Recovery Act listing of licensed small quantity generators

Agency Version Date: 03/16/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 215-814-2469
Most Recent Contact: 05/25/2018

STATE AND TRIBAL REGISTERED STORAGE TANK LISTS

FEMA UST: FEMA underground storage tank listing

Agency Version Date: 12/14/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/24/2018
Agency: FEMA
Agency Contact: 202-212-5283
Most Recent Contact: 04/27/2018

INDIAN UST R1: Underground Storage Tanks on Indian Land in EPA Region 1

Agency Version Date: 10/14/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/21/2018
Agency: U.S. Environmental Protection Agency Region 1
Agency Contact: 855-246-3642
Most Recent Contact: 06/12/2018

INDIAN UST R10: Underground Storage Tanks on Indian Land in EPA Region 10

Agency Version Date: 10/24/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/09/2018
Agency: U.S. Environmental Protection Agency Region 10
Agency Contact: 855-246-3642
Most Recent Contact: 04/30/2018

STATE AND TRIBAL REGISTERED STORAGE TANK LISTS (cont.)

INDIAN UST R2: Underground Storage Tanks on Indian Land in EPA Region 2

Agency Version Date: 12/07/2016
Agency Update Frequency: Quarterly
Planned Next Contact: 08/27/2018
Agency: U.S. Environmental Protection Agency Region 2
Agency Contact: 855-246-3642
Most Recent Contact: 06/18/2018

INDIAN UST R4: Underground Storage Tanks on Indian Land in EPA Region 4

Agency Version Date: 10/14/2017
Agency Update Frequency: Semi Annually
Planned Next Contact: 07/09/2018
Agency: U.S. Environmental Protection Agency Region 4
Agency Contact: 855-246-3642
Most Recent Contact: 04/30/2018

INDIAN UST R5: Underground Storage Tanks on Indian Land in EPA Region 5

Agency Version Date: 10/16/2017
Agency Update Frequency: Varies
Planned Next Contact: 09/06/2018
Agency: U.S. Environmental Protection Agency Region 5
Agency Contact: 855-246-3642
Most Recent Contact: 06/28/2018

INDIAN UST R6: Underground Storage Tanks on Indian Land in EPA Region 6

Agency Version Date: 10/06/2017
Agency Update Frequency: Semi Annually
Planned Next Contact: 07/12/2018
Agency: U.S. Environmental Protection Agency Region 6
Agency Contact: 855-246-3642
Most Recent Contact: 05/03/2018

INDIAN UST R7: Underground Storage Tanks on Indian Land in EPA Region 7

Agency Version Date: 10/12/2017
Agency Update Frequency: Varies
Planned Next Contact: 09/06/2018
Agency: U.S. Environmental Protection Agency Region 7
Agency Contact: 855-246-3642
Most Recent Contact: 06/28/2018

INDIAN UST R8: Underground Storage Tanks on Indian Land in EPA Region 8

Agency Version Date: 04/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/20/2018
Agency: U.S. Environmental Protection Agency Region 8
Agency Contact: 855-246-3642
Most Recent Contact: 06/11/2018

INDIAN UST R9: Underground Storage Tanks on Indian Land in EPA Region 9

Agency Version Date: 01/22/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/20/2018
Agency: U.S. Environmental Protection Agency Region 9
Agency Contact: 855-246-3642
Most Recent Contact: 06/11/2018

AST - PA: Registered Aboveground Storage Tanks

Agency Version Date: 04/10/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/28/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 772-5599
Most Recent Contact: 06/19/2018

UST - PA: Registered Underground Storage Tanks

Agency Version Date: 04/10/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/28/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 772-5599
Most Recent Contact: 06/19/2018

STATE AND TRIBAL LEAKING STORAGE TANK LISTS

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land in EPA Region 1

Agency Version Date: 10/14/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/21/2018
Agency: U.S. Environmental Protection Agency Region 1
Agency Contact: 855-246-3642
Most Recent Contact: 06/12/2018

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land in EPA Region 10

Agency Version Date: 10/24/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/09/2018
Agency: U.S. Environmental Protection Agency Region 10
Agency Contact: 855-246-3642
Most Recent Contact: 04/30/2018

INDIAN LUST R2: Leaking Underground Storage Tanks on Indian Land in EPA Region 2

Agency Version Date: 12/07/2016
Agency Update Frequency: Quarterly
Planned Next Contact: 08/27/2018
Agency: U.S. Environmental Protection Agency Region 2
Agency Contact: 855-246-3642
Most Recent Contact: 06/18/2018

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land in EPA Region 4

Agency Version Date: 10/14/2017
Agency Update Frequency: Semi Annually
Planned Next Contact: 07/09/2018
Agency: U.S. Environmental Protection Agency Region 4
Agency Contact: 855-246-3642
Most Recent Contact: 04/30/2018

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land in EPA Region 5

Agency Version Date: 10/16/2017
Agency Update Frequency: Varies
Planned Next Contact: 09/06/2018
Agency: U.S. Environmental Protection Agency Region 5
Agency Contact: 855-246-3642
Most Recent Contact: 06/28/2018

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land in EPA Region 6

Agency Version Date: 10/06/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/02/2018
Agency: U.S. Environmental Protection Agency Region 6
Agency Contact: 855-246-3642
Most Recent Contact: 04/23/2018

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land in EPA Region 7

Agency Version Date: 09/21/2017
Agency Update Frequency: Varies
Planned Next Contact: 09/06/2018
Agency: U.S. Environmental Protection Agency Region 7
Agency Contact: 855-246-3642
Most Recent Contact: 06/28/2018

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land in EPA Region 8

Agency Version Date: 10/12/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 06/29/2018
Agency: U.S. Environmental Protection Agency Region 8
Agency Contact: 855-246-3642
Most Recent Contact: 04/20/2018

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land in EPA Region 9

Agency Version Date: 04/10/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/20/2018
Agency: U.S. Environmental Protection Agency Region 9
Agency Contact: 855-246-3642
Most Recent Contact: 06/11/2018

LAST - PA: Leaking Aboveground Storage Tanks

Agency Version Date: 04/10/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/28/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 06/19/2018

STATE AND TRIBAL LEAKING STORAGE TANK LISTS (cont.)

LUST - PA: Leaking Underground Storage Tanks

Agency Version Date: 04/10/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/28/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 06/19/2018

URLT - PA: Unregulated Tanks with leaks

Agency Version Date: 04/10/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/28/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 06/19/2018

STATE BROWNFIELD LIST

TRIBAL BROWNFIELDS: Tribal brownfield remediation site listing

Agency Version Date: 02/10/2014
Agency Update Frequency: Quarterly
Planned Next Contact: 09/21/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 855-246-3642
Most Recent Contact: 06/25/2018

BROWNFIELDS - PA: Locations determined to be Brownfield Sites

Agency Version Date: 02/23/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/13/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 05/04/2018

HIST BROWNFIELDS - PA: List of locations determined to be Brownfield Sites that are no longer in current agency list.

Agency Version Date: 10/06/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/13/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 05/04/2018

STATE AND TRIBAL LANDFILL AND/OR SOLID WASTE DISPOSAL SITE LISTS

ABANDONED LF - PA: Landfills that have been abandoned listed in the Abandoned Landfill Inventory

Agency Version Date: 02/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/06/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 787-7381
Most Recent Contact: 04/27/2018

HIST LF INVENTORY - PA: Listing of Historical landfills

Agency Version Date: 06/07/2018
Agency Update Frequency: No update
Planned Next Contact: 08/16/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 787-7381
Most Recent Contact: 06/07/2018

INACTIVE LF - PA: Inactive Landfills

Agency Version Date: 02/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/06/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 787-7381
Most Recent Contact: 04/27/2018

SWF/LF - PA: State Landfill Sites

Agency Version Date: 02/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/06/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 787-7381
Most Recent Contact: 04/27/2018

STATE- AND TRIBAL - EQUIVALENT CERCLIS

HSCA - PA: Sites listed in the Hazardous Site Cleanup

Agency Version Date: 04/10/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/28/2018
Agency: Department of Environmental Protection
Agency Contact: N/R
Most Recent Contact: 06/19/2018

HSCA REM - PA: Sites under the HSCA that are designated as Remedial Response

Agency Version Date: 04/10/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/28/2018
Agency: Department of Environmental Protection
Agency Contact: N/R
Most Recent Contact: 06/19/2018

STATE INSTITUTIONAL CONTROLS / ENGINEERING CONTROLS REGISTRIES

I C - PA: Sites with Institutional Controls

Agency Version Date: 12/01/2017
Agency Update Frequency: No update
Planned Next Contact: 06/29/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 04/20/2018

STATE AND TRIBAL VOLUNTARY CLEANUP SITES

VCP - PA: Voluntary Cleanup Program Sites

Agency Version Date: 03/28/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/15/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 06/06/2018

LOCAL LISTS OF LANDFILL / SOLID WASTE DISPOSAL SITES

DEBRIS REGION 9: Torres Martinez Reservation illegal dump site listing

Agency Version Date: 03/29/2017
Agency Update Frequency: Varies
Planned Next Contact: 08/21/2018
Agency: U.S. Environmental Protection Agency Region 9
Agency Contact: 855-246-3642
Most Recent Contact: 05/23/2018

INDIAN ODI R8: Region 8 Indian land open dump inventory sites mainted within the STARS program

Agency Version Date: 04/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 09/03/2018
Agency: Indian Health Service
Agency Contact: 855-246-3642
Most Recent Contact: 06/25/2018

ODI: Open dump inventory sites

Agency Version Date: 10/03/2017
Agency Update Frequency: No Update
Planned Next Contact: 07/10/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 855-246-3642
Most Recent Contact: 05/01/2018

TRIBAL ODI: Indian land open dump inventory for all regions

Agency Version Date: 02/22/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/12/2018
Agency: Indian Health Service
Agency Contact: 301-443-3593
Most Recent Contact: 05/03/2018

LOCAL LISTS OF HAZARDOUS WASTE / CONTAMINATED SITES

FED CDL: The U.S. Department of Justice listing of clandestine drug lab locations

Agency Version Date: 04/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/20/2018
Agency: U.S. Department of Justice
Agency Contact: 202-307-7610
Most Recent Contact: 06/11/2018

US HIST CDL: The U.S. Department of Justice historical listing of clandestine drug lab locations

Agency Version Date: 04/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 08/20/2018
Agency: U.S. Department of Justice
Agency Contact: 202-307-7610
Most Recent Contact: 06/11/2018

LOCAL BROWNFIELD LISTS

Fed Brownfields: Federal brownfield remediation sites

Agency Version Date: 04/10/2018
Agency Update Frequency: Semi Annually
Planned Next Contact: 08/28/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 855-246-3642
Most Recent Contact: 06/19/2018

RECORDS OF EMERGENCY RELEASE REPORTS

HMIRS (DOT): Hazardous Material spills reported by the Department of Transportation

Agency Version Date: 03/07/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/25/2018
Agency: U.S. Department of Transportation
Agency Contact: (202) 366-4996
Most Recent Contact: 05/16/2018

SPILLS - PA: Listing of Hazardous Material spills/releases reported in the Hazardous Material Logbook

Agency Version Date: 04/10/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/28/2018
Agency: Department of Environmental Protection
Agency Contact: N/R
Most Recent Contact: 06/19/2018

LOCAL LAND RECORDS

LIENS 2: Comprehensive Environmental Response Compensation and Liability Act sites with liens

Agency Version Date: 05/11/2017
Agency Update Frequency: No Longer Maintained
Planned Next Contact: 09/10/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 800-424-9346
Most Recent Contact: 03/12/2018

OTHER ASCERTAINABLE RECORDS

AFS: Air Facility Systems Quarterly Extract

Agency Version Date: 02/09/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 06/29/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 04/20/2018

BRS: Reporting of hazardous waste generation and management from large quantity generators

Agency Version Date: 03/16/2018
Agency Update Frequency: Biennial
Planned Next Contact: 08/03/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/25/2018

OTHER ASCERTAINABLE RECORDS (cont.)

CDC HAZDAT: The Agency for Toxic Substances and Disease Registry's Hazardous Substance Release/Health Effects Database.

Agency Version Date: 06/28/2014
Agency Update Frequency: Varies
Planned Next Contact: 09/03/2018
Agency: Agency for Toxic Substances and Disease Registry
Agency Contact: 770-488-6399
Most Recent Contact: 06/25/2018

COAL ASH DOE: List of existing and planned generators with 1 megawatt or greater of combined capacity that are utilizing coal ash impoundments.

Agency Version Date: 03/08/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/26/2018
Agency: Department of Energy
Agency Contact: (202) 586-8800
Most Recent Contact: 05/17/2018

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

Agency Version Date: 07/31/2014
Agency Update Frequency: Varies
Planned Next Contact: 07/02/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 04/23/2018

COAL GAS: Manufactured Gas Plant locations

Agency Version Date: 05/11/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 07/13/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 855-246-3642
Most Recent Contact: 04/16/2018

CONSENT (DECREES): Legal decisions regarding responsibility for Superfund locations

Agency Version Date: 01/02/2018
Agency Update Frequency: Varies
Planned Next Contact: 09/03/2018
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 06/25/2018

Corrective Actions_2020: The RCRA cleanup baseline includes facilities expected to need corrective action.

Agency Version Date: 09/30/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 08/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: N/R
Most Recent Contact: 05/25/2018

DIGITAL OBSTACLE: The Digital Obstacle File describes all known obstacles of interest to aviation users in the U.S. with limited coverage of the Pacific the Caribbean Canada and Mexico. The obstacles are assigned unique numerical identifiers; accuracy codes and listed in order of ascending latitude within each state or area by FAA Region.

Agency Version Date: 02/25/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/30/2018
Agency: Federal Aviation Administration
Agency Contact: 855-379-6518
Most Recent Contact: 06/21/2018

DOD: Department of Defense sites

Agency Version Date: 03/13/2018
Agency Update Frequency: Varies
Planned Next Contact: 09/03/2018
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 06/25/2018

DOT OPS: Incident Data Report

Agency Version Date: 02/19/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/09/2018
Agency: U.S. Department of Transportation
Agency Contact: (202) 366-4996
Most Recent Contact: 04/30/2018

OTHER ASCERTAINABLE RECORDS (cont.)

ECHO: ECHO is EPA Enforcement and Compliance History Online website to search for facilities in your community to assess their compliance with environmental regulations related to CAA, CWA, RCRA, & SDWA.

Agency Version Date: 03/12/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 07/30/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 202-566-1667
Most Recent Contact: 05/21/2018

ENOI: The Electronic Notice of Intent (eNOI) database contains construction sites and industrial facilities that submit permit requests to EPA for Construction General Permits (CGP) and Multi-Sector General Permits (MSGP).

Agency Version Date: 02/23/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 07/13/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/04/2018

EPA FUELS: List of companies and facilities registered to participate in EPA Fuel Programs under Title 40 CFR Part 80.

Agency Version Date: 04/20/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 06/29/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: (202) 564-2307
Most Recent Contact: 04/20/2018

EPA OSC: Listing of oil spills and hazardous substance release sites requiring EPA On-Site Coordinators.

Agency Version Date: 03/07/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 07/25/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: (202) 564-2307
Most Recent Contact: 05/16/2018

EPA WATCH: The EPA Watch List was used to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. EPA maintained the lists from 2011 - 2013.

Agency Version Date: 02/09/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 06/29/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: (202) 564-2307
Most Recent Contact: 04/20/2018

FA HWF: Hazardous Waste Facilities with Financial Assurance

Agency Version Date: 03/27/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/14/2018
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 06/04/2018

FEDLAND: Federal land locations

Agency Version Date: 03/12/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/30/2018
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 05/21/2018

FRS: Facility Registry Systems

Agency Version Date: 02/15/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/05/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 04/26/2018

FTTS: Tracking of administrative and enforcement activities related to FIFRA/TSCA

Agency Version Date: 04/16/2013
Agency Update Frequency: Varies
Planned Next Contact: 07/09/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 564-2280
Most Recent Contact: 04/11/2018

OTHER ASCERTAINABLE RECORDS (cont.)

FTTS INSP: Tracking of inspections related to FIFRA/TSCA

Agency Version Date: 05/08/2017
Agency Update Frequency: Varies
Planned Next Contact: 07/12/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 564-2280
Most Recent Contact: 04/16/2018

FUDS: Defense sites that require cleanup

Agency Version Date: 09/30/2015
Agency Update Frequency: Varies
Planned Next Contact: 07/02/2018
Agency: US Army Corps of Engineering
Agency Contact: (202) 761-0011
Most Recent Contact: 04/23/2018

HIST AFS: List of Air Facility Systems Quarterly Extract that are no longer in current agency list.

Agency Version Date: 02/09/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 06/29/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 04/20/2018

HWC DOCKET: Listing of Federal facilities which are managing or have managed hazardous waste; or have had a release of hazardous waste.

Agency Version Date: 02/09/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 06/29/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: (202) 564-2307
Most Recent Contact: 04/20/2018

ICIS: Comprised of all Federal Administrative and Judicial enforcement information [intended to replace PCS] by tracking enforcement and compliance information (also contains what used to be known as FFTS)

Agency Version Date: 03/13/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/31/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/22/2018

INDIAN RESERVATION: Indian Reservation sites

Agency Version Date: 04/25/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/04/2018
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 04/25/2018

LEAD_SMELTER: Listing of former Lead Smelter Sites

Agency Version Date: 01/09/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/10/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/01/2018

LUCIS: Land Use Control Information Systems

Agency Version Date: 06/28/2014
Agency Update Frequency: No Longer Maintained
Planned Next Contact: 07/13/2018
Agency: Department of the Navy: BRAC PMO
Agency Contact: (619) 532-0900
Most Recent Contact: 05/04/2018

LUCIS 2: Land Use Control Information Systems

Agency Version Date: 01/17/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 07/13/2018
Agency: Department of the Navy: BRAC PMO
Agency Contact: (619) 532-0900
Most Recent Contact: 04/16/2018

OTHER ASCERTAINABLE RECORDS (cont.)

MINES: Mines Master Index Files

Agency Version Date: 03/14/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/01/2018
Agency: Department of Labor
Agency Contact: (202) 693-9400
Most Recent Contact: 05/23/2018

MLTS: Sites in possession/use of radioactive materials regulated by NRC

Agency Version Date: 04/13/2018
Agency Update Frequency: Varies
Planned Next Contact: 09/07/2018
Agency: Nuclear Regulatory Commission
Agency Contact: (800) 397-4209
Most Recent Contact: 06/11/2018

NPL AOC: Areas of Concern related to NPL remediation sites

Agency Version Date: 01/02/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: Environmental Protection Agency
Agency Contact: N/R
Most Recent Contact: 06/25/2018

NPL LIENS: National Priority List of sites with Liens

Agency Version Date: 02/19/2018
Agency Update Frequency: Varies
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

OSHA: OSHA's listing of inspections violations and fatality information

Agency Version Date: 03/13/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/31/2018
Agency: Occupational Safety & Health Administration
Agency Contact: 800-321-6742
Most Recent Contact: 05/22/2018

PADS: Listing of generators transporters commercial store/ brokers and disposers of PCB

Agency Version Date: 01/18/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/31/2018
Agency: Environmental Protection Agency
Agency Contact: (703) 308-8404
Most Recent Contact: 06/22/2018

PCB TRANSFORMER: Registry of PCB's

Agency Version Date: 01/18/2018
Agency Update Frequency: No Update
Planned Next Contact: 08/16/2018
Agency: Environmental Protection Agency
Agency Contact: (703) 308-8404
Most Recent Contact: 06/07/2018

RAATS: Listing of major violators with enforcement actions issued under RCRA. Includes administrative and civil actions filed by the EPA. This dataset is no longer maintained.

Agency Version Date: 03/16/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/03/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/25/2018

RADINFO: EPA regulated facilities with radiation and radioactive materials

Agency Version Date: 03/29/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/16/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 06/07/2018

RMP: Facilities producing/handling/ process/ distribute/ store specific chemicals report plans required by the Clean Air Act

Agency Version Date: 02/28/2018
Agency Update Frequency: Monthly
Planned Next Contact: 07/10/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 564-2534
Most Recent Contact: 04/12/2018

OTHER ASCERTAINABLE RECORDS (cont.)

ROD: Permanent remedy at an NPL site

Agency Version Date: 03/13/2018
Agency Update Frequency: Varies
Planned Next Contact: 09/03/2018
Agency: Environmental Protection Agency
Agency Contact: (800) 424-9346
Most Recent Contact: 06/25/2018

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners

Agency Version Date: 02/22/2018
Agency Update Frequency: No Update
Planned Next Contact: 07/12/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/03/2018

SEMS_SMELTER: This report includes sites that have smelting-related, or potentially smelting-related, indicators in the SEMS database. The report includes information on the site location as well as contaminants of concern.

Agency Version Date: 12/11/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 09/03/2018
Agency: U.S. Environmental Protection Agency
Agency Contact: 703-603-8867
Most Recent Contact: 06/25/2018

SSTS: Tracking of facilities who produce pesticides and their quantity

Agency Version Date: 02/28/2018
Agency Update Frequency: Annually
Planned Next Contact: 07/18/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/09/2018

TOSCA-CHEMICAL: Chemicals controlled by the Toxic Substance Control Act

Agency Version Date: 06/28/2014
Agency Update Frequency: Varies
Planned Next Contact: 07/03/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 04/24/2018

TOSCA-PLANT: Plants controlled by the Toxic Substance Control Act

Agency Version Date: 05/09/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/18/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/09/2018

TRIS: Information regarding toxic chemicals that are being used/manufactured/ treated/ transported/released into the environment

Agency Version Date: 03/12/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/30/2018
Agency: Environmental Protection Agency
Agency Contact: (202) 566-1667
Most Recent Contact: 05/21/2018

UMTRA: Uranium Recovery Sites

Agency Version Date: 01/04/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/02/2018
Agency: United States Nuclear Regulatory Commission
Agency Contact: (301) 415-8200
Most Recent Contact: 05/24/2018

ACT 2 DEED - PA: Sites listed with Deed Acknowledgment

Agency Version Date: 03/21/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/08/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 787-2043
Most Recent Contact: 05/30/2018

OTHER ASCERTAINABLE RECORDS (cont.)

AIRS - PA: Permit and Emissions Inventory

Agency Version Date: 02/20/2018
Agency Update Frequency: Annually
Planned Next Contact: 07/10/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-9241
Most Recent Contact: 05/01/2018

ARCT - PA: Aboveground Storage tanks Out of service

Agency Version Date: 04/02/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/20/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 772-5599
Most Recent Contact: 06/11/2018

AUL - PA: Sites with Activity Use Limitation

Agency Version Date: 03/09/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 07/27/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-1566
Most Recent Contact: 05/18/2018

DRYCLEANERS - PA: Dry Cleaning Facilities

Agency Version Date: 02/20/2018
Agency Update Frequency: Varies
Planned Next Contact: 07/10/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 772-9482
Most Recent Contact: 05/01/2018

EFACTS - PA: Environment Facility Application Compliance Tracking System

Agency Version Date: 12/21/2016
Agency Update Frequency: Quarterly
Planned Next Contact: 07/03/2018
Agency: PA Department of Environmental Protection
Agency Contact: N/R
Most Recent Contact: 04/24/2018

EFACTS ENV Remediation - PA: Environmental Cleanup & Brownfields records from the PA eFACTS (Environment Facility Application Compliance Tracking System).

Agency Version Date: 11/28/2017
Agency Update Frequency: Quarterly
Planned Next Contact: 09/04/2018
Agency: PA Department of Environmental Protection
Agency Contact: 360.902.1452
Most Recent Contact: 06/26/2018

EMI - PA: Listing of facilities with air emissions data

Agency Version Date: 02/20/2018
Agency Update Frequency: Quarterly
Planned Next Contact: 07/20/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 783-9241
Most Recent Contact: 04/24/2018

MANIFEST - PA: State's Hazardous Waste Manifest

Agency Version Date: 03/20/2018
Agency Update Frequency: Monthly
Planned Next Contact: 08/08/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 787-6239
Most Recent Contact: 05/30/2018

UIC - PA: Regulated Underground Injection Controlled wells

Agency Version Date: 03/22/2018
Agency Update Frequency: Varies
Planned Next Contact: 08/09/2018
Agency: Department of Environmental Protection
Agency Contact: (717) 787-2043
Most Recent Contact: 05/31/2018

SUBJECT PROPERTY ADDRESS:

Strawbridge Property
Walker Road and Mount Olivet Road
Franklin Township, PA 19350

SUBJECT PROPERTY COORDINATES:

Latitude(North):	39.736396 - 39°44'11"
Longitude(West):	-75.858168 - -75°51'29.4"
Universal Transverse Mercator:	Zone 18N
UTM X (Meters):	426465.63
UTM Y (Meters):	4398852.52

ELEVATION:

Elevation:	248.169 ft. above sea level

USGS TOPOGRAPHIC MAP:

Subject Property Map:	39075f7 NEWARK WEST, MD
Most Recent Revision:	2016
Subject Property Map:	39075f8 BAY VIEW, MD
Most Recent Revision:	2016

GEOHYDROLOGY DATA:

SUBJECT PROPERTY TOPOGRAPHY:

Topographic Gradient: South

DFIRM FLOOD ZONE:

	DFIRM Flood
Subject Property County:	Electronic Data:
CHESTER	Yes - refer to the PROPERTY PROXIMITY MAP and AREA MAP
Flood Plain Panel at Subject Property:	42029C
Additional Panels in search area:	24015C

FEMA FLOOD ZONE:

	FEMA Flood
Subject Property County:	Electronic Data:
CHESTER	Yes - refer to the PROPERTY PROXIMITY MAP and AREA MAP
Flood Plain Panel at Subject Property:	42029C0605D 42029C0585D
Additional Panels in search area:	2400190020A 42029C0445D 42029C0465D

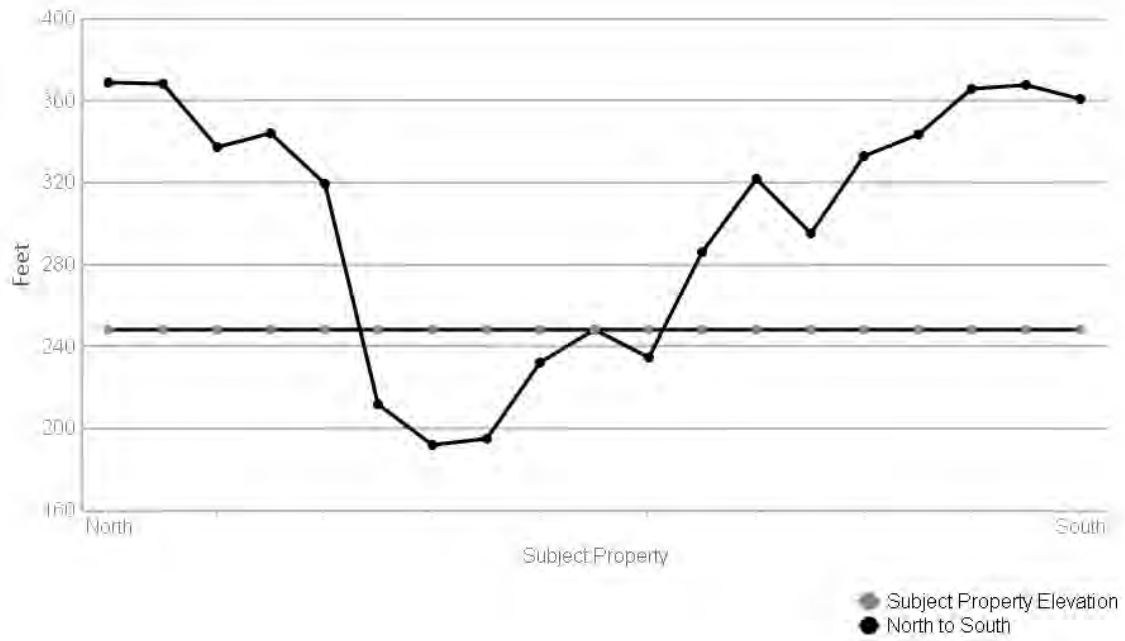
NATIONAL WETLAND INVENTORY:

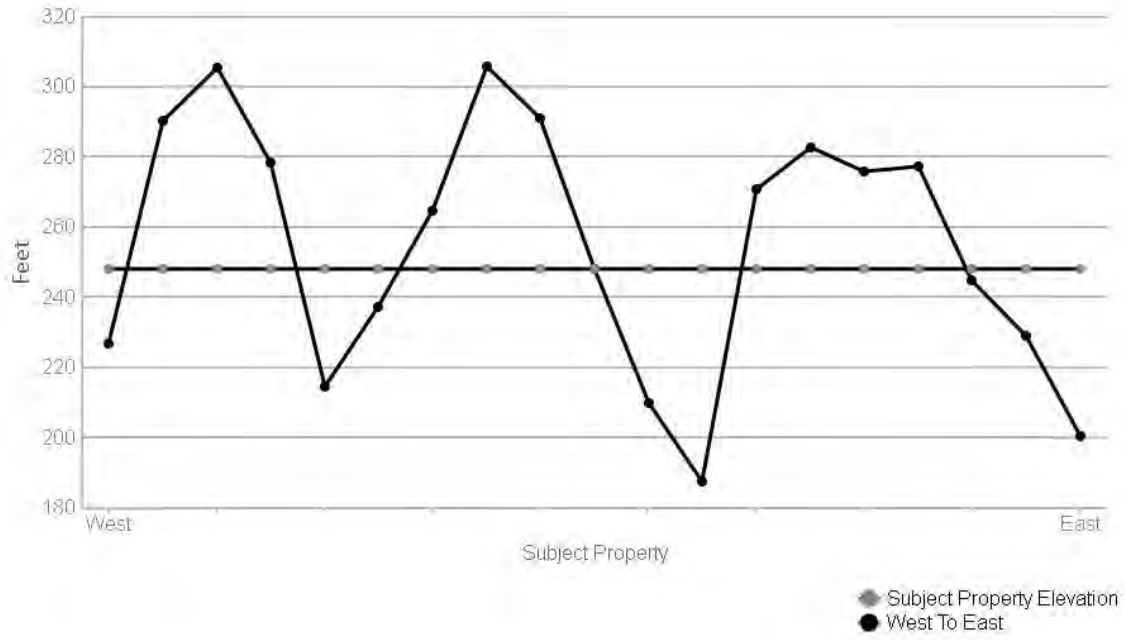
	NWI Electronic
NWI Quad at Subject Property:	Data Coverage:
NEWARK WEST	Yes - refer to the Geological Findings Map

LITHOSTRATIGRAPHIC INFORMATION:

ROCK STRATIGRAPHIC UNIT:		GEOLOGIC AGE IDENTIFICATION
Era:	No available data	Category: No available data
System:	No available data	
Series:	No available data	
Code:	No available data	

SURROUNDING ELEVATION PROFILES:





SOIL COMPOSITION IN GENERAL AREA OF SUBJECT PROPERTY:

No Available Data

WATER AGENCY DATA:

WATER AGENCY SEARCH DISTANCES:

DATABASE:	SEARCH DISTANCE (MILES):
NWIS	1.000
OIL & GAS WELLS - PA	1.000
PWS	1.000
WELLS - PA	1.000

DISTANCE TO NEAREST:	DISTANCE:
NWIS	0.000 mi / 0 ft
OIL & GAS WELLS - PA	N/A
PWS	N/A
WELLS - PA	0.000 mi / 0 ft

FEDERAL WATER AGENCY DATA SUMMARY:

MAP ID:	WELL ID:	LOCATION FROM SP:
3	01494990	< 1/8 Mile ESE
6	394430075505601	< 1/8 Mile ENE
7	394437075515001	< 1/8 Mile NW
8	394439075505601	< 1/8 Mile NE
B10	394353075504101	< 1/8 Mile ESE
B11	394355075504001	< 1/8 Mile ESE
12	394447075510701	< 1/8 Mile NNE
13	394444075512301	< 1/8 Mile NNE
14	01494980	< 1/8 Mile W
15	394338075512901	< 1/8 Mile S
A17	394449075510001	< 1/8 Mile NE
19	394444075521801	< 1/8 Mile NW
20	394358075502401	< 1/8 Mile E
21	394347075522601	< 1/8 Mile WSW
22	394411075502501	< 1/8 Mile E
23	394330075515301	< 1/8 Mile SSW
24	394445075513401	< 1/8 Mile N
25	394410075523701	< 1/8 Mile W
26	394434075503401	< 1/8 Mile ENE
31	394328075520301	1/8 - 1/4 Mile SW
C33	394353075501601	1/8 - 1/4 Mile ESE
36	394423075523701	1/8 - 1/4 Mile W
37	394448075514701	1/8 - 1/4 Mile NNW
39	394422075502001	1/8 - 1/4 Mile E
40	394456075510901	1/8 - 1/4 Mile NNE
41	394333075521101	1/8 - 1/4 Mile SW
43	394454075512601	1/8 - 1/4 Mile N
45	394430075502101	1/8 - 1/4 Mile ENE
47	394350075524601	1/8 - 1/4 Mile WSW
48	394338075521401	1/4 - 1/2 Mile SW
49	394500075510501	1/4 - 1/2 Mile NNE
50	394352075500901	1/4 - 1/2 Mile ESE
51	394332075521901	1/4 - 1/2 Mile SW
52	394431075501401	1/4 - 1/2 Mile ENE
53	394339075524601	1/4 - 1/2 Mile WSW
54	394356075500401	1/4 - 1/2 Mile E
57	394417075500601	1/4 - 1/2 Mile E
59	394459075522901	1/4 - 1/2 Mile NW
66	394452075502901	1/4 - 1/2 Mile NE

FEDERAL WATER AGENCY DATA SUMMARY: *(cont.)*

MAP ID:	WELL ID:	LOCATION FROM SP:
67	394328075523001	1/4 - 1/2 Mile SW
68	394407075500001	1/4 - 1/2 Mile E
70	394324075522801	1/2 - 1 Mile SW
71	394326075523801	1/2 - 1 Mile WSW
72	394435075500401	1/2 - 1 Mile ENE
73	394358075495401	1/2 - 1 Mile E
F74	394514075505701	1/2 - 1 Mile NNE
75	394342075530301	1/2 - 1 Mile WSW
76	394351075531001	1/2 - 1 Mile W
77	394320075523101	1/2 - 1 Mile SW
78	394515075504401	1/2 - 1 Mile NE
79	394430075530401	1/2 - 1 Mile WNW
80	394439075495701	1/2 - 1 Mile ENE
84	394327075525801	1/2 - 1 Mile WSW
G85	394452075500701	1/2 - 1 Mile ENE
96	394415075494701	1/2 - 1 Mile E
98	394314075523601	1/2 - 1 Mile SW
99	394518075521501	1/2 - 1 Mile NW
103	394509075501801	1/2 - 1 Mile NE
105	394404075494001	1/2 - 1 Mile E
111	394413075532301	1/2 - 1 Mile W
112	394447075495201	1/2 - 1 Mile ENE
116	394454075495501	1/2 - 1 Mile ENE
121	394526075503101	1/2 - 1 Mile NE
123	394433075532201	1/2 - 1 Mile WNW
125	394403075492901	1/2 - 1 Mile E
126	394503075495701	1/2 - 1 Mile ENE
I127	394451075494401	1/2 - 1 Mile ENE
130	394530075503001	1/2 - 1 Mile NE
132	394527075515601	1/2 - 1 Mile NNW
133	394512075530201	1/2 - 1 Mile WNW
134	394445075493901	1/2 - 1 Mile ENE
139	394350075492501	1/2 - 1 Mile E
140	394401075492301	1/2 - 1 Mile E
142	394531075520501	1/2 - 1 Mile NNW
K143	394502075494901	1/2 - 1 Mile ENE
144	394354075533901	1/2 - 1 Mile W
147	394426075533501	1/2 - 1 Mile W
148	394533075521201	1/2 - 1 Mile NNW
151	394526075501401	1/2 - 1 Mile NE

Note: PWS System location is not always the same as well location.

STATE/LOCAL WATER AGENCY DATA SUMMARY:

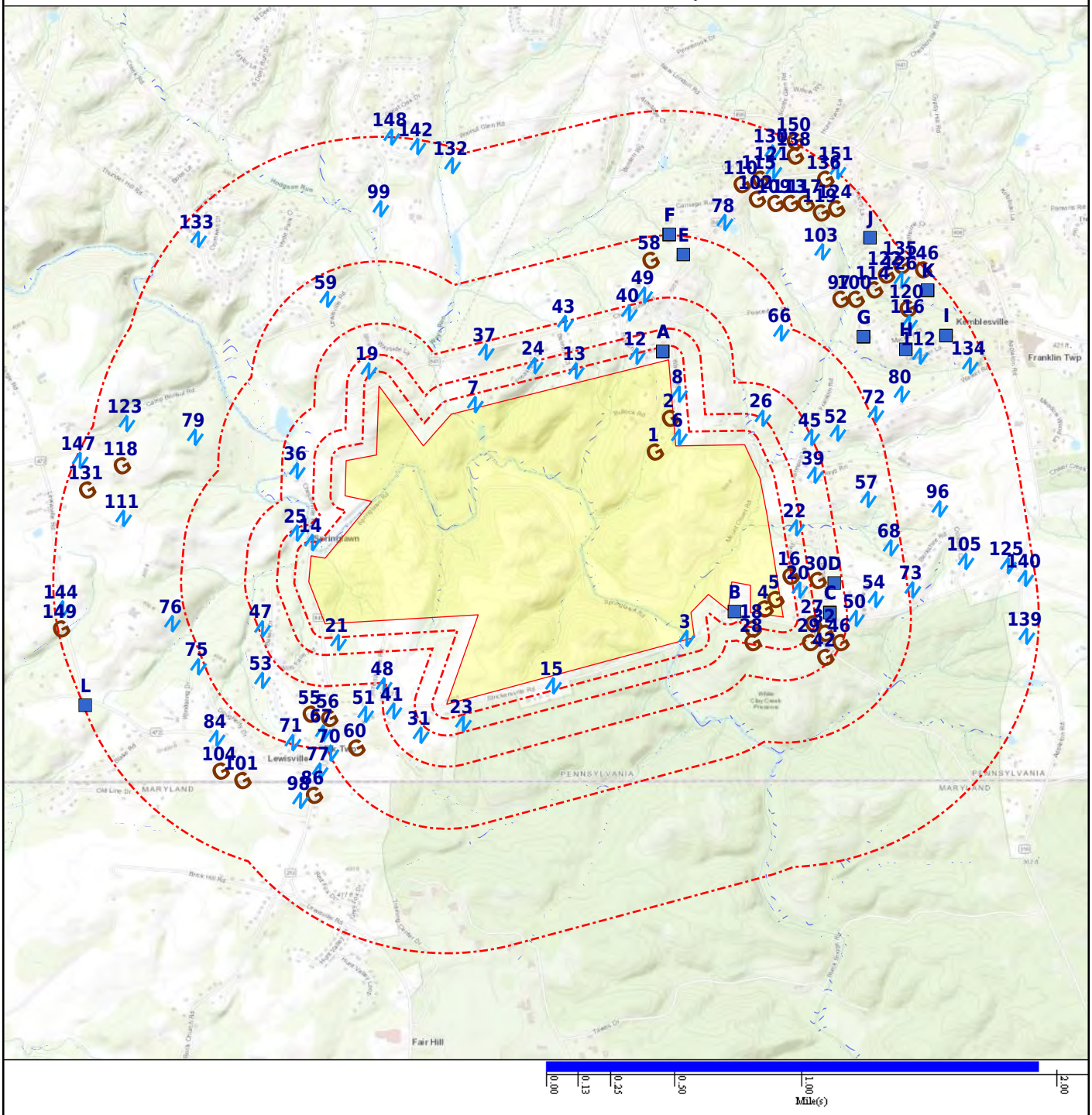
MAP ID:	WELL ID:	LOCATION FROM SP:
1	103763	< 1/8 Mile ENE
2	103654	< 1/8 Mile NE
4	103632	< 1/8 Mile ESE
5	103631	< 1/8 Mile ESE
A9	103665	< 1/8 Mile NE
16	103626	< 1/8 Mile E
18	103633	< 1/8 Mile ESE
27	103637	< 1/8 Mile ESE
28	103634	1/8 - 1/4 Mile ESE
29	103635	1/8 - 1/4 Mile ESE
30	103630	1/8 - 1/4 Mile E
32	103623	1/8 - 1/4 Mile ESE
C34	103625	1/8 - 1/4 Mile ESE
C35	103628	1/8 - 1/4 Mile ESE
D38	103629	1/8 - 1/4 Mile E
42	103627	1/8 - 1/4 Mile ESE
D44	103636	1/8 - 1/4 Mile E

STATE/LOCAL WATER AGENCY DATA SUMMARY: *(cont.)*

MAP ID:	WELL ID:	LOCATION FROM SP:
46	103624	1/8 - 1/4 Mile ESE
55	103514	1/4 - 1/2 Mile WSW
56	103579	1/4 - 1/2 Mile SW
58	103655	1/4 - 1/2 Mile NNE
60	103525	1/4 - 1/2 Mile SW
E61	103766	1/4 - 1/2 Mile NNE
E62	103764	1/4 - 1/2 Mile NNE
E63	103767	1/4 - 1/2 Mile NNE
E64	103765	1/4 - 1/2 Mile NNE
E65	103768	1/4 - 1/2 Mile NNE
F69	103656	1/4 - 1/2 Mile NNE
G81	103785	1/2 - 1 Mile ENE
G82	103784	1/2 - 1 Mile ENE
G83	103783	1/2 - 1 Mile ENE
G87	103775	1/2 - 1 Mile ENE
G88	103782	1/2 - 1 Mile ENE
G89	103781	1/2 - 1 Mile ENE
G90	103774	1/2 - 1 Mile ENE
G91	103777	1/2 - 1 Mile ENE
G92	103776	1/2 - 1 Mile ENE
G93	103780	1/2 - 1 Mile ENE
G94	103779	1/2 - 1 Mile ENE
G95	103778	1/2 - 1 Mile ENE
97	103652	1/2 - 1 Mile ENE
100	103651	1/2 - 1 Mile ENE
101	103497	1/2 - 1 Mile WSW
102	103608	1/2 - 1 Mile NE
104	103515	1/2 - 1 Mile WSW
H106	103760	1/2 - 1 Mile ENE
H107	103761	1/2 - 1 Mile ENE
H108	103762	1/2 - 1 Mile ENE
109	103607	1/2 - 1 Mile NE
110	103658	1/2 - 1 Mile NE
113	103606	1/2 - 1 Mile NE
114	103650	1/2 - 1 Mile ENE
115	103657	1/2 - 1 Mile NE
117	103605	1/2 - 1 Mile NE
118	103571	1/2 - 1 Mile W
119	103603	1/2 - 1 Mile NE
120	103649	1/2 - 1 Mile ENE
122	103647	1/2 - 1 Mile ENE
124	103602	1/2 - 1 Mile NE
I128	103668	1/2 - 1 Mile ENE
J129	103646	1/2 - 1 Mile NE
131	103577	1/2 - 1 Mile W
135	103645	1/2 - 1 Mile ENE
136	103604	1/2 - 1 Mile NE
K137	103648	1/2 - 1 Mile ENE
138	103600	1/2 - 1 Mile NE
J141	103644	1/2 - 1 Mile NE
L145	103517	1/2 - 1 Mile WSW
146	103639	1/2 - 1 Mile ENE
149	103491	1/2 - 1 Mile W
150	103599	1/2 - 1 Mile NE
L152	103510	1/2 - 1 Mile WSW

SUBJECT NAME: Strawbridge Property
ADDRESS: Walker Road and Mount Olivet Road, Franklin...
LAT/LONG: 39.736396 / -75.858168

PREPARED FOR: Ten Bears Environmental Associates Co
ORDER #: 21199
REPORT DATE: June 28, 2018



Map Id: 1
Direction: ENE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.051 mi. / 267.648 ft.
Relative: Higher

Site Name : 103763
39.74306, -75.85028
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225296
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103763
Owner :	FORD HERMAN
Yield GPM :	18
Casing Top :	0 / 55 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4009
Date Drilled :	N/R
Well Depth :	97
Static Level :	22
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	24
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.74306
Longitude :	-75.85028
Last Date in Agency List :	03/20/2018

Map Id: 2
Direction: NE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.055 mi. / 290.489 ft.
Relative: Higher

Site Name : 103654
39.745, -75.84917
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222654
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103654
Owner :	DIFFER W
Yield GPM :	15
Casing Top :	0 / 95 / 6
Licensee :	N/R
Local Well Number :	4746N
Date Drilled :	09/27/1983
Well Depth :	125
Static Level :	0
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	80
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: 2
Direction: NE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.055 mi. / 290.489 ft.
Relative: Higher

Site Name : 103654
39.745, -75.84917
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222654
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	NEWARK WEST
Latitude :	39.745
Longitude :	-75.84917
Last Date in Agency List :	03/20/2018

Map Id: 3
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.033 mi. / 174.596 ft.
Relative: Lower

Site Name : 01494990
39.73011070,-75.84799510
PA

Database(s) : [NWIS]

Envirosite ID: 394356236
EPA ID: N/R

NWIS

Site Identification Number :	01494990
Site Type :	Stream
Site Name :	Big Elk Creek near Lewisville, PA
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	275
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	N/R
Data Types :	NNNANNNNNNNNNNNNNNNNNNNNNNNNA
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	04/26/1990
Drainage Area :	41.0
Contributing Drainage Area :	41.0
Data Reliability :	N/R
Data-other GW Files :	NNNNNNNN
National Aquifer :	N/R
Local Aquifer :	N/R
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444230900
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	05/24/1973

Map Id: 3
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.033 mi. / 174.596 ft.
Relative: Lower

Site Name : 01494990
39.73011070,-75.84799510
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 394356236
EPA ID: N/R

NWIS ***(cont.)***

Water-Quality Data End Date :	09/05/2017
Water-Quality Data Count :	97
Field Water-Level Data Begin Date :	N/R
Field Water-Level Data End Date :	N/R
Field Water-Level Data Count :	0
Site-Visit Data Begin Date :	04/26/1990
Site-Visit Data End Date :	03/15/2018
Site-Visit Data Count :	192
Latitude :	39.73011070
Longitude :	-75.84799510

Map Id: 4
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.047 mi. / 248.094 ft.
Relative: Lower

Site Name : 103632
39.73389, -75.84222
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222196
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103632
Owner :	HANLEY A
Yield GPM :	7
Casing Top :	0 / 44 / 6
Licensee :	KENNETH L MADRON WELL DRILLING CO
Local Well Number :	4724N
Date Drilled :	01/01/1983
Well Depth :	290
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73389
Longitude :	-75.84222
Last Date in Agency List :	03/20/2018

Map Id: 5
Direction: ESE
Distance: 0.000 mi.
Actual: 0.000 ft.
Elevation: 0.048 mi. / 255.105 ft.
Relative: Higher

Site Name : 103631
39.73444, -75.84139
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221901
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103631
Owner :	DARHUN INC
Yield GPM :	7
Casing Top :	0 / 80 / 6
Licensee :	N/R
Local Well Number :	4723N
Date Drilled :	03/01/1979
Well Depth :	240
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	65
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73444
Longitude :	-75.84139
Last Date in Agency List :	03/20/2018

Map Id: 6
Direction: ENE
Distance: 0.007 mi.
Actual: 35.718 ft.
Elevation: 0.058 mi. / 308.543 ft.
Relative: Higher

Site Name : 394430075505601
39.74177720,-75.84855080
PA

Database(s) : [NWIS]

Envirosite ID: 395613478
EPA ID: N/R

NWIS

Site Identification Number :	394430075505601
Site Type :	Well
Site Name :	CH 6308
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	310
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 6
Direction: ENE
Distance: 0.007 mi.
Actual: 35.718 ft.
Elevation: 0.058 mi. / 308.543 ft.
Relative: Higher

Site Name : 394430075505601
39.74177720,-75.84855080
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395613478
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/12/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	192
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/12/2000
Field Water-Level Data End Date :	06/12/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74177720
Longitude :	-75.84855080

Map Id: 7
Direction: NW
Distance: 0.010 mi.
Actual: 52.775 ft.
Elevation: 0.04 mi. / 211.778 ft.
Relative: Lower

Site Name : 394437075515001
39.74372149,-75.86355140
PA

Database(s) : [NWIS]

Envirosite ID: 395001141
EPA ID: N/R

NWIS

Site Identification Number :	394437075515001
Site Type :	Well
Site Name :	CH 1792
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	278
Method Altitude Determined :	Interpolated from topographic map.

Map Id: 7
Direction: NW
Distance: 0.010 mi.
Actual: 52.775 ft.
Elevation: 0.04 mi. / 211.778 ft.
Relative: Lower

Site Name : 394437075515001
39.74372149,-75.86355140
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395001141
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy :	010
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	N/R
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	01/01/1966
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYYNNNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	N/R
Local Aquifer Type :	N/R
Well Depth :	70.0
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	N/R
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	10/01/1966
Field Water-Level Data End Date :	10/01/1966
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74372149
Longitude :	-75.86355140

Map Id: 8
Direction: NE
Distance: 0.020 mi.
Actual: 107.670 ft.
Elevation: 0.061 mi. / 320.459 ft.
Relative: Higher

Site Name : 394439075505601
39.74427717,-75.84855080
PA

Database(s) : [NWIS]

Envirosite ID: 395177699
EPA ID: N/R

NWIS

Site Identification Number :	394439075505601
Site Type :	Well
Site Name :	CH 6309
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County

Map Id: 8
Direction: NE
Distance: 0.020 mi.
Actual: 107.670 ft.
Elevation: 0.061 mi. / 320.459 ft.
Relative: Higher

Site Name : 394439075505601
39.74427717,-75.84855080
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395177699
EPA ID: N/R

NWIS ***(cont.)***

Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	317
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1987
Date Site Established or Inventoried:	08/05/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	185
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	08/05/2000
Field Water-Level Data End Date :	08/05/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74427717
Longitude :	-75.84855080

Map Id: A9
Direction: NE
Distance: 0.028 mi.
Actual: 145.556 ft.
Elevation: 0.067 mi. / 354.144 ft.
Relative: Higher

Site Name : 103665
39.74889, -75.84944
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364335237
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103665

Map Id: A9
Direction: NE
Distance: 0.028 mi.
Actual: 145.556 ft.
Elevation: 0.067 mi. / 354.144 ft.
Relative: Higher

Site Name : 103665
39.74889, -75.84944
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364335237
EPA ID: N/R

WELLS - PA ***(cont.)***

Owner :	HEINEMAN ANDREW
Yield GPM :	12
Casing Top :	0 / 48 / 6
Licensee :	N/R
Local Well Number :	4757N
Date Drilled :	05/27/1983
Well Depth :	90
Static Level :	17
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	43
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.74889
Longitude :	-75.84944
Last Date in Agency List :	03/20/2018

Map Id: B10
Direction: ESE
Distance: 0.032 mi.
Actual: 166.968 ft.
Elevation: 0.043 mi. / 225.154 ft.
Relative: Lower

Site Name : 394353075504101
39.73149960,-75.84438389
PA

Database(s) : [NWIS]

Envirosite ID: 395457228
EPA ID: N/R

NWIS

Site Identification Number :	394353075504101
Site Type :	Well
Site Name :	CH 6314
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	228
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: B10
Direction: ESE
Distance: 0.032 mi.
Actual: 166.968 ft.
Elevation: 0.043 mi. / 225.154 ft.
Relative: Lower

Site Name : 394353075504101
39.73149960,-75.84438389
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395457228
EPA ID: N/R

NWIS ***(cont.)***

Date of First Construction :	N/R
Date Site Established or Inventoried:	06/13/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	265
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/13/2000
Field Water-Level Data End Date :	06/13/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73149960
Longitude :	-75.84438389

Map Id: B11
Direction: ESE
Distance: 0.034 mi.
Actual: 178.447 ft.
Elevation: 0.042 mi. / 223.281 ft.
Relative: Lower

Site Name : 394355075504001
39.73205515,-75.84410610
PA

Database(s) : [NWIS]

Envirosite ID: 395214075
EPA ID: N/R

NWIS

Site Identification Number :	394355075504001
Site Type :	Well
Site Name :	CH 6313
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	239
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10

Map Id: B11
Direction: ESE
Distance: 0.034 mi.
Actual: 178.447 ft.
Elevation: 0.042 mi. / 223.281 ft.
Relative: Lower

Site Name : 394355075504001
39.73205515,-75.84410610
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395214075
EPA ID: N/R

NWIS ***(cont.)***

Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/24/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	160
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/24/2000
Field Water-Level Data End Date :	06/24/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73205515
Longitude :	-75.84410610

Map Id: 12
Direction: NNE
Distance: 0.037 mi.
Actual: 196.576 ft.
Elevation: 0.069 mi. / 363.442 ft.
Relative: Higher

Site Name : 394447075510701
39.74649930,-75.85160650
PA

Database(s) : [NWIS]

Envirosite ID: 395177723
EPA ID: N/R

NWIS

Site Identification Number :	394447075510701
Site Type :	Well
Site Name :	CH 6268
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA

Map Id: 12
Direction: NNE
Distance: 0.037 mi.
Actual: 196.576 ft.
Elevation: 0.069 mi. / 363.442 ft.
Relative: Higher

Site Name : 394447075510701
39.74649930,-75.85160650
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395177723
EPA ID: N/R

NWIS ***(cont.)***

Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	378
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/12/2000
Field Water-Level Data End Date :	06/12/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74649930
Longitude :	-75.85160650

Map Id: 13
Direction: NNE
Distance: 0.040 mi.
Actual: 213.670 ft.
Elevation: 0.072 mi. / 379.764 ft.
Relative: Higher

Site Name : 394444075512301
39.74566598,-75.85605110
PA

Database(s) : [NWIS]

Envirosite ID: 395465843
EPA ID: N/R

NWIS

Site Identification Number :	394444075512301
Site Type :	Well

Map Id: 13
Direction: NNE
Distance: 0.040 mi.
Actual: 213.670 ft.
Elevation: 0.072 mi. / 379.764 ft.
Relative: Higher

Site Name : 394444075512301
39.74566598,-75.85605110
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395465843
EPA ID: N/R

NWIS ***(cont.)***

Site Name :	CH 6266
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	386
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1994
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/06/2000
Field Water-Level Data End Date :	06/06/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74566598
Longitude :	-75.85605110

Map Id: 14
Direction: W
Distance: 0.045 mi.
Actual: 239.765 ft.
Elevation: 0.039 mi. / 208.458 ft.
Relative: Lower

Site Name : 01494980
39.73566597,-75.87549630
PA

Database(s) : [NWIS]

Envirosite ID: 394353254
EPA ID: N/R

NWIS

Site Identification Number :	01494980
Site Type :	Stream
Site Name :	Big Elk Creek at Lewisville, PA
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAYVIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	N/R
Method Altitude Determined :	N/R
Altitude Accuracy :	N/R
Altitude Datum :	N/R
Hydrologic Unit :	N/R
Drainage Basin :	N/R
Topographic Setting :	N/R
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNI
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	04/26/1975
Drainage Area :	31.2
Contributing Drainage Area :	N/R
Data Reliability :	N/R
Data-other GW Files :	NNNNNNNN
National Aquifer :	N/R
Local Aquifer :	N/R
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	N/R
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	N/R
Field Water-Level Data End Date :	N/R
Field Water-Level Data Count :	0
Site-Visit Data Begin Date :	07/14/1949
Site-Visit Data End Date :	09/09/1991
Site-Visit Data Count :	20
Latitude :	39.73566597
Longitude :	-75.87549630

Map Id: 15
Direction: S
Distance: 0.046 mi.
Actual: 241.745 ft.
Elevation: 0.067 mi. / 354.482 ft.
Relative: Higher

Site Name : 394338075512901
39.72733289,-75.85771778
PA

Database(s) : [NWIS]

Envirosite ID: 395050506
EPA ID: N/R

NWIS

Site Identification Number :	394338075512901
Site Type :	Well
Site Name :	CH 6315
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	371
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1988
Date Site Established or Inventoried:	06/24/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/24/2000
Field Water-Level Data End Date :	06/24/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72733289
Longitude :	-75.85771778

Map Id: 16
Direction: E
Distance: 0.048 mi.
Actual: 255.769 ft.
Elevation: 0.053 mi. / 279.469 ft.
Relative: Higher

Site Name : 103626
39.73583, -75.84028
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222182
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103626
Owner :	DARHUN INC
Yield GPM :	25
Casing Top :	0 / 150.75 / 6
Licensee :	N/R
Local Well Number :	4718N
Date Drilled :	08/01/1978
Well Depth :	198
Static Level :	33
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	130
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73583
Longitude :	-75.84028
Last Date in Agency List :	03/20/2018

Map Id: A17
Direction: NE
Distance: 0.049 mi.
Actual: 256.507 ft.
Elevation: 0.068 mi. / 358.832 ft.
Relative: Higher

Site Name : 394449075510001
39.74705490,-75.84966190
PA

Database(s) : [NWIS]

Envirosite ID: 394835995
EPA ID: N/R

NWIS

Site Identification Number :	394449075510001
Site Type :	Well
Site Name :	CH 6263
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	365
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: A17
Direction: NE
Distance: 0.049 mi.
Actual: 256.507 ft.
Elevation: 0.068 mi. / 358.832 ft.
Relative: Higher

Site Name : 394449075510001
39.74705490,-75.84966190
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 394835995
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/08/2000
Field Water-Level Data End Date :	06/08/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74705490
Longitude :	-75.84966190

Map Id: 18
Direction: ESE
Distance: 0.070 mi.
Actual: 367.054 ft.
Elevation: 0.05 mi. / 263.54 ft.
Relative: Higher

Site Name : 103633
39.73278, -75.84306
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225477
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103633
Owner :	HANLEY A
Yield GPM :	3
Casing Top :	0 / 68 / 6
Licensee :	N/R
Local Well Number :	4725N
Date Drilled :	04/01/1979
Well Depth :	220
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R

Map Id: 18
Direction: ESE
Distance: 0.070 mi.
Actual: 367.054 ft.
Elevation: 0.05 mi. / 263.54 ft.
Relative: Higher

Site Name : 103633
39.73278, -75.84306
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225477
EPA ID: N/R

WELLS - PA ***(cont.)***

WQ Data :	0
Depth to Bed :	65
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73278
Longitude :	-75.84306
Last Date in Agency List :	03/20/2018

Map Id: 19
Direction: NW
Distance: 0.070 mi.
Actual: 371.534 ft.
Elevation: 0.059 mi. / 312.041 ft.
Relative: Higher

Site Name : 394444075521801
39.74566580,-75.87132950
PA

Database(s) : [NWIS]

Envirosite ID: 395480074
EPA ID: N/R

NWIS

Site Identification Number :	394444075521801
Site Type :	Well
Site Name :	CH 6254
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	325
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1999
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	300
Hole Depth :	N/R
Source of Depth Data :	O

Map Id: 19
Direction: NW
Distance: 0.070 mi.
Actual: 371.534 ft.
Elevation: 0.059 mi. / 312.041 ft.
Relative: Higher

Site Name : 394444075521801
39.74566580,-75.87132950
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395480074
EPA ID: N/R

NWIS ***(cont.)***

Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/19/2000
Field Water-Level Data End Date :	06/19/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74566580
Longitude :	-75.87132950

Map Id: 20
Direction: E
Distance: 0.072 mi.
Actual: 381.189 ft.
Elevation: 0.055 mi. / 288.743 ft.
Relative: Higher

Site Name : 394358075502401
39.73288850,-75.83966150
PA

Database(s) : [NWIS]

Envirosite ID: 394918113
EPA ID: N/R

NWIS

Site Identification Number :	394358075502401
Site Type :	Well
Site Name :	CH 6280
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	292
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1987
Date Site Established or Inventoried:	06/24/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y

Map Id: 20
Direction: E
Distance: 0.072 mi.
Actual: 381.189 ft.
Elevation: 0.055 mi. / 288.743 ft.
Relative: Higher

Site Name : 394358075502401
39.73288850,-75.83966150
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 394918113
EPA ID: N/R

NWIS ***(cont.)***

National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	150
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/24/2000
Field Water-Level Data End Date :	06/24/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73288850
Longitude :	-75.83966150

Map Id: 21
Direction: WSW
Distance: 0.087 mi.
Actual: 456.925 ft.
Elevation: 0.065 mi. / 342.087 ft.
Relative: Higher

Site Name : 394347075522601
39.72983274,-75.87355180
PA

Database(s) : [NWIS]

Envirosite ID: 395613014
EPA ID: N/R

NWIS

Site Identification Number :	394347075522601
Site Type :	Well
Site Name :	CH 6260
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	352
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 21
Direction: WSW
Distance: 0.087 mi.
Actual: 456.925 ft.
Elevation: 0.065 mi. / 342.087 ft.
Relative: Higher

Site Name : 394347075522601
39.72983274,-75.87355180
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395613014
EPA ID: N/R

NWIS ***(cont.)***

Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	07/19/2000
Field Water-Level Data End Date :	07/19/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72983274
Longitude :	-75.87355180

Map Id: 22
Direction: E
Distance: 0.096 mi.
Actual: 504.748 ft.
Elevation: 0.044 mi. / 230.669 ft.
Relative: Lower

Site Name : 394411075502501
39.73649957,-75.83993930
PA

Database(s) : [NWIS]

Envirosite ID: 395478522
EPA ID: N/R

NWIS

Site Identification Number :	394411075502501
Site Type :	Well
Site Name :	CH 6279
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	249
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10

Map Id: 22
Direction: E
Distance: 0.096 mi.
Actual: 504.748 ft.
Elevation: 0.044 mi. / 230.669 ft.
Relative: Lower

Site Name : 394411075502501
39.73649957,-75.83993930
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395478522
EPA ID: N/R

NWIS ***(cont.)***

Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/29/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	140
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/29/2000
Field Water-Level Data End Date :	06/29/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73649957
Longitude :	-75.83993930

Map Id: 23
Direction: SSW
Distance: 0.099 mi.
Actual: 520.786 ft.
Elevation: 0.071 mi. / 375.312 ft.
Relative: Higher

Site Name : 394330075515301
39.72511066,-75.86438470
PA

Database(s) : [NWIS]

Envirosite ID: 395098310
EPA ID: N/R

NWIS

Site Identification Number :	394330075515301
Site Type :	Well
Site Name :	CH 6316
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA

Map Id: 23
Direction: SSW
Distance: 0.099 mi.
Actual: 520.786 ft.
Elevation: 0.071 mi. / 375.312 ft.
Relative: Higher

Site Name : 394330075515301
39.72511066,-75.86438470
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395098310
EPA ID: N/R

NWIS ***(cont.)***

Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	375
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1992
Date Site Established or Inventoried:	06/24/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	360
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/24/2000
Field Water-Level Data End Date :	06/24/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72511066
Longitude :	-75.86438470

Map Id: 24
Direction: N
Distance: 0.100 mi.
Actual: 525.564 ft.
Elevation: 0.069 mi. / 363.852 ft.
Relative: Higher

Site Name : 394445075513401
39.74594370,-75.85910678
PA

Database(s) : [NWIS]

Envirosite ID: 395054342
EPA ID: N/R

NWIS

Site Identification Number :	394445075513401
Site Type :	Well

Map Id: 24
Direction: N
Distance: 0.100 mi.
Actual: 525.564 ft.
Elevation: 0.069 mi. / 363.852 ft.
Relative: Higher

Site Name : 394445075513401
39.74594370,-75.85910678
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395054342
EPA ID: N/R

NWIS ***(cont.)***

Site Name :	CH 6265
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	370
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1995
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/08/2000
Field Water-Level Data End Date :	06/08/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74594370
Longitude :	-75.85910678

Map Id: 25
Direction: W
Distance: 0.105 mi.
Actual: 553.330 ft.
Elevation: 0.042 mi. / 222.68 ft.
Relative: Lower

Site Name : 394410075523701
39.73622150,-75.87660750
PA

Database(s) : [NWIS]

Envirosite ID: 395214318
EPA ID: N/R

NWIS

Site Identification Number :	394410075523701
Site Type :	Well
Site Name :	CH 6261
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	238
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	07/19/2000
Field Water-Level Data End Date :	07/19/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73622150
Longitude :	-75.87660750

Map Id: 26
Direction: ENE
Distance: 0.115 mi.
Actual: 605.008 ft.
Elevation: 0.052 mi. / 277.073 ft.
Relative: Higher

Site Name : 394434075503401
39.74288836,-75.84243940
PA

Database(s) : [NWIS]

Envirosite ID: 395001128
EPA ID: N/R

NWIS

Site Identification Number :	394434075503401
Site Type :	Well
Site Name :	CH 6307
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	275
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1996
Date Site Established or Inventoried:	08/05/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	220
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	08/05/2000
Field Water-Level Data End Date :	08/05/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74288836
Longitude :	-75.84243940

Map Id: 27
Direction: ESE
Distance: 0.117 mi.
Actual: 619.968 ft.
Elevation: 0.06 mi. / 318.219 ft.
Relative: Higher

Site Name : 103637
39.73306, -75.83861
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225169
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103637
Owner :	DARHUN INC
Yield GPM :	1.33
Casing Top :	0 / 60 / 6
Licensee :	N/R
Local Well Number :	4729N
Date Drilled :	10/01/1979
Well Depth :	300
Static Level :	55
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	35
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73306
Longitude :	-75.83861
Last Date in Agency List :	03/20/2018

Map Id: 28
Direction: ESE
Distance: 0.127 mi.
Actual: 668.322 ft.
Elevation: 0.054 mi. / 284.354 ft.
Relative: Higher

Site Name : 103634
39.73194, -75.84306
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225487
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103634
Owner :	HANLEY A
Yield GPM :	6.5
Casing Top :	0 / 47 / 6
Licensee :	N/R
Local Well Number :	4726N
Date Drilled :	07/01/1980
Well Depth :	140
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	40
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: 28
Direction: ESE
Distance: 0.127 mi.
Actual: 668.322 ft.
Elevation: 0.054 mi. / 284.354 ft.
Relative: Higher

Site Name : 103634
39.73194, -75.84306
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225487
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	NEWARK WEST
Latitude :	39.73194
Longitude :	-75.84306
Last Date in Agency List :	03/20/2018

Map Id: 29
Direction: ESE
Distance: 0.145 mi.
Actual: 767.416 ft.
Elevation: 0.057 mi. / 303.566 ft.
Relative: Higher

Site Name : 103635
39.73194, -75.83889
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225086
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103635
Owner :	LISHON CONST CO
Yield GPM :	2
Casing Top :	0 / 100 / 6
Licensee :	N/R
Local Well Number :	4727N
Date Drilled :	06/01/1981
Well Depth :	340
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	60
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73194
Longitude :	-75.83889
Last Date in Agency List :	03/20/2018

Map Id: 30
Direction: E
Distance: 0.148 mi.
Actual: 782.741 ft.
Elevation: 0.058 mi. / 305.138 ft.
Relative: Higher

Site Name : 103630
39.73556, -75.83833
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222268
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103630
Owner :	DARHUN INC
Yield GPM :	100
Casing Top :	0 / 38 / 6
Licensee :	N/R
Local Well Number :	4722N
Date Drilled :	05/01/1979
Well Depth :	270
Static Level :	2
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	20
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73556
Longitude :	-75.83833
Last Date in Agency List :	03/20/2018

Map Id: 31
Direction: SW
Distance: 0.171 mi.
Actual: 903.696 ft.
Elevation: 0.07 mi. / 369.797 ft.
Relative: Higher

Site Name : 394328075520301
39.72444444,-75.86750000
PA

Database(s) : [NWIS]

Envirosite ID: 395612860
EPA ID: N/R

NWIS

Site Identification Number :	394328075520301
Site Type :	Well
Site Name :	CH 5436
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	375
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	NANNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 31
Direction: SW
Distance: 0.171 mi.
Actual: 903.696 ft.
Elevation: 0.07 mi. / 369.797 ft.
Relative: Higher

Site Name : 394328075520301
39.72444444,-75.86750000
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395612860
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	199406
Date Site Established or Inventoried:	01/01/1998
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YNYNNNNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation
Local Aquifer Type :	Unconfined single aquifer
Well Depth :	280
Hole Depth :	280
Source of Depth Data :	D
Project Number :	444227500
Real-Time Data Flag :	N/R
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	N/R
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	N/R
Field Water-Level Data Begin Date :	N/R
Field Water-Level Data End Date :	N/R
Field Water-Level Data Count :	N/R
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	N/R
Latitude :	39.72444444
Longitude :	-75.86750000

Map Id: 32
Direction: ESE
Distance: 0.172 mi.
Actual: 907.731 ft.
Elevation: 0.062 mi. / 329.255 ft.
Relative: Higher

Site Name : 103623
39.7325, -75.83778
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222293
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103623
Owner :	DARHUN INC
Yield GPM :	4
Casing Top :	0 / 50 / 6
Licensee :	N/R
Local Well Number :	4715N
Date Drilled :	05/01/1979
Well Depth :	180
Static Level :	2
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R

Map Id: 32
Direction: ESE
Distance: 0.172 mi.
Actual: 907.731 ft.
Elevation: 0.062 mi. / 329.255 ft.
Relative: Higher

Site Name : 103623
39.7325, -75.83778
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222293
EPA ID: N/R

WELLS - PA ***(cont.)***

WQ Data :	0
Depth to Bed :	10
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.7325
Longitude :	-75.83778
Last Date in Agency List :	03/20/2018

Map Id: C33
Direction: ESE
Distance: 0.176 mi.
Actual: 929.833 ft.
Elevation: 0.062 mi. / 325.476 ft.
Relative: Higher

Site Name : 394353075501601
39.73149965,-75.83743910
PA

Database(s) : [NWIS]

Envirosite ID: 395051120
EPA ID: N/R

NWIS

Site Identification Number :	394353075501601
Site Type :	Well
Site Name :	CH 6278
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	328
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1955
Date Site Established or Inventoried:	07/22/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	130
Hole Depth :	N/R
Source of Depth Data :	O

Map Id: C33
Direction: ESE
Distance: 0.176 mi.
Actual: 929.833 ft.
Elevation: 0.062 mi. / 325.476 ft.
Relative: Higher

Site Name : 394353075501601
39.73149965,-75.83743910
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395051120
EPA ID: N/R

NWIS ***(cont.)***

Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	07/22/2000
Field Water-Level Data End Date :	07/22/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73149965
Longitude :	-75.83743910

Map Id: C34
Direction: ESE
Distance: 0.188 mi.
Actual: 992.872 ft.
Elevation: 0.063 mi. / 330.141 ft.
Relative: Higher

Site Name : 103625
39.73333, -75.83722
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225023
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103625
Owner :	DARHUN INC
Yield GPM :	4
Casing Top :	0 / 66 / 6
Licensee :	N/R
Local Well Number :	4717N
Date Drilled :	08/01/1979
Well Depth :	200
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	55
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73333
Longitude :	-75.83722
Last Date in Agency List :	03/20/2018

Map Id: C35
Direction: ESE
Distance: 0.192 mi.
Actual: 1014.022 ft.
Elevation: 0.061 mi. / 320.118 ft.
Relative: Higher

Site Name : 103628
39.73417, -75.83722
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222193
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103628
Owner :	DARHUN INC
Yield GPM :	3
Casing Top :	0 / 42 / 6
Licensee :	N/R
Local Well Number :	4720N
Date Drilled :	03/01/1979
Well Depth :	220
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	20
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73417
Longitude :	-75.83722
Last Date in Agency List :	03/20/2018

Map Id: 36
Direction: W
Distance: 0.199 mi.
Actual: 1049.029 ft.
Elevation: 0.044 mi. / 229.977 ft.
Relative: Lower

Site Name : 394423075523701
39.73983255,-75.87660750
PA

Database(s) : [NWIS]

Envirosite ID: 394714010
EPA ID: N/R

NWIS

Site Identification Number :	394423075523701
Site Type :	Well
Site Name :	CH 6262
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	243
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 36
Direction: W
Distance: 0.199 mi.
Actual: 1049.029 ft.
Elevation: 0.044 mi. / 229.977 ft.
Relative: Lower

Site Name : 394423075523701
39.73983255,-75.87660750
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 394714010
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1960
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	125
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	07/19/2000
Field Water-Level Data End Date :	07/19/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73983255
Longitude :	-75.87660750

Map Id: 37
Direction: NNW
Distance: 0.203 mi.
Actual: 1072.391 ft.
Elevation: 0.056 mi. / 295.253 ft.
Relative: Higher

Site Name : 394448075514701
39.74677700,-75.86271800
PA

Database(s) : [NWIS]

Envirosite ID: 395001511
EPA ID: N/R

NWIS

Site Identification Number :	394448075514701
Site Type :	Well
Site Name :	CH 6264
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	302
Method Altitude Determined :	Interpolated from topographic map.

Map Id: 37
Direction: NNW
Distance: 0.203 mi.
Actual: 1072.391 ft.
Elevation: 0.056 mi. / 295.253 ft.
Relative: Higher

Site Name : 394448075514701
39.74677700,-75.86271800
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395001511
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1960
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/08/2000
Field Water-Level Data End Date :	06/08/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74677700
Longitude :	-75.86271800

Map Id: D38
Direction: E
Distance: 0.204 mi.
Actual: 1075.727 ft.
Elevation: 0.057 mi. / 298.688 ft.
Relative: Higher

Site Name : 103629
39.73528, -75.83722
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222626
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103629
Owner :	DARHUN INC
Yield GPM :	25
Casing Top :	0 / 80 / 6
Licensee :	N/R
Local Well Number :	4721N
Date Drilled :	03/01/1979

Map Id: D38
Direction: E
Distance: 0.204 mi.
Actual: 1075.727 ft.
Elevation: 0.057 mi. / 298.688 ft.
Relative: Higher

Site Name : 103629
39.73528, -75.83722
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222626
EPA ID: N/R

WELLS - PA ***(cont.)***

Well Depth :	220
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	10
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73528
Longitude :	-75.83722
Last Date in Agency List :	03/20/2018

Map Id: 39
Direction: E
Distance: 0.205 mi.
Actual: 1080.159 ft.
Elevation: 0.054 mi. / 284.629 ft.
Relative: Higher

Site Name : 394422075502001
39.73955510,-75.83855030
PA

Database(s) : [NWIS]

Envirosite ID: 395958499
EPA ID: N/R

NWIS

Site Identification Number :	394422075502001
Site Type :	Well
Site Name :	CH 6305
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	290
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/26/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y

Map Id: 39
Direction: E
Distance: 0.205 mi.
Actual: 1080.159 ft.
Elevation: 0.054 mi. / 284.629 ft.
Relative: Higher

Site Name : 394422075502001
39.73955510,-75.83855030
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395958499
EPA ID: N/R

NWIS ***(cont.)***

National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	140
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/26/2000
Field Water-Level Data End Date :	06/26/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73955510
Longitude :	-75.83855030

Map Id: 40
Direction: NNE
Distance: 0.212 mi.
Actual: 1117.473 ft.
Elevation: 0.074 mi. / 393.087 ft.
Relative: Higher

Site Name : 394456075510901
39.74899930,-75.85216200
PA

Database(s) : [NWIS]

Envirosite ID: 395099938
EPA ID: N/R

NWIS

Site Identification Number :	394456075510901
Site Type :	Well
Site Name :	CH 6269
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	400
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 40
Direction: NNE
Distance: 0.212 mi.
Actual: 1117.473 ft.
Elevation: 0.074 mi. / 393.087 ft.
Relative: Higher

Site Name : 394456075510901
39.74899930,-75.85216200
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395099938
EPA ID: N/R

NWIS ***(cont.)***

Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/09/2000
Field Water-Level Data End Date :	06/09/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74899930
Longitude :	-75.85216200

Map Id: 41
Direction: SW
Distance: 0.215 mi.
Actual: 1136.241 ft.
Elevation: 0.074 mi. / 391.368 ft.
Relative: Higher

Site Name : 394333075521101
39.72583330,-75.86944440
PA

Database(s) : [NWIS]

Envirosite ID: 395185749
EPA ID: N/R

NWIS

Site Identification Number :	394333075521101
Site Type :	Well
Site Name :	CH 5431
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	396
Method Altitude Determined :	Differentially corrected Global Positioning System.
Altitude Accuracy :	10

Map Id: 41
Direction: SW
Distance: 0.215 mi.
Actual: 1136.241 ft.
Elevation: 0.074 mi. / 391.368 ft.
Relative: Higher

Site Name : 394333075521101
39.72583330,-75.86944440
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395185749
EPA ID: N/R

NWIS ***(cont.)***

Altitude Datum :	North American Vertical Datum of 1988
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Flat surface
Data Types :	NNNONNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	07/07/1998
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	NYNNNNNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation
Local Aquifer Type :	Unconfined single aquifer
Well Depth :	131
Hole Depth :	131
Source of Depth Data :	S
Project Number :	444227500
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	07/07/1998
Water-Quality Data End Date :	07/07/1998
Water-Quality Data Count :	1
Field Water-Level Data Begin Date :	N/R
Field Water-Level Data End Date :	N/R
Field Water-Level Data Count :	0
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72583330
Longitude :	-75.86944440

Map Id: 42
Direction: ESE
Distance: 0.228 mi.
Actual: 1201.610 ft.
Elevation: 0.059 mi. / 309.833 ft.
Relative: Higher

Site Name : 103627
39.73111, -75.83778
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225472
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103627
Owner :	DARHUN INC
Yield GPM :	1.75
Casing Top :	0 / 91 / 6
Licensee :	N/R
Local Well Number :	4719N
Date Drilled :	04/01/1979
Well Depth :	300

Map Id: 42
Direction: ESE
Distance: 0.228 mi.
Actual: 1201.610 ft.
Elevation: 0.059 mi. / 309.833 ft.
Relative: Higher

Site Name : 103627
39.73111, -75.83778
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225472
EPA ID: N/R

WELLS - PA ***(cont.)***

Static Level :	50
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	25
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73111
Longitude :	-75.83778
Last Date in Agency List :	03/20/2018

Map Id: 43
Direction: N
Distance: 0.237 mi.
Actual: 1251.997 ft.
Elevation: 0.068 mi. / 356.929 ft.
Relative: Higher

Site Name : 394454075512601
39.74844370,-75.85688450
PA

Database(s) : [NWIS]

Envirosite ID: 394919405
EPA ID: N/R

NWIS

Site Identification Number :	394454075512601
Site Type :	Well
Site Name :	CH 6267
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	360
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers

Map Id: 43
Direction: N
Distance: 0.237 mi.
Actual: 1251.997 ft.
Elevation: 0.068 mi. / 356.929 ft.
Relative: Higher

Site Name : 394454075512601
39.74844370,-75.85688450
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 394919405
EPA ID: N/R

NWIS ***(cont.)***

Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/19/2000
Field Water-Level Data End Date :	06/19/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74844370
Longitude :	-75.85688450

Map Id: D44
Direction: E
Distance: 0.238 mi.
Actual: 1259.155 ft.
Elevation: 0.055 mi. / 288.238 ft.
Relative: Higher

Site Name : 103636
39.73583, -75.83667
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225124
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103636
Owner :	DARHUN INC
Yield GPM :	3
Casing Top :	0 / 79 / 6
Licensee :	N/R
Local Well Number :	4728N
Date Drilled :	10/01/1979
Well Depth :	220
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	75
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73583

Map Id: D44
Direction: E
Distance: 0.238 mi.
Actual: 1259.155 ft.
Elevation: 0.055 mi. / 288.238 ft.
Relative: Higher

Site Name : 103636
39.73583, -75.83667
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225124
EPA ID: N/R

WELLS - PA ***(cont.)***

Longitude :	-75.83667
Last Date in Agency List :	03/20/2018

Map Id: 45
Direction: ENE
Distance: 0.239 mi.
Actual: 1262.425 ft.
Elevation: 0.047 mi. / 248.734 ft.
Relative: Higher

Site Name : 394430075502101
39.74177729,-75.83882810
PA

Database(s) : [NWIS]

Envirosite ID: 395214856
EPA ID: N/R

NWIS

Site Identification Number :	394430075502101
Site Type :	Well
Site Name :	CH 6304
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	255
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1985
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	150
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0

Map Id: 45
Direction: ENE
Distance: 0.239 mi.
Actual: 1262.425 ft.
Elevation: 0.047 mi. / 248.734 ft.
Relative: Higher

Site Name : 394430075502101
39.74177729,-75.83882810
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395214856
EPA ID: N/R

NWIS ***(cont.)***

Field Water-Level Data Begin Date :	06/26/2000
Field Water-Level Data End Date :	06/26/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74177729
Longitude :	-75.83882810

Map Id: 46
Direction: ESE
Distance: 0.242 mi.
Actual: 1276.766 ft.
Elevation: 0.062 mi. / 327.52 ft.
Relative: Higher

Site Name : 103624
39.73194, -75.83667
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222611
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103624
Owner :	DARHUN INC
Yield GPM :	1
Casing Top :	0 / 130.5 / 6
Licensee :	N/R
Local Well Number :	4716N
Date Drilled :	07/01/1979
Well Depth :	300
Static Level :	45
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	85
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.73194
Longitude :	-75.83667
Last Date in Agency List :	03/20/2018

Map Id: 47
Direction: WSW
Distance: 0.244 mi.
Actual: 1290.060 ft.
Elevation: 0.063 mi. / 332.303 ft.
Relative: Higher

Site Name : 394350075524601
39.73066600,-75.87910759
PA

Database(s) : [NWIS]

Envirosite ID: 395051050
EPA ID: N/R

NWIS

Site Identification Number :	394350075524601
Site Type :	Well
Site Name :	CH 6386
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	338
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/28/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/28/2000
Field Water-Level Data End Date :	06/28/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73066600
Longitude :	-75.87910759

Map Id: 48
Direction: SW
Distance: 0.262 mi.
Actual: 1383.235 ft.
Elevation: 0.079 mi. / 417.779 ft.
Relative: Higher

Site Name : 394338075521401
39.72733280,-75.87021830
PA

Database(s) : [NWIS]

Envirosite ID: 394918009
EPA ID: N/R

NWIS

Site Identification Number :	394338075521401
Site Type :	Well
Site Name :	CH 6318
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	421
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/28/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/28/2000
Field Water-Level Data End Date :	06/28/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72733280
Longitude :	-75.87021830

Map Id: 49
Direction: NNE
Distance: 0.271 mi.
Actual: 1431.719 ft.
Elevation: 0.077 mi. / 407.812 ft.
Relative: Higher

Site Name : 394500075510501
39.75011040,-75.85105090
PA

Database(s) : [NWIS]

Envirosite ID: 395453971
EPA ID: N/R

NWIS

Site Identification Number :	394500075510501
Site Type :	Well
Site Name :	CH 6270
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	412
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	150
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/08/2000
Field Water-Level Data End Date :	06/08/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75011040
Longitude :	-75.85105090

Map Id: 50
Direction: ESE
Distance: 0.280 mi.
Actual: 1477.662 ft.
Elevation: 0.06 mi. / 318.058 ft.
Relative: Higher

Site Name : 394352075500901
39.73122189,-75.83549460
PA

Database(s) : [NWIS]

Envirosite ID: 395464339
EPA ID: N/R

NWIS

Site Identification Number :	394352075500901
Site Type :	Well
Site Name :	CH 6277
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	321
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/24/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/24/2000
Field Water-Level Data End Date :	06/24/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73122189
Longitude :	-75.83549460

Map Id: 51
Direction: SW
Distance: 0.331 mi.
Actual: 1746.661 ft.
Elevation: 0.077 mi. / 404.59 ft.
Relative: Higher

Site Name : 394332075521901
39.72566616,-75.87160730
PA

Database(s) : [NWIS]

Envirosite ID: 395958415
EPA ID: N/R

NWIS

Site Identification Number :	394332075521901
Site Type :	Well
Site Name :	CH 6317
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	408
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1991
Date Site Established or Inventoried:	07/19/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	380
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	07/19/2000
Field Water-Level Data End Date :	07/19/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72566616
Longitude :	-75.87160730

Map Id: 52
Direction: ENE
Distance: 0.341 mi.
Actual: 1802.611 ft.
Elevation: 0.055 mi. / 288.773 ft.
Relative: Higher

Site Name : 394431075501401
39.74205508,-75.83688360
PA

Database(s) : [NWIS]

Envirosite ID: 395000844
EPA ID: N/R

NWIS

Site Identification Number :	394431075501401
Site Type :	Well
Site Name :	CH 6303
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	290
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/12/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/12/2000
Field Water-Level Data End Date :	06/12/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74205508
Longitude :	-75.83688360

Map Id: 53
Direction: WSW
Distance: 0.346 mi.
Actual: 1824.958 ft.
Elevation: 0.073 mi. / 384.59 ft.
Relative: Higher

Site Name : 394339075524601
39.72761050,-75.87910759
PA

Database(s) : [NWIS]

Envirosite ID: 395498720
EPA ID: N/R

NWIS

Site Identification Number :	394339075524601
Site Type :	Well
Site Name :	CH 6385
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	401
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/28/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/28/2000
Field Water-Level Data End Date :	06/28/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72761050
Longitude :	-75.87910759

Map Id: 54
Direction: E
Distance: 0.359 mi.
Actual: 1894.596 ft.
Elevation: 0.06 mi. / 319.226 ft.
Relative: Higher

Site Name : 394356075500401
39.73233300,-75.83410570
PA

Database(s) : [NWIS]

Envirosite ID: 395478049
EPA ID: N/R

NWIS

Site Identification Number :	394356075500401
Site Type :	Well
Site Name :	CH 6276
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	326
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/24/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	300
Hole Depth :	N/R
Source of Depth Data :	D
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/24/2000
Field Water-Level Data End Date :	06/24/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73233300
Longitude :	-75.83410570

Map Id: 55
Direction: WSW
Distance: 0.376 mi.
Actual: 1985.543 ft.
Elevation: 0.078 mi. / 410.279 ft.
Relative: Higher

Site Name : 103514
39.72778, -75.87556
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364224817
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103514
Owner :	GREGG K
Yield GPM :	10
Casing Top :	0 / 79 / 6
Licensee :	N/R
Local Well Number :	4671N
Date Drilled :	04/01/1979
Well Depth :	141
Static Level :	26
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	70
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW
Latitude :	39.72778
Longitude :	-75.87556
Last Date in Agency List :	03/20/2018

Map Id: 56
Direction: SW
Distance: 0.390 mi.
Actual: 2060.982 ft.
Elevation: 0.08 mi. / 421.788 ft.
Relative: Higher

Site Name : 103579
39.7275, -75.87417
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364224951
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103579
Owner :	WRIGHT HENRY
Yield GPM :	5
Casing Top :	0 / 62 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4137
Date Drilled :	N/R
Well Depth :	160
Static Level :	28
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	50
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.

Map Id: 56
Direction: SW
Distance: 0.390 mi.
Actual: 2060.982 ft.
Elevation: 0.08 mi. / 421.788 ft.
Relative: Higher

Site Name : 103579
39.7275, -75.87417
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364224951
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	NEWARK WEST
Latitude :	39.7275
Longitude :	-75.87417
Last Date in Agency List :	03/20/2018

Map Id: 57
Direction: E
Distance: 0.391 mi.
Actual: 2064.371 ft.
Elevation: 0.058 mi. / 306.512 ft.
Relative: Higher

Site Name : 394417075500601
39.73816626,-75.83466128
PA

Database(s) : [NWIS]

Envirosite ID: 395958482
EPA ID: N/R

NWIS

Site Identification Number :	394417075500601
Site Type :	Well
Site Name :	CH 6306
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	311
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1986
Date Site Established or Inventoried:	06/26/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R

Map Id: 57
Direction: E
Distance: 0.391 mi.
Actual: 2064.371 ft.
Elevation: 0.058 mi. / 306.512 ft.
Relative: Higher

Site Name : 394417075500601
39.73816626,-75.83466128
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395958482
EPA ID: N/R

NWIS ***(cont.)***

Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/26/2000
Field Water-Level Data End Date :	06/26/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73816626
Longitude :	-75.83466128

Map Id: 58
Direction: NNE
Distance: 0.396 mi.
Actual: 2090.692 ft.
Elevation: 0.07 mi. / 370.331 ft.
Relative: Higher

Site Name : 103655
39.75417, -75.85056
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364226686
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103655
Owner :	SKINNER A
Yield GPM :	6
Casing Top :	0 / 30 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	4747N
Date Drilled :	11/01/1978
Well Depth :	72
Static Level :	27
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	24
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75417
Longitude :	-75.85056
Last Date in Agency List :	03/20/2018

Map Id: 59
Direction: NW
Distance: 0.399 mi.
Actual: 2108.138 ft.
Elevation: 0.06 mi. / 316.627 ft.
Relative: Higher

Site Name : 394459075522901
39.74983240,-75.87438520
PA

Database(s) : [NWIS]

Envirosite ID: 394714918
EPA ID: N/R

NWIS

Site Identification Number :	394459075522901
Site Type :	Well
Site Name :	CH 6146
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	338
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/29/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/29/2000
Field Water-Level Data End Date :	06/29/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74983240
Longitude :	-75.87438520

Map Id: 60
Direction: SW
Distance: 0.403 mi.
Actual: 2129.705 ft.
Elevation: 0.074 mi. / 390.663 ft.
Relative: Higher

Site Name : 103525
39.72583, -75.87222
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364224925
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103525
Owner :	VENDRICK K
Yield GPM :	3
Casing Top :	0 / 41 / 6
Licensee :	N/R
Local Well Number :	4682N
Date Drilled :	12/01/1978
Well Depth :	207
Static Level :	59
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	35
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.72583
Longitude :	-75.87222
Last Date in Agency List :	03/20/2018

Map Id: E61
Direction: NNE
Distance: 0.431 mi.
Actual: 2274.390 ft.
Elevation: 0.079 mi. / 414.528 ft.
Relative: Higher

Site Name : 103766
39.75472, -75.84806
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221967
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103766
Owner :	BROOKING ORVILE
Yield GPM :	25
Casing Top :	0 / 40 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	X 4012
Date Drilled :	N/R
Well Depth :	140
Static Level :	25
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	30
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: E61
Direction: NNE
Distance: 0.431 mi.
Actual: 2274.390 ft.
Elevation: 0.079 mi. / 414.528 ft.
Relative: Higher

Site Name : 103766
39.75472, -75.84806
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364221967
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	WEST GROVE
Latitude :	39.75472
Longitude :	-75.84806
Last Date in Agency List :	03/20/2018

Map Id: E62
Direction: NNE
Distance: 0.431 mi.
Actual: 2274.390 ft.
Elevation: 0.079 mi. / 414.528 ft.
Relative: Higher

Site Name : 103764
39.75472, -75.84806
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222286
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103764
Owner :	HANNUM C C
Yield GPM :	10
Casing Top :	0 / 48 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4010
Date Drilled :	N/R
Well Depth :	139
Static Level :	28
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	45
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75472
Longitude :	-75.84806
Last Date in Agency List :	03/20/2018

Map Id: E63
Direction: NNE
Distance: 0.431 mi.
Actual: 2274.390 ft.
Elevation: 0.079 mi. / 414.528 ft.
Relative: Higher

Site Name : 103767
39.75472, -75.84806
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222339
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103767
Owner :	CARRIAGE PRK 20
Yield GPM :	25
Casing Top :	0 / 27 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	X 4013
Date Drilled :	N/R
Well Depth :	73
Static Level :	23
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	12
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75472
Longitude :	-75.84806
Last Date in Agency List :	03/20/2018

Map Id: E64
Direction: NNE
Distance: 0.431 mi.
Actual: 2274.390 ft.
Elevation: 0.079 mi. / 414.528 ft.
Relative: Higher

Site Name : 103765
39.75472, -75.84806
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225125
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103765
Owner :	SKINNER AL
Yield GPM :	10
Casing Top :	0 / 20 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	X 4011
Date Drilled :	N/R
Well Depth :	71
Static Level :	20
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	12
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: E64
Direction: NNE
Distance: 0.431 mi.
Actual: 2274.390 ft.
Elevation: 0.079 mi. / 414.528 ft.
Relative: Higher

Site Name : 103765
39.75472, -75.84806
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225125
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	WEST GROVE
Latitude :	39.75472
Longitude :	-75.84806
Last Date in Agency List :	03/20/2018

Map Id: E65
Direction: NNE
Distance: 0.431 mi.
Actual: 2274.390 ft.
Elevation: 0.079 mi. / 414.528 ft.
Relative: Higher

Site Name : 103768
39.75472, -75.84806
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364226752
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103768
Owner :	SKINNER ALBERT
Yield GPM :	5
Casing Top :	0 / 38 / 6
Licensee :	MAYBERRY, LEONARD
Local Well Number :	X 4014
Date Drilled :	N/R
Well Depth :	160
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	30
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75472
Longitude :	-75.84806
Last Date in Agency List :	03/20/2018

Map Id: 66
Direction: NE
Distance: 0.443 mi.
Actual: 2340.384 ft.
Elevation: 0.062 mi. / 327.661 ft.
Relative: Higher

Site Name : 394452075502901
39.74788830,-75.84105050
PA

Database(s) : [NWIS]

Envirosite ID: 395501206
EPA ID: N/R

NWIS

Site Identification Number :	394452075502901
Site Type :	Well
Site Name :	CH 6312
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	334
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1965
Date Site Established or Inventoried:	06/10/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	155
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/10/2000
Field Water-Level Data End Date :	06/10/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74788830
Longitude :	-75.84105050

Map Id: 67
Direction: SW
Distance: 0.448 mi.
Actual: 2367.165 ft.
Elevation: 0.08 mi. / 421.962 ft.
Relative: Higher

Site Name : 394328075523001
39.72455505,-75.87466290
PA

Database(s) : [NWIS]

Envirosite ID: 395213665
EPA ID: N/R

NWIS

Site Identification Number :	394328075523001
Site Type :	Well
Site Name :	CH 1785
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	428
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	010
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	N/R
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	01/01/1969
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYYNNNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	N/R
Local Aquifer Type :	N/R
Well Depth :	159
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	N/R
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	07/01/1974
Field Water-Level Data End Date :	07/01/1974
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72455505
Longitude :	-75.87466290

Map Id: 68
Direction: E
Distance: 0.449 mi.
Actual: 2373.268 ft.
Elevation: 0.059 mi. / 309.265 ft.
Relative: Higher

Site Name : 394407075500001
39.73538850,-75.83299450
PA

Database(s) : [NWIS]

Envirosite ID: 395464770
EPA ID: N/R

NWIS

Site Identification Number :	394407075500001
Site Type :	Well
Site Name :	CH 6274
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	320
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/22/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/22/2000
Field Water-Level Data End Date :	06/22/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73538850
Longitude :	-75.83299450

Map Id: F69
Direction: NNE
Distance: 0.485 mi.
Actual: 2560.639 ft.
Elevation: 0.075 mi. / 396.201 ft.
Relative: Higher

Site Name : 103656
39.75556, -75.84944
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221939
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103656
Owner :	SKINNER ALBERT D
Yield GPM :	30
Casing Top :	0 / 38 / 5
Licensee :	MAYBERRY, LEONARD
Local Well Number :	4748N
Date Drilled :	07/28/1975
Well Depth :	110
Static Level :	20
Well Finish :	N/R
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	0
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75556
Longitude :	-75.84944
Last Date in Agency List :	03/20/2018

Map Id: 70
Direction: SW
Distance: 0.503 mi.
Actual: 2653.755 ft.
Elevation: 0.079 mi. / 417.772 ft.
Relative: Higher

Site Name : 394324075522801
39.72344396,-75.87410740
PA

Database(s) : [NWIS]

Envirosite ID: 395456373
EPA ID: N/R

NWIS

Site Identification Number :	394324075522801
Site Type :	Well
Site Name :	CH 6259
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	425
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 70
Direction: SW
Distance: 0.503 mi.
Actual: 2653.755 ft.
Elevation: 0.079 mi. / 417.772 ft.
Relative: Higher

Site Name : 394324075522801
39.72344396,-75.87410740
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395456373
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/23/2000
Field Water-Level Data End Date :	06/23/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72344396
Longitude :	-75.87410740

Map Id: 71
Direction: WSW
Distance: 0.504 mi.
Actual: 2662.475 ft.
Elevation: 0.079 mi. / 415.853 ft.
Relative: Higher

Site Name : 394326075523801
39.72399948,-75.87688530
PA

Database(s) : [NWIS]

Envirosite ID: 395463554
EPA ID: N/R

NWIS

Site Identification Number :	394326075523801
Site Type :	Well
Site Name :	CH 6384
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	419
Method Altitude Determined :	Interpolated from topographic map.

Map Id: 71
Direction: WSW
Distance: 0.504 mi.
Actual: 2662.475 ft.
Elevation: 0.079 mi. / 415.853 ft.
Relative: Higher

Site Name : 394326075523801
39.72399948,-75.87688530
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395463554
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/29/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/29/2000
Field Water-Level Data End Date :	06/29/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72399948
Longitude :	-75.87688530

Map Id: 72
Direction: ENE
Distance: 0.508 mi.
Actual: 2681.079 ft.
Elevation: 0.067 mi. / 352.346 ft.
Relative: Higher

Site Name : 394435075500401
39.74316620,-75.83410570
PA

Database(s) : [NWIS]

Envirosite ID: 395214941
EPA ID: N/R

NWIS

Site Identification Number :	394435075500401
Site Type :	Well
Site Name :	CH 6302
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County

Map Id: 72
Direction: ENE
Distance: 0.508 mi.
Actual: 2681.079 ft.
Elevation: 0.067 mi. / 352.346 ft.
Relative: Higher

Site Name : 394435075500401
39.74316620,-75.83410570
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395214941
EPA ID: N/R

NWIS ***(cont.)***

Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	350
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	06/25/2000
Date Site Established or Inventoried:	08/05/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	08/05/2000
Field Water-Level Data End Date :	08/05/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74316620
Longitude :	-75.83410570

Map Id: 73
Direction: E
Distance: 0.511 mi.
Actual: 2697.624 ft.
Elevation: 0.06 mi. / 318.612 ft.
Relative: Higher

Site Name : 394358075495401
39.73288857,-75.83132778
PA

Database(s) : [NWIS]

Envirosite ID: 395464534
EPA ID: N/R

NWIS

Site Identification Number :	394358075495401

Map Id: 73
Direction: E
Distance: 0.511 mi.
Actual: 2697.624 ft.
Elevation: 0.06 mi. / 318.612 ft.
Relative: Higher

Site Name : 394358075495401
39.73288857,-75.83132778
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395464534
EPA ID: N/R

NWIS ***(cont.)***

Site Type :	Well
Site Name :	CH 6275
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	320
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/22/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/22/2000
Field Water-Level Data End Date :	06/22/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73288857
Longitude :	-75.83132778

Map Id: F74
Direction: NNE
Distance: 0.523 mi.
Actual: 2759.410 ft.
Elevation: 0.077 mi. / 408.625 ft.
Relative: Higher

Site Name : 394514075505701
39.75399920,-75.84882870
PA

Database(s) : [NWIS]

Envirosite ID: 394836147
EPA ID: N/R

NWIS

Site Identification Number :	394514075505701
Site Type :	Well
Site Name :	CH 6258
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	405
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1991
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	125
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/08/2000
Field Water-Level Data End Date :	06/08/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75399920
Longitude :	-75.84882870

Map Id: 75
Direction: WSW
Distance: 0.534 mi.
Actual: 2819.222 ft.
Elevation: 0.078 mi. / 413.803 ft.
Relative: Higher

Site Name : 394342075530301
39.72844380,-75.88383000
PA

Database(s) : [NWIS]

Envirosite ID: 395000132
EPA ID: N/R

NWIS

Site Identification Number :	394342075530301
Site Type :	Well
Site Name :	CH 6382
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	420
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1970
Date Site Established or Inventoried:	06/23/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	150
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/23/2000
Field Water-Level Data End Date :	06/23/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72844380
Longitude :	-75.88383000

Map Id: 76
Direction: W
Distance: 0.570 mi.
Actual: 3010.692 ft.
Elevation: 0.067 mi. / 355.673 ft.
Relative: Higher

Site Name : 394351075531001
39.73094375,-75.88577450
PA

Database(s) : [NWIS]

Envirosite ID: 394835147
EPA ID: N/R

NWIS

Site Identification Number :	394351075531001
Site Type :	Well
Site Name :	CH 6378
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	415
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	280
Hole Depth :	N/R
Source of Depth Data :	D
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	08/05/2000
Field Water-Level Data End Date :	08/05/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73094375
Longitude :	-75.88577450

Map Id: 77
Direction: SW
Distance: 0.576 mi.
Actual: 3043.336 ft.
Elevation: 0.081 mi. / 425.249 ft.
Relative: Higher

Site Name : 394320075523101
39.72233286,-75.87494070
PA

Database(s) : [NWIS]

Envirosite ID: 395176670
EPA ID: N/R

NWIS

Site Identification Number :	394320075523101
Site Type :	Well
Site Name :	CH 1784
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	430
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	20
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	N/R
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	02/10/1970
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYYNNNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	N/R
Local Aquifer Type :	N/R
Well Depth :	150
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	N/R
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	1970-10
Field Water-Level Data End Date :	1970-10
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72233286
Longitude :	-75.87494070

Map Id: 78
Direction: NE
Distance: 0.581 mi.
Actual: 3066.045 ft.
Elevation: 0.074 mi. / 391.45 ft.
Relative: Higher

Site Name : 394515075504401
39.75427704,-75.84521750
PA

Database(s) : [NWIS]

Envirosite ID: 395215915
EPA ID: N/R

NWIS

Site Identification Number :	394515075504401
Site Type :	Well
Site Name :	CH 6257
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	394
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/08/2000
Field Water-Level Data End Date :	06/08/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75427704
Longitude :	-75.84521750

Map Id: 79
Direction: WNW
Distance: 0.606 mi.
Actual: 3198.444 ft.
Elevation: 0.073 mi. / 385.968 ft.
Relative: Higher

Site Name : 394430075530401
39.74177690,-75.88410780
PA

Database(s) : [NWIS]

Envirosite ID: 395214890
EPA ID: N/R

NWIS

Site Identification Number :	394430075530401
Site Type :	Well
Site Name :	CH 6374
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	382
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	199202
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYY Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	400
Hole Depth :	N/R
Source of Depth Data :	D
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/10/2000
Field Water-Level Data End Date :	06/10/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74177690
Longitude :	-75.88410780

Map Id: 80
Direction: ENE
Distance: 0.634 mi.
Actual: 3345.810 ft.
Elevation: 0.07 mi. / 370.656 ft.
Relative: Higher

Site Name : 394439075495701
39.74427730,-75.83216120
PA

Database(s) : [NWIS]

Envirosite ID: 395054314
EPA ID: N/R

NWIS

Site Identification Number :	394439075495701
Site Type :	Well
Site Name :	CH 6301
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	381
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1980
Date Site Established or Inventoried:	06/13/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	100
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/13/2000
Field Water-Level Data End Date :	06/13/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74427730
Longitude :	-75.83216120

Map Id: G81
Direction: ENE
Distance: 0.634 mi.
Actual: 3346.426 ft.
Elevation: 0.059 mi. / 313.566 ft.
Relative: Higher

Site Name : 103785
39.74972, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221981
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103785
Owner :	KIMBELOT CORP
Yield GPM :	6
Casing Top :	0 / 45 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4031
Date Drilled :	N/R
Well Depth :	280
Static Level :	60
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	40
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.74972
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G82
Direction: ENE
Distance: 0.634 mi.
Actual: 3346.426 ft.
Elevation: 0.059 mi. / 313.566 ft.
Relative: Higher

Site Name : 103784
39.74972, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364226811
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103784
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 44 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4030
Date Drilled :	N/R
Well Depth :	160
Static Level :	38
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: G82
Direction: ENE
Distance: 0.634 mi.
Actual: 3346.426 ft.
Elevation: 0.059 mi. / 313.566 ft.
Relative: Higher

Site Name : 103784
39.74972, -75.83472
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364226811
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	NEWARK WEST
Latitude :	39.74972
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G83
Direction: ENE
Distance: 0.634 mi.
Actual: 3346.426 ft.
Elevation: 0.059 mi. / 313.566 ft.
Relative: Higher

Site Name : 103783
39.74972, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364335240
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103783
Owner :	KIMBELOT CORP
Yield GPM :	0
Casing Top :	0 / 44 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4029
Date Drilled :	N/R
Well Depth :	400
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.74972
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: 84
Direction: WSW
Distance: 0.634 mi.
Actual: 3348.862 ft.
Elevation: 0.08 mi. / 423.356 ft.
Relative: Higher

Site Name : 394327075525801
39.72427720,-75.88244100
PA

Database(s) : [NWIS]

Envirosite ID: 394835042
EPA ID: N/R

NWIS

Site Identification Number :	394327075525801
Site Type :	Well
Site Name :	CH 6383
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	430
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/23/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/23/2000
Field Water-Level Data End Date :	06/23/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72427720
Longitude :	-75.88244100

Map Id: G85
Direction: ENE
Distance: 0.638 mi.
Actual: 3369.211 ft.
Elevation: 0.061 mi. / 323.494 ft.
Relative: Higher

Site Name : 394452075500701
39.74788837,-75.83493910
PA

Database(s) : [NWIS]

Envirosite ID: 395099906
EPA ID: N/R

NWIS

Site Identification Number :	394452075500701
Site Type :	Well
Site Name :	CH 6311
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	327
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/12/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/12/2000
Field Water-Level Data End Date :	06/12/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74788837
Longitude :	-75.83493910

Map Id: 86
Direction: SW
Distance: 0.644 mi.
Actual: 3401.699 ft.
Elevation: 0.078 mi. / 414.419 ft.
Relative: Higher

Site Name : MDG342513
606 LEWISVILLE ROAD
ELKTON, MD 21921

Database(s) : [INACTIVE PCS]

Envirosite ID: 396762404
EPA ID: N/R

INACTIVE PCS

Issue Date :	03/02/2006
Original Issue Date :	03/02/2006
Effective Date :	03/02/2006
Expiration Date :	05/24/2007
Retirement Date :	N/R
Termination Date :	N/R
Issuing Agency :	N/R
Agency Type Code :	State
Activity ID :	20034192
External Permit Number :	MDG342513
Facility Type Indicator :	NON-POTW
Permit Type Code :	General Permit Covered Facility-NPDES)
Major Minor Status :	N
Permit Status Code :	Expired
Total Design Flow Number :	N/R
Actual Average Flow Number :	N/R
State Water Body :	N/R
State Water Body Name :	LITTLE ELK CREEK
Permit Name :	MID STATES OIL REFINING-ELKTON
Permit Comp Status :	Y
RNC Tracking :	Y
Master External Permit Number :	MDG340000
TMDL Interface :	N/R
EDMR Authorization :	N
Pretreatment Indicator Code :	N/R

Map Id: G87
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103775
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221977
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103775
Owner :	KIMBELOT CORP
Yield GPM :	20
Casing Top :	0 / 43 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4021
Date Drilled :	N/R
Well Depth :	200
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	38
Site Type :	WELL
Elevation :	0

Map Id: G87
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103775
39.75, -75.83472
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364221977
EPA ID: N/R

WELLS - PA ***(cont.)***

County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G88
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103782
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222051
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103782
Owner :	KIMBELOT CORP
Yield GPM :	12
Casing Top :	0 / 44 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4028
Date Drilled :	N/R
Well Depth :	160
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G89
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103781
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222274
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103781
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 79 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4027
Date Drilled :	N/R
Well Depth :	180
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	74
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G90
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103774
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222312
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103774
Owner :	KIMBERLOT CORP
Yield GPM :	25
Casing Top :	0 / 46 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4020
Date Drilled :	N/R
Well Depth :	200
Static Level :	41
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	41
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: G90
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103774
39.75, -75.83472
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222312
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G91
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103777
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222347
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103777
Owner :	KIMBELOT CORP
Yield GPM :	12
Casing Top :	0 / 61 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4023
Date Drilled :	N/R
Well Depth :	300
Static Level :	70
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	56
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G92
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103776
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225136
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103776
Owner :	KIMBELOT CORP
Yield GPM :	20
Casing Top :	0 / 167 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4022
Date Drilled :	N/R
Well Depth :	240
Static Level :	50
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	162
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G93
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103780
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225536
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103780
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 48 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4026
Date Drilled :	N/R
Well Depth :	160
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	43
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: G93
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103780
39.75, -75.83472
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225536
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G94
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103779
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364226098
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103779
Owner :	KIMBELOT CORP
Yield GPM :	30
Casing Top :	0 / 77 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4025
Date Drilled :	N/R
Well Depth :	240
Static Level :	45
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	72
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: G95
Direction: ENE
Distance: 0.647 mi.
Actual: 3415.399 ft.
Elevation: 0.062 mi. / 325.863 ft.
Relative: Higher

Site Name : 103778
39.75, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364226782
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103778
Owner :	KIMBELOT CORP
Yield GPM :	8
Casing Top :	0 / 51 / 6
Licensee :	POWELL DRILLING & SERVICES INC
Local Well Number :	X 4024
Date Drilled :	N/R
Well Depth :	200
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	46
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.75
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: 96
Direction: E
Distance: 0.663 mi.
Actual: 3500.467 ft.
Elevation: 0.069 mi. / 365.627 ft.
Relative: Higher

Site Name : 394415075494701
39.73761075,-75.82938330
PA

Database(s) : [NWIS]

Envirosite ID: 395458130
EPA ID: N/R

NWIS

Site Identification Number :	394415075494701
Site Type :	Well
Site Name :	CH 6273
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	363
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 96
Direction: E
Distance: 0.663 mi.
Actual: 3500.467 ft.
Elevation: 0.069 mi. / 365.627 ft.
Relative: Higher

Site Name : 394415075494701
39.73761075,-75.82938330
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395458130
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/10/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/10/2000
Field Water-Level Data End Date :	06/10/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73761075
Longitude :	-75.82938330

Map Id: 97
Direction: ENE
Distance: 0.684 mi.
Actual: 3610.628 ft.
Elevation: 0.055 mi. / 288.392 ft.
Relative: Higher

Site Name : 103652
39.75194, -75.83667
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222242
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103652
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 42 / 6
Licensee :	N/R
Local Well Number :	4744N
Date Drilled :	10/06/1977
Well Depth :	240
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R

Map Id: 97
Direction: ENE
Distance: 0.684 mi.
Actual: 3610.628 ft.
Elevation: 0.055 mi. / 288.392 ft.
Relative: Higher

Site Name : 103652
39.75194, -75.83667
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222242
EPA ID: N/R

WELLS - PA ***(cont.)***

WQ Data :	0
Depth to Bed :	37
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75194
Longitude :	-75.83667
Last Date in Agency List :	03/20/2018

Map Id: 98
Direction: SW
Distance: 0.700 mi.
Actual: 3694.466 ft.
Elevation: 0.081 mi. / 426.001 ft.
Relative: Higher

Site Name : 394314075523601
39.72066620,-75.87632968
MD

Database(s) : [NWIS]

Envirosite ID: 395185585
EPA ID: N/R

NWIS

Site Identification Number :	394314075523601
Site Type :	Well
Site Name :	CE Ae 45
Agency :	U.S. Geological Survey
District :	Maryland
State :	MD
County :	Cecil County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW, MD-PA
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	420.00
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	08/10/1966
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYYNNNN
National Aquifer :	N/R
Local Aquifer :	Pelitic Gneiss of Wissahickon (?) Formation
Local Aquifer Type :	N/R
Well Depth :	85.0
Hole Depth :	85.0
Source of Depth Data :	N/R

Map Id: 98
Direction: SW
Distance: 0.700 mi.
Actual: 3694.466 ft.
Elevation: 0.081 mi. / 426.001 ft.
Relative: Higher

Site Name : 394314075523601
39.72066620,-75.87632968
MD

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395185585
EPA ID: N/R

NWIS ***(cont.)***

Project Number :	N/R
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	08/10/1966
Field Water-Level Data End Date :	08/10/1966
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.72066620
Longitude :	-75.87632968

Map Id: 99
Direction: NW
Distance: 0.704 mi.
Actual: 3715.494 ft.
Elevation: 0.052 mi. / 275.522 ft.
Relative: Higher

Site Name : 394518075521501
39.75511010,-75.87049630
PA

Database(s) : [NWIS]

Envirosite ID: 395454812
EPA ID: N/R

NWIS

Site Identification Number :	394518075521501
Site Type :	Well
Site Name :	CH 6252
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	270
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y

Map Id: 99
Direction: NW
Distance: 0.704 mi.
Actual: 3715.494 ft.
Elevation: 0.052 mi. / 275.522 ft.
Relative: Higher

Site Name : 394518075521501
39.75511010,-75.87049630
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395454812
EPA ID: N/R

NWIS ***(cont.)***

National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	07/22/2000
Field Water-Level Data End Date :	07/22/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75511010
Longitude :	-75.87049630

Map Id: 100
Direction: ENE
Distance: 0.717 mi.
Actual: 3787.683 ft.
Elevation: 0.052 mi. / 276.453 ft.
Relative: Higher

Site Name : 103651
39.75194, -75.83556
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225016
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103651
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 54 / 6
Licensee :	N/R
Local Well Number :	4743N
Date Drilled :	10/05/1977
Well Depth :	260
Static Level :	47
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	49
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: 100
Direction: ENE
Distance: 0.717 mi.
Actual: 3787.683 ft.
Elevation: 0.052 mi. / 276.453 ft.
Relative: Higher

Site Name : 103651
39.75194, -75.83556
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225016
EPA ID: N/R

WELLS - PA ***(cont.)***

Latitude :	39.75194
Longitude :	-75.83556
Last Date in Agency List :	03/20/2018

Map Id: 101
Direction: WSW
Distance: 0.719 mi.
Actual: 3795.127 ft.
Elevation: 0.074 mi. / 388.99 ft.
Relative: Higher

Site Name : 103497
39.72389, -75.88056
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222172
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103497
Owner :	GRAYBERL
Yield GPM :	5
Casing Top :	0 / 52 / 6
Licensee :	KENNETH L MADRON WELL DRILLING CO
Local Well Number :	4654N
Date Drilled :	04/01/1983
Well Depth :	288
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	45
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW
Latitude :	39.72389
Longitude :	-75.88056
Last Date in Agency List :	03/20/2018

Map Id: 102
Direction: NE
Distance: 0.723 mi.
Actual: 3815.444 ft.
Elevation: 0.071 mi. / 376.572 ft.
Relative: Higher

Site Name : 103608
39.75778, -75.84278
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222318
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103608

Map Id: 102
Direction: NE
Distance: 0.723 mi.
Actual: 3815.444 ft.
Elevation: 0.071 mi. / 376.572 ft.
Relative: Higher

Site Name : 103608
39.75778, -75.84278
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222318
EPA ID: N/R

WELLS - PA ***(cont.)***

Owner :	TAITT WM R BLDR
Yield GPM :	20
Casing Top :	0 / 50 / 6
Licensee :	N/R
Local Well Number :	4700N
Date Drilled :	08/12/1981
Well Depth :	292
Static Level :	85
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	44
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75778
Longitude :	-75.84278
Last Date in Agency List :	03/20/2018

Map Id: 103
Direction: NE
Distance: 0.732 mi.
Actual: 3862.674 ft.
Elevation: 0.067 mi. / 351.289 ft.
Relative: Higher

Site Name : 394509075501801
39.75261048,-75.83799488
PA

Database(s) : [NWIS]

Envirosite ID: 395055678
EPA ID: N/R

NWIS

Site Identification Number :	394509075501801
Site Type :	Well
Site Name :	CH 6243
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	352
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 103
Direction: NE
Distance: 0.732 mi.
Actual: 3862.674 ft.
Elevation: 0.067 mi. / 351.289 ft.
Relative: Higher

Site Name : 394509075501801
39.75261048,-75.83799488
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395055678
EPA ID: N/R

NWIS ***(cont.)***

Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/10/2000
Field Water-Level Data End Date :	06/10/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75261048
Longitude :	-75.83799488

Map Id: 104
Direction: WSW
Distance: 0.732 mi.
Actual: 3863.865 ft.
Elevation: 0.072 mi. / 380.817 ft.
Relative: Higher

Site Name : 103515
39.72444, -75.88222
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221888
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103515
Owner :	BOWLSBEY L
Yield GPM :	10
Casing Top :	0 / 56 / 6
Licensee :	N/R
Local Well Number :	4672N
Date Drilled :	04/01/1979
Well Depth :	154
Static Level :	24
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0

Map Id: 104
Direction: WSW
Distance: 0.732 mi.
Actual: 3863.865 ft.
Elevation: 0.072 mi. / 380.817 ft.
Relative: Higher

Site Name : 103515
39.72444, -75.88222
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364221888
EPA ID: N/R

WELLS - PA ***(cont.)***

Depth to Bed :	48
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW
Latitude :	39.72444
Longitude :	-75.88222
Last Date in Agency List :	03/20/2018

Map Id: 105
Direction: E
Distance: 0.733 mi.
Actual: 3871.223 ft.
Elevation: 0.068 mi. / 359.042 ft.
Relative: Higher

Site Name : 394404075494001
39.73455525,-75.82743870
PA

Database(s) : [NWIS]

Envirosite ID: 394713893
EPA ID: N/R

NWIS

Site Identification Number :	394404075494001
Site Type :	Well
Site Name :	CH 6272
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	359
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/10/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241

Map Id: 105
Direction: E
Distance: 0.733 mi.
Actual: 3871.223 ft.
Elevation: 0.068 mi. / 359.042 ft.
Relative: Higher

Site Name : 394404075494001
39.73455525,-75.82743870
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 394713893
EPA ID: N/R

NWIS ***(cont.)***

Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/10/2000
Field Water-Level Data End Date :	06/10/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73455525
Longitude :	-75.82743870

Map Id: H106
Direction: ENE
Distance: 0.742 mi.
Actual: 3918.033 ft.
Elevation: 0.069 mi. / 362.769 ft.
Relative: Higher

Site Name : 103760
39.74917, -75.83167
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222259
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103760
Owner :	STRATTON HERBRT
Yield GPM :	5
Casing Top :	0 / 54 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4006
Date Drilled :	N/R
Well Depth :	153
Static Level :	48
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	48
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.74917
Longitude :	-75.83167
Last Date in Agency List :	03/20/2018

Map Id: H107
Direction: ENE
Distance: 0.742 mi.
Actual: 3918.033 ft.
Elevation: 0.069 mi. / 362.769 ft.
Relative: Higher

Site Name : 103761
39.74917, -75.83167
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364226097
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103761
Owner :	CENTURY BLDR
Yield GPM :	9
Casing Top :	0 / 70 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4007
Date Drilled :	N/R
Well Depth :	120
Static Level :	26
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	60
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	NEWARK WEST
Latitude :	39.74917
Longitude :	-75.83167
Last Date in Agency List :	03/20/2018

Map Id: H108
Direction: ENE
Distance: 0.742 mi.
Actual: 3918.033 ft.
Elevation: 0.069 mi. / 362.769 ft.
Relative: Higher

Site Name : 103762
39.74917, -75.83167
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364335239
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103762
Owner :	CENTURY BLDR 23
Yield GPM :	10
Casing Top :	0 / 55 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4008
Date Drilled :	N/R
Well Depth :	120
Static Level :	22
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	48
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: H108
Direction: ENE
Distance: 0.742 mi.
Actual: 3918.033 ft.
Elevation: 0.069 mi. / 362.769 ft.
Relative: Higher

Site Name : 103762
39.74917, -75.83167
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364335239
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	NEWARK WEST
Latitude :	39.74917
Longitude :	-75.83167
Last Date in Agency List :	03/20/2018

Map Id: 109
Direction: NE
Distance: 0.744 mi.
Actual: 3928.755 ft.
Elevation: 0.071 mi. / 377.438 ft.
Relative: Higher

Site Name : 103607
39.7575, -75.84139
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221960
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103607
Owner :	CERISOLI + MORRISON
Yield GPM :	6
Casing Top :	0 / 60 / 6
Licensee :	N/R
Local Well Number :	4699N
Date Drilled :	01/06/1981
Well Depth :	208
Static Level :	46
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	54
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.7575
Longitude :	-75.84139
Last Date in Agency List :	03/20/2018

Map Id: 110
Direction: NE
Distance: 0.750 mi.
Actual: 3957.773 ft.
Elevation: 0.078 mi. / 409.747 ft.
Relative: Higher

Site Name : 103658
39.75861, -75.84389
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364335236
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103658
Owner :	ROY A
Yield GPM :	15
Casing Top :	0 / 45 / 6
Licensee :	N/R
Local Well Number :	4750N
Date Drilled :	06/19/1978
Well Depth :	200
Static Level :	40
Well Finish :	N/R
Use of Site :	N/R
Use of Water :	N/R
Formation :	N/R
WQ Data :	0
Depth to Bed :	40
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75861
Longitude :	-75.84389
Last Date in Agency List :	03/20/2018

Map Id: 111
Direction: W
Distance: 0.757 mi.
Actual: 3997.717 ft.
Elevation: 0.075 mi. / 394.669 ft.
Relative: Higher

Site Name : 394413075532301
39.73705470,-75.88938580
PA

Database(s) : [NWIS]

Envirosite ID: 395613286
EPA ID: N/R

NWIS

Site Identification Number :	394413075532301
Site Type :	Well
Site Name :	CH 6376
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	403
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 111
Direction: W
Distance: 0.757 mi.
Actual: 3997.717 ft.
Elevation: 0.075 mi. / 394.669 ft.
Relative: Higher

Site Name : 394413075532301
39.73705470,-75.88938580
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395613286
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	08/05/2000
Field Water-Level Data End Date :	08/05/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73705470
Longitude :	-75.88938580

Map Id: 112
Direction: ENE
Distance: 0.765 mi.
Actual: 4038.596 ft.
Elevation: 0.067 mi. / 353.051 ft.
Relative: Higher

Site Name : 394447075495201
39.74649950,-75.83077230
PA

Database(s) : [NWIS]

Envirosite ID: 395459286
EPA ID: N/R

NWIS

Site Identification Number :	394447075495201
Site Type :	Well
Site Name :	CH 6300
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	362
Method Altitude Determined :	Interpolated from topographic map.

Map Id: 112
Direction: ENE
Distance: 0.765 mi.
Actual: 4038.596 ft.
Elevation: 0.067 mi. / 353.051 ft.
Relative: Higher

Site Name : 394447075495201
39.74649950,-75.83077230
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395459286
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/12/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	460
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/12/2000
Field Water-Level Data End Date :	06/12/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74649950
Longitude :	-75.83077230

Map Id: 113
Direction: NE
Distance: 0.778 mi.
Actual: 4110.428 ft.
Elevation: 0.068 mi. / 360.381 ft.
Relative: Higher

Site Name : 103606
39.7575, -75.84028
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225206
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103606
Owner :	HANNON C
Yield GPM :	4
Casing Top :	0 / 45 / 6
Licensee :	N/R
Local Well Number :	4698N
Date Drilled :	10/15/1981

Map Id: 113
Direction: NE
Distance: 0.778 mi.
Actual: 4110.428 ft.
Elevation: 0.068 mi. / 360.381 ft.
Relative: Higher

Site Name : 103606
39.7575, -75.84028
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225206
EPA ID: N/R

WELLS - PA ***(cont.)***

Well Depth :	208
Static Level :	57
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	38
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.7575
Longitude :	-75.84028
Last Date in Agency List :	03/20/2018

Map Id: 114
Direction: ENE
Distance: 0.793 mi.
Actual: 4188.655 ft.
Elevation: 0.057 mi. / 299.17 ft.
Relative: Higher

Site Name : 103650
39.7525, -75.83417
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225273
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103650
Owner :	KIMBELOT CORP
Yield GPM :	10
Casing Top :	0 / 50 / 6
Licensee :	N/R
Local Well Number :	4742N
Date Drilled :	10/05/1977
Well Depth :	220
Static Level :	35
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	45
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.7525
Longitude :	-75.83417
Last Date in Agency List :	03/20/2018

Map Id: 115
Direction: NE
Distance: 0.798 mi.
Actual: 4211.093 ft.
Elevation: 0.076 mi. / 401.585 ft.
Relative: Higher

Site Name : 103657
39.75889, -75.8425
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222328
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103657
Owner :	ROY A
Yield GPM :	7
Casing Top :	0 / 42 / 6
Licensee :	N/R
Local Well Number :	4749N
Date Drilled :	06/20/1978
Well Depth :	200
Static Level :	50
Well Finish :	N/R
Use of Site :	N/R
Use of Water :	N/R
Formation :	N/R
WQ Data :	0
Depth to Bed :	37
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75889
Longitude :	-75.8425
Last Date in Agency List :	03/20/2018

Map Id: 116
Direction: ENE
Distance: 0.798 mi.
Actual: 4215.449 ft.
Elevation: 0.068 mi. / 358.537 ft.
Relative: Higher

Site Name : 394454075495501
39.74844395,-75.83160560
PA

Database(s) : [NWIS]

Envirosite ID: 395177732
EPA ID: N/R

NWIS

Site Identification Number :	394454075495501
Site Type :	Well
Site Name :	CH 6310
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	348
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 116
Direction: ENE
Distance: 0.798 mi.
Actual: 4215.449 ft.
Elevation: 0.068 mi. / 358.537 ft.
Relative: Higher

Site Name : 394454075495501
39.74844395,-75.83160560
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395177732
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/10/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	125
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/10/2000
Field Water-Level Data End Date :	06/10/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74844395
Longitude :	-75.83160560

Map Id: 117
Direction: NE
Distance: 0.816 mi.
Actual: 4307.060 ft.
Elevation: 0.064 mi. / 336.112 ft.
Relative: Higher

Site Name : 103605
39.7575, -75.83917
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225113
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103605
Owner :	HANNON C
Yield GPM :	6
Casing Top :	0 / 52 / 6
Licensee :	N/R
Local Well Number :	4697N
Date Drilled :	02/10/1982
Well Depth :	208
Static Level :	47
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R

Map Id: 117
Direction: NE
Distance: 0.816 mi.
Actual: 4307.060 ft.
Elevation: 0.064 mi. / 336.112 ft.
Relative: Higher

Site Name : 103605
39.7575, -75.83917
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364225113
EPA ID: N/R

WELLS - PA ***(cont.)***

WQ Data :	0
Depth to Bed :	40
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.7575
Longitude :	-75.83917
Last Date in Agency List :	03/20/2018

Map Id: 118
Direction: W
Distance: 0.826 mi.
Actual: 4359.306 ft.
Elevation: 0.074 mi. / 391.427 ft.
Relative: Higher

Site Name : 103571
39.74222, -75.88944
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225329
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103571
Owner :	MCKINNEY HOWARD
Yield GPM :	12
Casing Top :	0 / 43 / 6
Licensee :	BROWN BROS DRILLING INC
Local Well Number :	X 4129
Date Drilled :	N/R
Well Depth :	83
Static Level :	25
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	39
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW
Latitude :	39.74222
Longitude :	-75.88944
Last Date in Agency List :	03/20/2018

Map Id: 119
Direction: NE
Distance: 0.828 mi.
Actual: 4371.519 ft.
Elevation: 0.061 mi. / 322.126 ft.
Relative: Higher

Site Name : 103603
39.75694, -75.83806
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222195
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103603
Owner :	TAITT BLDRS
Yield GPM :	12
Casing Top :	0 / 20 / 6
Licensee :	N/R
Local Well Number :	4695N
Date Drilled :	06/03/1982
Well Depth :	128
Static Level :	16
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	9
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75694
Longitude :	-75.83806
Last Date in Agency List :	03/20/2018

Map Id: 120
Direction: ENE
Distance: 0.832 mi.
Actual: 4392.645 ft.
Elevation: 0.062 mi. / 328.173 ft.
Relative: Higher

Site Name : 103649
39.75139, -75.83167
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221912
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103649
Owner :	KIMBELOT CORP
Yield GPM :	40
Casing Top :	0 / 104 / 6
Licensee :	N/R
Local Well Number :	4741N
Date Drilled :	10/13/1977
Well Depth :	240
Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	99
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: 120
Direction: ENE
Distance: 0.832 mi.
Actual: 4392.645 ft.
Elevation: 0.062 mi. / 328.173 ft.
Relative: Higher

Site Name : 103649
39.75139, -75.83167
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364221912
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	WEST GROVE
Latitude :	39.75139
Longitude :	-75.83167
Last Date in Agency List :	03/20/2018

Map Id: 121
Direction: NE
Distance: 0.853 mi.
Actual: 4503.747 ft.
Elevation: 0.076 mi. / 398.885 ft.
Relative: Higher

Site Name : 394526075503101
39.75733257,-75.84160630
PA

Database(s) : [NWIS]

Envirosite ID: 395467273
EPA ID: N/R

NWIS

Site Identification Number :	394526075503101
Site Type :	Well
Site Name :	CH 6256
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	405
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R

Map Id: 121
Direction: NE
Distance: 0.853 mi.
Actual: 4503.747 ft.
Elevation: 0.076 mi. / 398.885 ft.
Relative: Higher

Site Name : 394526075503101
39.75733257,-75.84160630
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395467273
EPA ID: N/R

NWIS ***(cont.)***

Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/05/2000
Field Water-Level Data End Date :	06/05/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75733257
Longitude :	-75.84160630

Map Id: 122
Direction: ENE
Distance: 0.866 mi.
Actual: 4572.236 ft.
Elevation: 0.061 mi. / 321.48 ft.
Relative: Higher

Site Name : 103647
39.75333, -75.83333
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225015
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103647
Owner :	KIMBELOT CORP
Yield GPM :	7
Casing Top :	0 / 74 / 6
Licensee :	N/R
Local Well Number :	4739N
Date Drilled :	03/28/1978
Well Depth :	240
Static Level :	70
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	69
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75333
Longitude :	-75.83333
Last Date in Agency List :	03/20/2018

Map Id: 123
Direction: WNW
Distance: 0.878 mi.
Actual: 4634.315 ft.
Elevation: 0.07 mi. / 367.507 ft.
Relative: Higher

Site Name : 394433075532201
39.74261017,-75.88910800
PA

Database(s) : [NWIS]

Envirosite ID: 395958529
EPA ID: N/R

NWIS

Site Identification Number :	394433075532201
Site Type :	Well
Site Name :	CH 1783
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	370
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	20
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	N/R
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	06/02/1972
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYYNNNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	83
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	N/R
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	10/15/1974
Water-Quality Data End Date :	10/15/1974
Water-Quality Data Count :	1
Field Water-Level Data Begin Date :	06/02/1972
Field Water-Level Data End Date :	06/02/1972
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74261017
Longitude :	-75.88910800

Map Id: 124
Direction: NE
Distance: 0.884 mi.
Actual: 4670.045 ft.
Elevation: 0.066 mi. / 348.711 ft.
Relative: Higher

Site Name : 103602
39.75722, -75.83694
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225104
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103602
Owner :	TAITT BLDRS
Yield GPM :	12
Casing Top :	0 / 43 / 6
Licensee :	N/R
Local Well Number :	4694N
Date Drilled :	12/02/1982
Well Depth :	208
Static Level :	38
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	34
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75722
Longitude :	-75.83694
Last Date in Agency List :	03/20/2018

Map Id: 125
Direction: E
Distance: 0.891 mi.
Actual: 4705.150 ft.
Elevation: 0.065 mi. / 343.698 ft.
Relative: Higher

Site Name : 394403075492901
39.73427750,-75.82438300
PA

Database(s) : [NWIS]

Envirosite ID: 395000402
EPA ID: N/R

NWIS

Site Identification Number :	394403075492901
Site Type :	Well
Site Name :	CH 6271
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	342
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 125
Direction: E
Distance: 0.891 mi.
Actual: 4705.150 ft.
Elevation: 0.065 mi. / 343.698 ft.
Relative: Higher

Site Name : 394403075492901
39.73427750,-75.82438300
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395000402
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/07/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/07/2000
Field Water-Level Data End Date :	06/07/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73427750
Longitude :	-75.82438300

Map Id: 126
Direction: ENE
Distance: 0.892 mi.
Actual: 4710.891 ft.
Elevation: 0.066 mi. / 347.877 ft.
Relative: Higher

Site Name : 394503075495701
39.75094390,-75.83216130
PA

Database(s) : [NWIS]

Envirosite ID: 395466628
EPA ID: N/R

NWIS

Site Identification Number :	394503075495701
Site Type :	Well
Site Name :	CH 6242
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	347
Method Altitude Determined :	Interpolated from topographic map.

Map Id: 126
Direction: ENE
Distance: 0.892 mi.
Actual: 4710.891 ft.
Elevation: 0.066 mi. / 347.877 ft.
Relative: Higher

Site Name : 394503075495701
39.75094390,-75.83216130
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395466628
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1980
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/10/2000
Field Water-Level Data End Date :	06/10/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75094390
Longitude :	-75.83216130

Map Id: I127
Direction: ENE
Distance: 0.905 mi.
Actual: 4779.699 ft.
Elevation: 0.074 mi. / 391.883 ft.
Relative: Higher

Site Name : 394451075494401
39.74761065,-75.82854990
PA

Database(s) : [NWIS]

Envirosite ID: 395613660
EPA ID: N/R

NWIS

Site Identification Number :	394451075494401
Site Type :	Well
Site Name :	CH 6299
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County

Map Id: I127
Direction: ENE
Distance: 0.905 mi.
Actual: 4779.699 ft.
Elevation: 0.074 mi. / 391.883 ft.
Relative: Higher

Site Name : 394451075494401
39.74761065,-75.82854990
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395613660
EPA ID: N/R

NWIS ***(cont.)***

Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	395
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/10/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/10/2000
Field Water-Level Data End Date :	06/10/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74761065
Longitude :	-75.82854990

Map Id: I128
Direction: ENE
Distance: 0.908 mi.
Actual: 4796.452 ft.
Elevation: 0.073 mi. / 385.01 ft.
Relative: Higher

Site Name : 103668
39.75028, -75.82889
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222246
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103668

Map Id: I128
Direction: ENE
Distance: 0.908 mi.
Actual: 4796.452 ft.
Elevation: 0.073 mi. / 385.01 ft.
Relative: Higher

Site Name : 103668
39.75028, -75.82889
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222246
EPA ID: N/R

WELLS - PA ***(cont.)***

Owner :	WOODARD N
Yield GPM :	7
Casing Top :	0 / 43 / 6
Licensee :	KENNETH L MADRON WELL DRILLING CO
Local Well Number :	4760N
Date Drilled :	05/01/1979
Well Depth :	208
Static Level :	0
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	38
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75028
Longitude :	-75.82889
Last Date in Agency List :	03/20/2018

Map Id: J129
Direction: NE
Distance: 0.909 mi.
Actual: 4798.622 ft.
Elevation: 0.06 mi. / 317.293 ft.
Relative: Higher

Site Name : 103646
39.75556, -75.83472
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222224
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103646
Owner :	KIMBELOT CORP
Yield GPM :	8
Casing Top :	0 / 75 / 6
Licensee :	N/R
Local Well Number :	4738N
Date Drilled :	10/12/1977
Well Depth :	320
Static Level :	90
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	70
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE

Map Id: J129
Direction: NE
Distance: 0.909 mi.
Actual: 4798.622 ft.
Elevation: 0.06 mi. / 317.293 ft.
Relative: Higher

Site Name : 103646
39.75556, -75.83472
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222224
EPA ID: N/R

WELLS - PA ***(cont.)***

Latitude :	39.75556
Longitude :	-75.83472
Last Date in Agency List :	03/20/2018

Map Id: 130
Direction: NE
Distance: 0.913 mi.
Actual: 4820.864 ft.
Elevation: 0.078 mi. / 412.651 ft.
Relative: Higher

Site Name : 394530075503001
39.75833330,-75.84166670
PA

Database(s) : [NWIS]

Envirosite ID: 395460724
EPA ID: N/R

NWIS

Site Identification Number :	394530075503001
Site Type :	Well
Site Name :	CH 5433
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	411
Method Altitude Determined :	Differentially corrected Global Positioning System.
Altitude Accuracy :	10
Altitude Datum :	North American Vertical Datum of 1988
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	NANONNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	01/01/1998
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	NNNYNNNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation
Local Aquifer Type :	Unconfined single aquifer
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444227500
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	07/14/1998
Water-Quality Data End Date :	07/14/1998

Map Id: 130
Direction: NE
Distance: 0.913 mi.
Actual: 4820.864 ft.
Elevation: 0.078 mi. / 412.651 ft.
Relative: Higher

Site Name : 394530075503001
39.75833330,-75.84166670
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395460724
EPA ID: N/R

NWIS ***(cont.)***

Water-Quality Data Count :	1
Field Water-Level Data Begin Date :	N/R
Field Water-Level Data End Date :	N/R
Field Water-Level Data Count :	0
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75833330
Longitude :	-75.84166670

Map Id: 131
Direction: W
Distance: 0.916 mi.
Actual: 4839.019 ft.
Elevation: 0.074 mi. / 389.8 ft.
Relative: Higher

Site Name : 103577
39.74083, -75.89194
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222280
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103577
Owner :	MALONEY JOHN
Yield GPM :	2
Casing Top :	0 / 20 / 6
Licensee :	R WALTER SLAUCH & SONS
Local Well Number :	X 4135
Date Drilled :	N/R
Well Depth :	253
Static Level :	24
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	STOCK
Formation :	OLIGOCLASE MICA SCHIST-WISSAHICKON FORMATION
WQ Data :	0
Depth to Bed :	13
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW
Latitude :	39.74083
Longitude :	-75.89194
Last Date in Agency List :	03/20/2018

Map Id: 132
Direction: NNW
Distance: 0.919 mi.
Actual: 4853.684 ft.
Elevation: 0.049 mi. / 258.996 ft.
Relative: Higher

Site Name : 394527075515601
39.75761010,-75.86521839
PA

Database(s) : [NWIS]

Envirosite ID: 395100672
EPA ID: N/R

NWIS

Site Identification Number :	394527075515601
Site Type :	Well
Site Name :	CH 5450
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	265
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Brandywine-Christina
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	08/17/1999
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYYNYNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Pegmatite
Local Aquifer Type :	N/R
Well Depth :	302
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200342
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	09/11/2000
Water-Quality Data End Date :	09/13/2000
Water-Quality Data Count :	2
Field Water-Level Data Begin Date :	09/11/2000
Field Water-Level Data End Date :	09/11/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75761010
Longitude :	-75.86521839

Map Id: 133
Direction: WNW
Distance: 0.922 mi.
Actual: 4869.400 ft.
Elevation: 0.079 mi. / 415.709 ft.
Relative: Higher

Site Name : 394512075530201
39.75333330,-75.88388889
PA

Database(s) : [NWIS]

Envirosite ID: 395481190
EPA ID: N/R

NWIS

Site Identification Number :	394512075530201
Site Type :	Well
Site Name :	CH 6145
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	OXFORD
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	420
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hilltop
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	05/27/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	330
Hole Depth :	N/R
Source of Depth Data :	D
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	05/27/2000
Field Water-Level Data End Date :	05/27/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75333330
Longitude :	-75.88388889

Map Id: 134
Direction: ENE
Distance: 0.924 mi.
Actual: 4877.183 ft.
Elevation: 0.073 mi. / 384.347 ft.
Relative: Higher

Site Name : 394445075493901
39.74594400,-75.82716099
PA

Database(s) : [NWIS]

Envirosite ID: 395001288
EPA ID: N/R

NWIS

Site Identification Number :	394445075493901
Site Type :	Well
Site Name :	CH 6298
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	389
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1972
Date Site Established or Inventoried:	06/07/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	130
Hole Depth :	N/R
Source of Depth Data :	O
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/07/2000
Field Water-Level Data End Date :	06/07/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74594400
Longitude :	-75.82716099

Map Id: 135
Direction: ENE
Distance: 0.933 mi.
Actual: 4928.656 ft.
Elevation: 0.068 mi. / 356.772 ft.
Relative: Higher

Site Name : 103645
39.75389, -75.83222
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364225209
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103645
Owner :	KIMBELOT CORP
Yield GPM :	40
Casing Top :	0 / 70 / 6
Licensee :	N/R
Local Well Number :	4737N
Date Drilled :	03/25/1978
Well Depth :	340
Static Level :	100
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	65
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75389
Longitude :	-75.83222
Last Date in Agency List :	03/20/2018

Map Id: 136
Direction: NE
Distance: 0.937 mi.
Actual: 4945.893 ft.
Elevation: 0.072 mi. / 378.967 ft.
Relative: Higher

Site Name : 103604
39.75889, -75.83778
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221957
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103604
Owner :	HANNON C
Yield GPM :	6
Casing Top :	0 / 42 / 6
Licensee :	KENNETH L MADRON WELL DRILLING CO
Local Well Number :	4696N
Date Drilled :	02/01/1980
Well Depth :	126
Static Level :	0
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	37
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: 136
Direction: NE
Distance: 0.937 mi.
Actual: 4945.893 ft.
Elevation: 0.072 mi. / 378.967 ft.
Relative: Higher

Site Name : 103604
39.75889, -75.83778
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364221957
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	WEST GROVE
Latitude :	39.75889
Longitude :	-75.83778
Last Date in Agency List :	03/20/2018

Map Id: K137
Direction: ENE
Distance: 0.938 mi.
Actual: 4952.628 ft.
Elevation: 0.064 mi. / 336.663 ft.
Relative: Higher

Site Name : 103648
39.7525, -75.83028
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222236
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103648
Owner :	KIMBELOT CORP
Yield GPM :	20
Casing Top :	0 / 63 / 6
Licensee :	N/R
Local Well Number :	4740N
Date Drilled :	02/01/1980
Well Depth :	300
Static Level :	60
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	58
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.7525
Longitude :	-75.83028
Last Date in Agency List :	03/20/2018

Map Id: 138
Direction: NE
Distance: 0.946 mi.
Actual: 4993.457 ft.
Elevation: 0.075 mi. / 397.795 ft.
Relative: Higher

Site Name : 103600
39.76028, -75.84
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222253
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103600
Owner :	BROWN J
Yield GPM :	6
Casing Top :	0 / 63 / 6
Licensee :	GURVIS B JONES
Local Well Number :	4692N
Date Drilled :	09/01/1982
Well Depth :	250
Static Level :	68
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	50
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.76028
Longitude :	-75.84
Last Date in Agency List :	03/20/2018

Map Id: 139
Direction: E
Distance: 0.947 mi.
Actual: 5001.656 ft.
Elevation: 0.064 mi. / 338.74 ft.
Relative: Higher

Site Name : 394350075492501
39.73019444,-75.82302778
PA

Database(s) : [NWIS]

Envirosite ID: 395185812
EPA ID: N/R

NWIS

Site Identification Number :	394350075492501
Site Type :	Well
Site Name :	CH 6295
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	341
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: 139
Direction: E
Distance: 0.947 mi.
Actual: 5001.656 ft.
Elevation: 0.064 mi. / 338.74 ft.
Relative: Higher

Site Name : 394350075492501
39.73019444,-75.82302778
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395185812
EPA ID: N/R

NWIS ***(cont.)***

Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	1978
Date Site Established or Inventoried:	06/27/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYY Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	160
Hole Depth :	N/R
Source of Depth Data :	D
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/27/2000
Field Water-Level Data End Date :	06/14/2005
Field Water-Level Data Count :	2
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73019444
Longitude :	-75.82302778

Map Id: 140
Direction: E
Distance: 0.951 mi.
Actual: 5021.679 ft.
Elevation: 0.066 mi. / 351.076 ft.
Relative: Higher

Site Name : 394401075492301
39.73361110,-75.82311110
PA

Database(s) : [NWIS]

Envirosite ID: 395214153
EPA ID: N/R

NWIS

Site Identification Number :	394401075492301
Site Type :	Well
Site Name :	CH 6484
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	NEWARK WEST
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	350
Method Altitude Determined :	Interpolated from topographic map.

Map Id: 140
Direction: E
Distance: 0.951 mi.
Actual: 5021.679 ft.
Elevation: 0.066 mi. / 351.076 ft.
Relative: Higher

Site Name : 394401075492301
39.73361110,-75.82311110
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395214153
EPA ID: N/R

NWIS ***(cont.)***

Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Brandywine-Christina
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/14/2005
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	247600261
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/14/2005
Field Water-Level Data End Date :	06/14/2005
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73361110
Longitude :	-75.82311110

Map Id: J141
Direction: NE
Distance: 0.956 mi.
Actual: 5048.651 ft.
Elevation: 0.059 mi. / 310.791 ft.
Relative: Higher

Site Name : 103644
39.75583, -75.83389
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221983
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103644
Owner :	KIMBELOT CORP
Yield GPM :	5
Casing Top :	0 / 55 / 6
Licensee :	N/R
Local Well Number :	4736N
Date Drilled :	07/15/1978

Map Id: J141
Direction: NE
Distance: 0.956 mi.
Actual: 5048.651 ft.
Elevation: 0.059 mi. / 310.791 ft.
Relative: Higher

Site Name : 103644
39.75583, -75.83389
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364221983
EPA ID: N/R

WELLS - PA ***(cont.)***

Well Depth :	320
Static Level :	60
Well Finish :	N/R
Use of Site :	N/R
Use of Water :	N/R
Formation :	N/R
WQ Data :	0
Depth to Bed :	50
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75583
Longitude :	-75.83389
Last Date in Agency List :	03/20/2018

Map Id: 142
Direction: NNW
Distance: 0.964 mi.
Actual: 5088.811 ft.
Elevation: 0.058 mi. / 304.229 ft.
Relative: Higher

Site Name : 394531075520501
39.75872117,-75.86771850
PA

Database(s) : [NWIS]

Envirosite ID: 395460748
EPA ID: N/R

NWIS

Site Identification Number :	394531075520501
Site Type :	Well
Site Name :	CH 6250
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	297
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/03/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y

Map Id: 142
Direction: NNW
Distance: 0.964 mi.
Actual: 5088.811 ft.
Elevation: 0.058 mi. / 304.229 ft.
Relative: Higher

Site Name : 394531075520501
39.75872117,-75.86771850
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395460748
EPA ID: N/R

NWIS ***(cont.)***

National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/03/2000
Field Water-Level Data End Date :	06/03/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75872117
Longitude :	-75.86771850

Map Id: K143
Direction: ENE
Distance: 0.964 mi.
Actual: 5089.963 ft.
Elevation: 0.065 mi. / 342.254 ft.
Relative: Higher

Site Name : 394502075494901
39.75066615,-75.82993890
PA

Database(s) : [NWIS]

Envirosite ID: 395613786
EPA ID: N/R

NWIS

Site Identification Number :	394502075494901
Site Type :	Well
Site Name :	CH 6241
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	367
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

Map Id: K143
Direction: ENE
Distance: 0.964 mi.
Actual: 5089.963 ft.
Elevation: 0.065 mi. / 342.254 ft.
Relative: Higher

Site Name : 394502075494901
39.75066615,-75.82993890
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395613786
EPA ID: N/R

NWIS ***(cont.)***

Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/12/2000
Field Water-Level Data End Date :	06/12/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75066615
Longitude :	-75.82993890

Map Id: 144
Direction: W
Distance: 0.979 mi.
Actual: 5167.631 ft.
Elevation: 0.069 mi. / 363.652 ft.
Relative: Higher

Site Name : 394354075533901
39.73177700,-75.89383040
PA

Database(s) : [NWIS]

Envirosite ID: 395451636
EPA ID: N/R

NWIS

Site Identification Number :	394354075533901
Site Type :	Well
Site Name :	CH 6377
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	362
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10

Map Id: 144
Direction: W
Distance: 0.979 mi.
Actual: 5167.631 ft.
Elevation: 0.069 mi. / 363.652 ft.
Relative: Higher

Site Name : 394354075533901
39.73177700,-75.89383040
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 395451636
EPA ID: N/R

NWIS ***(cont.)***

Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/13/2000
Field Water-Level Data End Date :	06/13/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.73177700
Longitude :	-75.89383040

Map Id: L145
Direction: WSW
Distance: 0.979 mi.
Actual: 5167.753 ft.
Elevation: 0.071 mi. / 377.018 ft.
Relative: Higher

Site Name : 103517
39.72833, -75.89167
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222223
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103517
Owner :	DUPONT P
Yield GPM :	10
Casing Top :	0 / 115 / 6
Licensee :	N/R
Local Well Number :	4674N
Date Drilled :	06/27/1978
Well Depth :	355

Map Id: L145
Direction: WSW
Distance: 0.979 mi.
Actual: 5167.753 ft.
Elevation: 0.071 mi. / 377.018 ft.
Relative: Higher

Site Name : 103517
39.72833, -75.89167
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222223
EPA ID: N/R

WELLS - PA ***(cont.)***

Static Level :	40
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	0
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW
Latitude :	39.72833
Longitude :	-75.89167
Last Date in Agency List :	03/20/2018

Map Id: 146
Direction: ENE
Distance: 0.979 mi.
Actual: 5170.636 ft.
Elevation: 0.069 mi. / 364.518 ft.
Relative: Higher

Site Name : 103639
39.75361, -75.83056
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364221909
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103639
Owner :	BOYLE E
Yield GPM :	6
Casing Top :	0 / 60 / 6
Licensee :	N/R
Local Well Number :	4731N
Date Drilled :	10/09/1981
Well Depth :	260
Static Level :	80
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	55
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.
Quad Boundary :	WEST GROVE
Latitude :	39.75361
Longitude :	-75.83056
Last Date in Agency List :	03/20/2018

Map Id: 147
Direction: W
Distance: 0.983 mi.
Actual: 5191.492 ft.
Elevation: 0.079 mi. / 415.997 ft.
Relative: Higher

Site Name : 394426075533501
39.74041667,-75.89250000
PA

Database(s) : [NWIS]

Envirosite ID: 395958513
EPA ID: N/R

NWIS

Site Identification Number :	394426075533501
Site Type :	Well
Site Name :	CH 4931
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	BAY VIEW
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	410
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Flat surface
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	199211
Date Site Established or Inventoried:	12/15/1993
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YYYYNYNN
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation
Local Aquifer Type :	Unconfined single aquifer
Well Depth :	132
Hole Depth :	N/R
Source of Depth Data :	D
Project Number :	444220700
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	07/21/1994
Water-Quality Data End Date :	11/27/2000
Water-Quality Data Count :	2
Field Water-Level Data Begin Date :	12/15/1993
Field Water-Level Data End Date :	07/21/1994
Field Water-Level Data Count :	3
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.74041667
Longitude :	-75.89250000

Map Id: 148
Direction: NNW
Distance: 0.992 mi.
Actual: 5237.815 ft.
Elevation: 0.062 mi. / 325.154 ft.
Relative: Higher

Site Name : 394533075521201
39.75927670,-75.86966300
PA

Database(s) : [NWIS]

Envirosite ID: 395179231
EPA ID: N/R

NWIS

Site Identification Number :	394533075521201
Site Type :	Well
Site Name :	CH 6251
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	328
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	5
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Chester-Sassafras
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	06/03/2000
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R
Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/03/2000
Field Water-Level Data End Date :	06/03/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75927670
Longitude :	-75.86966300

Map Id: 149
Direction: W
Distance: 0.994 mi.
Actual: 5247.878 ft.
Elevation: 0.062 mi. / 329.541 ft.
Relative: Higher

Site Name : 103491
39.73278, -75.89389
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364224905
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103491
Owner :	BUCHANAN MARSHALL
Yield GPM :	10
Casing Top :	0 / 78 / 6
Licensee :	N/R
Local Well Number :	4648N
Date Drilled :	09/25/1984
Well Depth :	135
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	72
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW
Latitude :	39.73278
Longitude :	-75.89389
Last Date in Agency List :	03/20/2018

Map Id: 150
Direction: NE
Distance: 0.995 mi.
Actual: 5254.846 ft.
Elevation: 0.079 mi. / 416.913 ft.
Relative: Higher

Site Name : 103599
39.76111, -75.84
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222190
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103599
Owner :	MADRON L
Yield GPM :	15
Casing Top :	0 / 55 / 6
Licensee :	KENNETH L MADRON WELL DRILLING CO
Local Well Number :	4691N
Date Drilled :	08/01/1984
Well Depth :	148
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	48
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	FRANKLIN TWP.

Map Id: 150
Direction: NE
Distance: 0.995 mi.
Actual: 5254.846 ft.
Elevation: 0.079 mi. / 416.913 ft.
Relative: Higher

Site Name : 103599
39.76111, -75.84
PA

Database(s) : [WELLS - PA] ***(cont.)***

Envirosite ID: 364222190
EPA ID: N/R

WELLS - PA ***(cont.)***

Quad Boundary :	WEST GROVE
Latitude :	39.76111
Longitude :	-75.84
Last Date in Agency List :	03/20/2018

Map Id: 151
Direction: NE
Distance: 0.997 mi.
Actual: 5261.573 ft.
Elevation: 0.075 mi. / 398.399 ft.
Relative: Higher

Site Name : 394526075501401
39.75733260,-75.83688388
PA

Database(s) : [NWIS]

Envirosite ID: 394836647
EPA ID: N/R

NWIS

Site Identification Number :	394526075501401
Site Type :	Well
Site Name :	CH 6255
Agency :	U.S. Geological Survey
District :	Pennsylvania
State :	PA
County :	Chester County
Country :	USA
Land Net Location Code :	N/R
Name of Location Map :	WEST GROVE
Scale of Location Map :	24000
Altitude of Gage/Land Surface :	391
Method Altitude Determined :	Interpolated from topographic map.
Altitude Accuracy :	10
Altitude Datum :	National Geodetic Vertical Datum of 1929
Hydrologic Unit :	Brandywine-Christina
Drainage Basin :	N/R
Topographic Setting :	Hillside
Data Types :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Instruments :	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
Date of First Construction :	N/R
Date Site Established or Inventoried:	N/R
Drainage Area :	N/R
Contributing Drainage Area :	N/R
Data Reliability :	Data have been checked by the reporting agency.
Data-other GW Files :	YY Y Y
National Aquifer :	Piedmont and Blue Ridge crystalline-rock aquifers
Local Aquifer :	Wissahickon Formation, Oligoclase Mica Schist
Local Aquifer Type :	N/R
Well Depth :	N/R
Hole Depth :	N/R
Source of Depth Data :	N/R
Project Number :	444200241
Real-Time Data Flag :	0
Peak-Streamflow Data Begin Date :	N/R
Peak-Streamflow Data End Date :	N/R
Peak-Streamflow Data Count :	0
Water-Quality Data Begin Date :	N/R

Map Id: 151
Direction: NE
Distance: 0.997 mi.
Actual: 5261.573 ft.
Elevation: 0.075 mi. / 398.399 ft.
Relative: Higher

Site Name : 394526075501401
39.75733260,-75.83688388
PA

Database(s) : [NWIS] ***(cont.)***

Envirosite ID: 394836647
EPA ID: N/R

NWIS ***(cont.)***

Water-Quality Data End Date :	N/R
Water-Quality Data Count :	0
Field Water-Level Data Begin Date :	06/05/2000
Field Water-Level Data End Date :	06/05/2000
Field Water-Level Data Count :	1
Site-Visit Data Begin Date :	N/R
Site-Visit Data End Date :	N/R
Site-Visit Data Count :	0
Latitude :	39.75733260
Longitude :	-75.83688388

Map Id: L152
Direction: WSW
Distance: 0.999 mi.
Actual: 5276.108 ft.
Elevation: 0.072 mi. / 379.186 ft.
Relative: Higher

Site Name : 103510
39.72861, -75.89222
PA

Database(s) : [WELLS - PA]

Envirosite ID: 364222217
EPA ID: N/R

WELLS - PA

PAGWIS ID :	103510
Owner :	PEAK J
Yield GPM :	3
Casing Top :	0 / 40 / 6
Licensee :	N/R
Local Well Number :	4667N
Date Drilled :	06/01/1980
Well Depth :	172
Static Level :	30
Well Finish :	OPEN HOLE
Use of Site :	WITHDRAWAL
Use of Water :	DOMESTIC
Formation :	N/R
WQ Data :	0
Depth to Bed :	34
Site Type :	WELL
Elevation :	0
County :	CHESTER
Municipality :	ELK TWP.
Quad Boundary :	BAY VIEW
Latitude :	39.72861
Longitude :	-75.89222
Last Date in Agency List :	03/20/2018

RADON DATA:

STATE SOURCE: No Available Data

FEDERAL AREA RADON INFORMATION FOR: CHESTER PA

NUMBER OF SAMPLE SITES: 33

Area:	Average Activity:	% <4 pCi/L:	% 4-20 pCi/L:	% >20 pCi/L:
basement	10.7643 pCi/L	57.14%	25%	17.86%
first floor	2.1 pCi/L	100%	0%	0%

INACTIVE PCS
Inactive Permit Compliance Facilities
Environmental Protection Agency
(202) 564-6582
Inactive Permitted facilities to discharge wastewater

NWIS
National Water Information Systems
United States Geological Society
(703) 648-5953
Information on all water resources for the United States. This database contains all current and historical data for the nation.

PCS ENF
Enforced Permit Compliance Facilities
Environmental Protection Agency
(202) 564-6582
Permitted facilities to discharge wastewater (Federal equivalent to NPDES)

PCS FACILITY
Permit Compliance Facilities
Environmental Protection Agency
(202) 564-6582
Permitted facilities to discharge wastewater (Federal equivalent to NPDES)

PWS
Public Water Supply
Environmental Protection Agency
(800) 426-4791
Safe drinking water information Systems

PWS ENF
Public Water Supply locations with Enforcement Violations
Environmental Protection Agency
(800) 426-4791
Safe drinking water information Systems with enforcememnt violations

STORMWATER
Storm Water Permits
Environmental Protection Agency
(202) 566-1667
Permitted storm water sites

NPDES - PA
National Pollutant Discharge Elimination System
Department of Environmental Protection
(717) 787-2043
Inventory of NPDES Permits

WELLS - PA
Water Well Locations
DEPARTMENT OF ENVIRONMENTAL PROTECTION
(717)772-2199
PAGWIS Well Water Well Inventory

FLOOD Q3
Flood data
Environmental Protection Agency
(202) 566-1667
Q3 Flood Data

HYDROLOGIC UNIT
Hydrologic Unit Maps
USGS
The United States Geological Survey created a hierarchical system of hydrologic units originally called regions, sub-regions, accounting units, and cataloging units. Each unit was assigned a unique Hydrologic Unit Code (HUC). As first implemented the system had 21 regions, 221 subregions, 378 accounting units, and 2,264 cataloging units. Over time the system was changed and expanded. As of 2010 there are six levels in the hierarchy, represented by hydrologic unit codes from 2 to 12 digits long, called regions, subregions, basins, subbasins, watersheds, and subwatersheds. The table below describes the system's hydrologic unit levels and their characteristics, along with example names and codes.

WETLANDS NWI
National Wetland Inventory
U.S. Fish and Wildlife Service
(703) 358-2171
Wetland Inventory for the United States

USGS GEOLOGIC AGE
USGS Digital Data Series DDS
Natural Resources Conservation Service: U.S. Department of Agriculture
(202) 690-4985
USGS Digital Data Series DDS: Geologic Age and Rock Stratigraphic Unit

RADON
National Radon Database
USGS
703-605-6008
A study of the EPA/State Residential Radon Survey and the National Residential Radon Survey.

OIL & GAS WELLS - PA
Oil & Gas Wells
Department of Environmental Protection
(717)772-2199
Oil & Gas Wells Directory

AIRPORT FACILITIES
Airport landing facilities
Federal Aviation Administration
(866) 835-5322
Airport landing facilities

BASINS
Better Assessment Science Integrating point & Non-point Sources
U.S. Environmental Protection Agency
855-246-3642
Integrated geographical information system national watershed data and environmental assessment known as Better Assessment Science Integrating point & Non-point Sources

EPICENTERS
National Geographical Data Center
National Geographical Data Center
303-497-6826
Data on over four million earthquakes dating from 2100 B.C. to 1995 A.D.

FLOOD DFIRM
National Flood Hazard Layer Database
Federal Emergency Management Agency
The National Flood Hazard Layer Database (NFHL) is a computer database that contains the flood hazard map information from FEMAs Flood Map Modernization program. These map data are from Digital Flood Insurance Rate Map (DFIRM) databases and Letters of Map Revision.

APPENDIX C

ENVIRONMENTAL LIEN SEARCH REPORT

The NETR Environmental Lien and AUL Search Report

STRAWBRIDGE PROPERTY
MOUNT OLIVET ROAD AND WALKER ROAD
LANDENBERG, PENNSYLVANIA

Monday, June 4, 2018

Project Number: L18-00952

2055 East Rio Salado Parkway
Tempe, Arizona 85281

Telephone: 480-967-6752
Fax: 480-966-9422

ENVIRONMENTAL LIEN AND AUL REPORT

The NETR Environmental LienSearch Report provides results from a search of available current land title records for environmental cleanup liens and other activity and use limitations, such as engineering controls and institutional controls.

A network of professional, trained researchers, following established procedures, uses client supplied property information to:

- search for parcel information and/or legal description;
- search for ownership information;
- research official land title documents recorded at jurisdictional agencies such as recorders' office, registries of deed, county clerks' offices, etc.;
- access a copy of the deed;
- search for environmental encumbering instrument(s) associated with the deed;
- provide a copy of any environmental encumbrance(s) based upon a review of key words in the instrument(s) (title, parties involved and description); and
- provide a copy of the deed or cite documents reviewed;

Thank you for your business
Please contact NETR at 480-967-6752
with any questions or comments

Disclaimer - Copyright and Trademark Notice

This report was prepared for the use of Nationwide Environmental Title Research, and Ten Bears Environmental, exclusively. This report is neither a guarantee of title, a commitment to insure, nor a policy of title insurance. **NO WARRANTY, EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT.** Nationwide Environmental Title Research (NETR) specifically disclaims the making of any such warranties, including without limitation, merchantability or fitness for a particular use or purpose. The information contained in this report is retrieved as it is recorded from the various agencies that make it available. The total liability is limited to the fee paid for this report.

Copyright 2006 by Nationwide Environmental Title Research. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Nationwide Environmental Title Research, or its affiliates, is prohibited without prior written permission

NETR and its logos are trademarks of Nationwide Environmental Title Research or its affiliates. All other trademarks used herein are the property of their respective owners.

ENVIRONMENTAL LIEN AND AUL REPORT

The NETR Environmental Lien Search Report is intended to assist in the search for environmental liens filed in land title records.

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Certificate of Award of Real Estate

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

Type of Instrument: Deed

Grantor: George Strawbridge, Jr., individually and BNY Mellon, N.A.,, R. Stewart Strawbridge and George J. Baxter, Successor Trustees of the Trust under Deed of George Strawbridge Jr. dated 1/20/1971

Grantee: The Conservation Fund, a non-profit corporation

Deed Dated: 11/09/2017
Deed Recorded: 11/10/2017
Book: 9653
Page: 523

LEGAL DESCRIPTION

All that certain piece or parcel of land being 96.7 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 70-5-6

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Certificate of Award of Real Estate

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

Type of Instrument: Deed

Grantor: George Strawbridge, Jr., individually and BNY Mellon, N.A.,, R. Stewart Strawbridge and George J. Baxter, Successor Trustees of the Trust under Deed of George Strawbridge Jr. dated 1/20/1971

Grantee: The Conservation Fund, a non-profit corporation

Deed Dated: 11/09/2017
Deed Recorded: 11/10/2017
Book: 9653
Page: 523

LEGAL DESCRIPTION

All that certain piece or parcel of land being 71.9 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 70-5-7

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Certificate of Award of Real Estate

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

LEGAL DESCRIPTION

All that certain piece or parcel of land being 346.7 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 70-5-8

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Individual Deed

Grantor: Jane F. Trimble

Grantee: George Strawbridge, Jr

Deed Dated: 03/31/1997
Deed Recorded: 04/02/1997
Book: 4158
Page: 1495

Type of Instrument: Deed

Grantor: George Strawbridge, Jr., individually and BNY Mellon, N.A.,, R. Stewart Strawbridge and George J. Baxter, Successor Trustees of the Trust under Deed of George Strawbridge Jr. dated 1/20/1971

Grantee: The Conservation Fund, a non-profit corporation

Deed Dated: 11/09/2017
Deed Recorded: 11/10/2017
Book: 9653
Page: 523

LEGAL DESCRIPTION

All that certain piece or parcel of land being 19.3 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 71-4-32.3

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Individual Deed

Grantor: Jane F. Trimble

Grantee: George Strawbridge, Jr

Deed Dated: 03/31/1997
Deed Recorded: 04/02/1997
Book: 4158
Page: 1495

Type of Instrument: Deed

Grantor: George Strawbridge, Jr., individually and BNY Mellon, N.A.,, R. Stewart Strawbridge and George J. Baxter, Successor Trustees of the Trust under Deed of George Strawbridge Jr. dated 1/20/1971

Grantee: The Conservation Fund, a non-profit corporation

Deed Dated: 11/09/2017
Deed Recorded: 11/10/2017
Book: 9653
Page: 523

LEGAL DESCRIPTION

All that certain piece or parcel of land being 14.4 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 72-6-1

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Certificate of Award of Real Estate

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

Type of Instrument: Deed

Grantor: George Strawbridge, Jr., individually and BNY Mellon, N.A.,, R. Stewart Strawbridge and George J. Baxter, Successor Trustees of the Trust under Deed of George Strawbridge Jr. dated 1/20/1971

Grantee: The Conservation Fund, a non-profit corporation

Deed Dated: 11/09/2017
Deed Recorded: 11/10/2017
Book: 9653
Page: 523

LEGAL DESCRIPTION

All that certain piece or parcel of land being 63.5 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 72-6-10

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

ENVIRONMENTAL LIEN AND AUL REPORT

TARGET PROPERTY INFORMATION

ADDRESS

Strawbridge Property
Mount Olivet Road and Walker Road
Landenberg, Pennsylvania

RESEARCH SOURCE

Source: Chester County Assessor
Chester County Recorder of Deeds

DEED INFORMATION

Type of Instrument: Certificate of Award of Real Estate

Grantor: Girard Bank, George Strawbridge, Sr., Trustees

Grantee: Delaware Trust Co., George Strawbridge, Sr., and William C. Lickle, Trustees

Deed Dated: 08/07/1984
Deed Recorded: 08/23/1984
Book: B64
Page: 175

LEGAL DESCRIPTION

All that certain piece or parcel of land being 370.1 acres, more or less, situated and lying in the City of Landenberg, Chester County, State of Pennsylvania

Assessor's Parcel Number(s): 72-6-4

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AULs: Found ☐ Not Found ☒

14755

RECORDER OF DEEDS
CHESTER COUNTY, PA.
'84 AUG 23 P2:05

AFFIDAVIT

CERTIFICATE OF AWARD OF REAL ESTATE

TRUST INTER VIVOS: GEORGE STRAWBRIDGE, JR., SETTLOR

NO. 84664

Award of Real Estate to: Delaware Trust Company, George Strawbridge, and William C. Lickle, of 900 Market Street Mall, Wilmington, Delaware 19801, Trustees under Deed of George Strawbridge, Jr. dated January 20, 1971, thirty percent interest.

Commonwealth of Pennsylvania :
ss
County of Montgomery :

I, Nancy Moorley, 1st Asst Assistant Clerk of the Orphans' Court Division of the Court of Common Pleas for the County of Montgomery, in the Commonwealth of Pennsylvania, do hereby certify the attached to be a true and correct excerpt from the schedule of distribution filed in conformity with adjudication of the Orphans' Court Division of the Court of Common Pleas of Montgomery County upon the first account of Girard Bank, George Strawbridge and Charles H. Norris, Jr., Trustees under Deed of George Strawbridge, Jr., dated January 20, 1971, filed and conformed nisi February 17, 1983, as the same remains on file and is of record in said court.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seal of said Court at Norristown this 7th day of August, 1984.

Nancy Moorley

Assistant Clerk of the Orphans' Court Division

B 64 175

Form 553354

EXHIBIT "A"

To Delaware Trust Company and George Strawbridge and William C. Lickle, Trustees Under Deed of George Strawbridge, Jr. dated January 20, 1971 their Successors & assigns Premises .30 Int. Springlawn, Chester County, Pa. valued @ and more fully described as follows:

155 200 97

ALL THOSE TWO CERTAIN tracts of ground Situate partly in the Townships of London Britain, Franklin and Elk, County of Chester and State of Pennsylvania described according to a Plan of Property of Springlawn Corp. dated 8-24-1978 made by M[illegible] Engineering Assoc. Engineers and Surveyors, Oxford, Pa. as follows, to wit:

PREMISES "A"

BEGINNING at a spike set in the title line of Public Road LR 15020 known as Fairview Elkton Road said road leading in a Northerly direction to Pennsylvania Route 896 and a Southerly direction to Elkton, Md. said spike marking a Northeasterly corner of this about to be described tract and a corner of R. Vannoy; thence leaving said spike by the title line of said road South 01 degree 30 minutes 06 seconds West 463.95 feet to a spike marking a corner of this and a Northwesterly corner of S. Eschus; thence by said lands of Eschus South 87 degrees 27 minutes 56 seconds West 349.22 feet to an iron pin marking a corner of this and a corner of lands of Eschus; thence partly by lands of S. Eschus, J. Luckett, J. Evans, and R. Swan South 03 degrees 55 minutes 54 seconds East 1085.49 feet to an old iron pin marking a corner of this and a corner of lands of R. Swan; thence by said lands of Swan the following four courses and distances to wit: (1) South 20 degrees 39 minutes 45 seconds West 679.70 feet to an iron pin (2) South 04 degrees 36 minutes 49 seconds West 341.47 feet to an iron pin (3) South 00 degrees 35 minutes 04 seconds West 1295.24 feet to an iron pin (4) South 04 degrees 04 minutes 41 seconds East 147.79 feet to an iron pin marking a Southeasterly corner of this and set on the line dividing the State of Pennsylvania from the State of Maryland; thence by the State of Maryland due West crossing over Township line dividing Elk Township from Franklin Township 11371.55 feet to a post marking a Southwesterly corner of this and a Southeasterly corner of R. M. Thompson; thence by said lands of Thompson the following two courses and distances to wit: (1) North 05 degrees 02 minutes 01 second East 1509.75 feet to an iron pin (2) North 87 degrees 52 minutes 04 seconds West 354.76 feet to a spike set in the title line of Public Road LR 15016 known as Lewisville Strickerville Road said road leading in an Easterly direction to Strickerville and a westerly direction to Lewisville said spike marking a Southeasterly corner of lands of M. P. Dougherty; thence by said lands of Dougherty the following three courses and distances to wit:

1 - North 11 degrees 57 minutes 12 seconds East 1765.62' to a stone
2 - South 87 degrees 41 minutes 21 seconds West 1539.62' to a point
3 - South 87 degrees 36 minutes 49 seconds West 1350.72' to a spike marking a corner of this and set in the title line of Pennsylvania Route 841, leading in a northerly direction to Pennsylvania Route 896 and a southerly direction to Lewisville; thence leaving said spike and by the title line of said Pennsylvania Route 841 the following four courses and distances to wit:

1 - North 08 degrees 35 minutes 11 seconds West 498.86' to a spike
2 - North 13 degrees 38 minutes 41 seconds West 418.53' to a spike
3 - North 16 degrees 54 minutes 38 seconds West 251.55' to a spike
4 - North 06 degrees 48 minutes 19 seconds East 476.20' to a spike set for a northwesterly corner of this and a corner of lands of L. T. Steele, Jr.; thence by said lands of Steele and also along the southerly side of the water rights right of way conveyed to Springlawn Corporation the following 14 courses and distances to wit:

1 - North 81 degrees 34 minutes 21 seconds East 321.87' to an iron pin
2 - North 47 degrees 27 minutes 26 seconds East 150.43' to an iron pin
3 - North 43 degrees 51 minutes 26 seconds East 242.61' to an iron pin
4 - North 57 degrees 31 minutes 26 seconds East 152.98' to an iron pin
5 - North 40 degrees 11 minutes 26 seconds East 155.16' to an iron pin
6 - North 47 degrees 49 minutes 26 seconds East 187.97' to an iron pin
7 - North 50 degrees 15 minutes 26 seconds East 90.78' to an iron pin
8 - North 38 degrees 02 minutes 26 seconds East 125.30' to an iron pin
9 - North 39 degrees 24 minutes 26 seconds East 214.76' to an iron pin
10 - North 46 degrees 15 minutes 26 seconds East 139.98' to an iron pin
11 - North 44 degrees 09 minutes 26 seconds East 227.40' to an iron pin
12 - North 39 degrees 04 minutes 26 seconds East 360.43' to an iron pin
13 - North 42 degrees 03 minutes 26 seconds East 288.73' to an iron pin
14 - North 55 degrees 03 minutes 26 seconds East 209.01' to an iron pin; thence crossing township line dividing Elk Township, Franklin Township, and partly by lands of aforementioned L. T. Steele, Jr. and lands of J. R. Frederick North 46 degrees 25 minutes 26 seconds East 858.48' to an iron pin marking a corner of this and a corner of lands of J. R. Frederick;

B 64 176

thence by lands of Frederick North 60 degrees 21 minutes 26 seconds East 387.37' to an iron pin; thence still by Frederick and partly by the water rights right of way granted to Springlawn Corporation by Frederick North 51 degrees 47 minutes 26 seconds East 302.81' to a tree; thence still by lands of Frederick and the southerly side of said right of way North 84 degrees 32 minutes 26 seconds East 294.70' to an iron pin marking a corner of Francis Hill; thence by said lands of Hill the following four courses and distances to wit:

1 - North 48 degrees 29 minutes 26 seconds East 291.01' to an iron pin
2 - North 52 degrees 01 minute 26 seconds East 187.62' to an iron pin
3 - North 68 degrees 47 minutes 26 seconds East 231.82' to an iron pin
4 - North 83 degrees 35 minutes 35 seconds East 1584.88' to an old iron pin marking a corner of J. Rowe; thence partly by lands of Rowe and partly by lands of T. Davis North 81 degrees 06 minutes 58 seconds East 779.23' to a point marking a northwesterly corner of lands of R. Riale; thence by said lands of Riale the following two courses and distances to wit:

1 - South 05 degrees 17 minutes 30 seconds West 534.84' to a point
2 - South 01 degrees 09 minutes 30 seconds west 225.12' to a point; thence still partly by lands of Riale and partly by lands of C. Thomas South 09 degrees 10 minutes 30 seconds West 196.00' to a point marking a corner of lands of Thomas; thence by said lands of Thomas South 04 degrees 58 minutes 30 seconds West 455.15' to an old iron pin marking a corner of said lands of Thomas; thence still partly by lands of Thomas and partly by lands of Riale South 87 degrees 56 minutes 30 seconds East 626.16' to an iron pin; thence by lands of Riale South 87 degrees 22 minutes 30 seconds East 580.03' to an old iron pin; thence passing through the title line of Public Road T-303 known as Mt. Olivet Road said road leading in a northerly direction to Peacedale Road and an easterly direction to Pennsylvania Route 896 South 88 degrees 03 minutes 00 seconds East 1201.27' to an iron pin marking a corner of Mt. Olivet School; thence by said lands of Mt. Olivet School the following five courses and distances to wit:

1 - South 00 degrees 06 minutes 57 seconds West 80.89' to an iron pin
2 - North 88 degrees 55 minutes 57 seconds East 270.00' to an iron pin
3 - North 26 degrees 32 minutes 33 seconds West 76.20' to a stone
4 - North 36 degrees 21 minutes 33 seconds West 96.89' to a stump
5 - North 88 degrees 32 minutes 03 seconds West 112.37' to a point set in the title line of aforementioned Public Road T-303; thence by said title line the following three courses and distances to wit:

1 - North 47 degrees 24 minutes 27 seconds East 131.16' to a point
2 - North 79 degrees 45 minutes 27 seconds East 93.81' to a point
3 - South 82 degrees 22 minutes 33 seconds East 56.76' to an iron pin; thence leaving said title line and by lands of B. Johnson the following three courses and distances to wit:

1 - South 37 degrees 09 minutes 33 seconds East 439.64' to an iron pin
2 - South 08 degrees 52 minutes 27 seconds West 1043.47' to an iron pin
3 - South 41 degrees 14 minutes 37 seconds East 536.41' to an iron pin marking a corner of this and a corner of lands of said Johnson; thence partly by said lands of Johnson and partly by lands of A. Del Duca South 06 degrees 44 minutes 00 seconds East 2116.95' to a spike set in the title line of aforementioned Public Road LR-15016; thence by said title line the following four courses and distances to wit:

1 - South 78 degrees 28 minutes 13 seconds East 112.74' to a point
2 - South 77 degrees 59 minutes 13 seconds East 273.31' to a point
3 - South 89 degrees 54 minutes 13 seconds East 137.50' to a point
4 - North 80 degrees 30 minutes 32 seconds East 59.47' to a spike marking a corner of this and a corner of lands of T. R. Crossan; thence by said lands of Crossan South 41 degrees 03 minutes 14 seconds East 614.04' to an iron pin; thence partly by lands of Crossan and partly by lands of aforementioned Vannoy North 72 degrees 34 minutes 16 seconds East 4070.69' to a spike being the first mentioned point and place of beginning.

CONTAINING 1,684.938 Acres be the same more or less.

TOGETHER with the water rights right of way as granted to Springlawn Corporation by L. T. Staats, Jr. situate in Elk Township and New London Township, Chester County, Pennsylvania described as follows.

BEGINNING at a spike set for a northwesterly corner of lands of Springlawn Corporation said spike being set in the title line of Pennsylvania Route 841 said road leading in a southerly direction to Lewisville and a northerly direction to Pennsylvania Route 896; thence leaving said point of beginning and by the title line of Pennsylvania Route 841 North 07 degrees 45 minutes 22 seconds East 256.93' to a point; thence leaving said title line and passing through lands of L. T. Staats, Jr. the following three courses and distances to wit:

1 - North 47 degrees 08 minutes 47 seconds East 1175.88' to a point
2 - North 45 degrees 03 minutes 56 seconds East 740.01' to a point
3 - North 48 degrees 24 minutes 25 seconds East 580.00' to a point set in line of lands of J. R. Frederick also set on Township Line dividing Franklin Township from New London Township; thence by lands of Frederick South 78 degrees 13 minutes 04 seconds East 295.95' to a point set in line of lands of Springlawn Corporation. Thence by said lands the following 15 courses and distances to wit:

1 - South 46 degrees 25 minutes 26 seconds West 67.79' to a point
2 - South 55 degrees 03 minutes 26 seconds West 209.01' to an iron pin
3 - South 42 degrees 03 minutes 26 seconds West 268.73' to an iron pin
4 - South 39 degrees 04 minutes 26 seconds West 360.43' to an iron pin
5 - South 44 degrees 09 minutes 26 seconds West 227.40' to an iron pin
6 - South 46 degrees 15 minutes 26 seconds West 189.98' to an iron pin
7 - South 39 degrees 24 minutes 26 seconds West 214.76' to an iron pin
8 - South 38 degrees 02 minutes 26 seconds West 125.30' to an iron pin
9 - South 50 degrees 15 minutes 26 seconds West 90.76' to an iron pin
10 - South 47 degrees 49 minutes 26 seconds West 187.97' to an iron pin
11 - South 40 degrees 11 minutes 26 seconds West 155.16' to an iron pin
12 - South 57 degrees 31 minutes 26 seconds West 102.98' to an iron pin
13 - South 43 degrees 51 minutes 26 seconds West 242.61' to an iron pin
14 - South 47 degrees 27 minutes 26 seconds West 150.43' to an iron pin
15 - South 81 degrees 34 minutes 21 seconds West 321.87' to point and place of beginning.

CONTAINING 18.451 acres be the same more or less.

ALSO TOGETHER with the use of water rights right of way as granted to Springlawn Corporation by J. R. Frederick situate in Franklin Township described as follows.

BEGINNING at a point set in line of lands of Springlawn Corporation said point being set South 84 degrees 32 minutes 26 seconds West from an iron pin marking a corner of J. R. Frederick, Francis Hill, and Springlawn Corporation 49.42'; thence leaving said point of beginning and by lands of Springlawn Corporation the following two courses and distances to wit:

1 - South 84 degrees 32 minutes 26 seconds West 245.58' to a tree
2 - South 51 degrees 47 minutes 26 seconds West 135.09' to a point thence leaving said lands of Springlawn Corporation and passing through lands of J. R. Frederick the following five courses and distances to wit:

1 - North 44 degrees 25 minutes 26 seconds West 311.47' to a point
2 - North 73 degrees 27 minutes 56 seconds West 265.84' to a point
3 - North 17 degrees 21 minutes 26 seconds West 343.95' to a point
4 - North 13 degrees 13 minutes 34 seconds East 248.22' to a point
5 - North 20 degrees 01 minutes 26 seconds West 506.78' to a point set in the title line Pennsylvania Route 841 said road leading in an easterly direction to Pennsylvania Route 896 and a Westerly direction to Lewisville thence by the title line of said road north 76 degrees 00 minutes 34 seconds East 45.00' to a point set for a northeasterly corner of this; thence leaving said title line passing through lands of J. R. Frederick the following five courses and distances to wit:

1 - South 19 degrees 02 minutes 26 seconds East 583.01' to a point
2 - South 50 degrees 53 minutes 56 seconds East 383.69' to a point
3 - South 63 degrees 09 minutes 26 seconds East 346.11' to a point
4 - South 45 degrees 30 minutes 26 seconds East 174.22' to a point
5 - South 23 degrees 51 minutes 26 seconds East 893.10' to the point and place of beginning,

CONTAINING 8.260 acres be the same more or less.

EXCEPTING AND RESERVING thereout and therefrom 4.283 acres as granted and conveyed onto R. Nachuba in Deed Book U-30 page 471, S. Greene in Deed Book L-35 page 593, and K. Wells in Deed Book R-52 page 597, situate in Franklin Township, Chester County, Pennsylvania, bounded and described as follows to wit:

BEGINNING at a post set in the intersection of Public Road LR 15016 known as Strickerville Lewisville Road with Public Road T-356 known as Mt. Olivet Road said road leading in a northerly direction to Walker Road, said point being set the following eight courses and distances to wit from a spike set for a southwesterly corner of A. Del Duca and a corner of Springlawn Corporation said point being set in the title line of LR 15016.

1 - North 78 degrees 28 minutes 13 seconds West 520.54' to a point
2 - North 82 degrees 59 minutes 43 seconds West 470.28' to a point
3 - North 84 degrees 03 minutes 22 seconds West 119.76' to an old spike
4 - South 89 degrees 12 minutes 22 seconds West 118.24' to an old spike
5 - South 74 degrees 56 minutes 22 seconds West 83.82' to a point
6 - South 40 degrees 54 minutes 21 seconds West 9.31' to a point

7 - South 81 degrees 00 minutes 26 seconds West 38.37' to a point
8 - South 56 degrees 49 minutes 44 seconds West 22.86' to said post of beginning; thence leaving said post of beginning and by the title line of aforementioned Public Road LR 15016 the following five courses and distances to wit:

1 - South 44 degrees 57 minutes 36 seconds East 41.00' to a point
2 - South 49 degrees 48 minutes 58 seconds West 149.50' to a point
3 - South 43 degrees 10 minutes 10 seconds West 300.23' to a point
4 - South 75 degrees 48 minutes 56 seconds West 270.00' to a spike
5 - South 67 degrees 36 minutes 37 seconds West 244.60' to a point set in the centerline of a metal bridge; thence leaving said title line and by lands of Springlawn Corporation the following 11 courses and distances to wit:

1 - North 53 degrees 36 minutes 07 seconds East 44.00' to a point
2 - North 37 degrees 31 minutes 07 seconds East 43.00' to a point
3 - North 00 degrees 41 minutes 03 seconds East 30.00' to a point
4 - North 18 degrees 51 minutes 07 seconds East 15.00' to a point
5 - North 33 degrees 21 minutes 07 seconds East 25.00' to a point
6 - North 19 degrees 46 minutes 07 seconds East 52.00' to a point
7 - North 03 degrees 18 minutes 13 seconds West 48.70' to a point
8 - North 22 degrees 54 minutes 53 seconds West 131.82' to a point
9 - North 44 degrees 32 minutes 28 seconds East 90.80' to a post
10 - North 80 degrees 47 minutes 08 seconds East 88.07' to a point
11 - North 81 degrees 12 minutes 24 seconds East 588.35' to a post being the first mentioned point and place of beginning.

CONTAINING 4.283 acres be the same more or less.

ALSO EXCEPTING AND RESERVING thereout and therefrom 4.324 acres granted and conveyed to P. Rowland in Deed Book R-36 page 293, W. Worth in Deed Book W-23 page 234 and A. Jezyk in Deed Book Y-37 page 298 situate in Franklin Township, Chester County, Pennsylvania.

BEGINNING at a point set for a corner of this and set in the title line of Public Road LR-15016 known as Strickerville Lewisville Road said road leading in an easterly direction to Public Road LR-15020 and a westerly direction to Lewisville, said point of beginning being set the following two courses and distances from a spike set for a southwesterly corner of A. Del Duca to wit:

1 - North 78 degrees 28 minutes 13 seconds west 520.54' to a point
2 - North 82 degrees 59 minutes 43 seconds West 470.28' to said point of beginning; thence leaving said point of beginning and by lands of Springlawn Corporation the following four courses and distances to wit:

1 - South 7 degrees 31 minutes 13 seconds West 188.93' to an iron pin
2 - North 82 degrees 56 minutes 28 seconds West 221.17' to an iron pin
3 - North 52 degrees 17 minutes 38 seconds West 97.26' to an iron pin
4 - North 02 degrees 13 minutes 38 seconds West 82.65' to a point set in the title line of aforementioned Public Road LR-15016; thence by said title line South 81 degrees 00 minutes 26 seconds West 38.37' to a point set in the title line of Public Road T-356 known as Mt. Olivet Road, said road leading in a northerly direction to Public Road T-303; thence by the title line of Public Road T-356 North 03 degrees 21 minutes 04 seconds West 426.15' to a point set for a northwesterly corner of this and a corner of Springlawn Corporation thence by said lands of Springlawn Corporation the following two courses and distances to wit:

1 - South 75 degrees 33 minutes 04 seconds East 437.50' to an old iron pin
2 - South 07 degrees 06 minutes 56 seconds West 294.48' to the point and place of beginning.

CONTAINING 4.324 acres be the same more or less.

ALSO EXCEPTING AND RESERVING thereout and therefrom 5.005 acres granted and conveyed onto W. Worth in Deed Book X-29 page 565, and W. Worth in Deed Book W-35 page 576 situate in Elk Township, Chester County, Pennsylvania.

BEGINNING at a spike set for a northwesterly corner of this and a corner of Springlawn Corporation, said point being set in the title line of Public Road LR 15016 known as Lewisville Strickerville Road, said point being set north 73 degrees 49 minutes 15 seconds East from an iron pin marking the northeasterly corner of lands of R. M. Thompson 1213.79' to said point of beginning; thence leaving said point of beginning and by the title line the aforementioned Public Road LR 15016 the following two courses and distances to wit:

1 - North 77 degrees 38 minutes 22 seconds East 381.00' to a spike
2 - North 76 degrees 08 minutes 02 seconds East 271.17' to a spike marking a northeasterly corner of this and a corner of Springlawn Corporation; thence by said lands of Springlawn Corporation the following three courses and distances to wit:

1 - South 12 degrees 21 minutes 58 seconds East 314.52' to a point
2 - South 73 degrees 08 minutes 27 seconds West 654.09' to a post
3 - North 12 degrees 21 minutes 38 seconds West 358.50' to the point and place of beginning.

CONTAINING 5.005 acres be the same more or less.

PREMISES "B"

BEGINNING at a spike set in the title line of Public Road T-301 known as Elbow Lane leading in an westerly direction to Public Road LR-15020 and a easterly direction to Pennsylvania Route 896 said spikes marking a westerly corner of this about to be described tract; thence leaving spike of beginning and by the title line of Public Road T-301 the following eight courses and distances to wit:

1 - North 76 degrees 09 minutes 24 seconds East 876.50' to a spike
2 - North 75 degrees 56 minutes 00 seconds East 750.81' to a spike
3 - North 76 degrees 45 minutes 00 seconds East passing over the township line dividing London Britain and Franklin Township 360.17' to a spike.
4 - South 85 degrees 05 minutes 09 seconds East 300.21' to a spike
5 - South 54 degrees 58 minutes 30 seconds East 147.03' to a spike
6 - South 48 degrees 25 minutes 00 seconds East 496.85' to a spike
7 - South 86 degrees 36 minutes 30 seconds East 318.43' to a spike
8 - South 89 degrees 56 minutes 30 seconds East 814.80' to a spike marking an easterly corner of this; thence leaving said title line due south 15.61' to a milestone set on the line dividing the State of Pennsylvania from the State of Maryland; thence by said state line due west crossing over the township line dividing London Britain Township from Franklin Township 3453.74' to a spike being the first mentioned point and place of beginning.

CONTAINING 16.906 acres be the same more or less.

AS TO PREMISES "A"
BEING as to part the same premises which John P. F. Blackstone, Singleman by Deed dated April 17, 1948 and recorded in Chester County in Deed Book Q-24 page 101 conveyed unto Springlawn Corporation, (Pa. Corp.).

BEING as to another part the same premises which Richard T. Swan and Anne M. Swan, by Deed dated July 7, 1959 and recorded in Chester County in Deed Book G-31 page 394 conveyed unto Springlawn Corporation (Pa. Corp.).

AND BEING as to the remaining part, of the same premises which Center Square, Inc. by Deed dated December 27, 1946 and recorded in Chester County in Deed Book G-22 page 231 conveyed unto Springlawn Corporation, (Pa. Corp.).

AS TO PREMISES "B"
BEING part of the same premises which Center Square, Inc. by Deed dated December 27, 1946 and recorded in Chester County in Deed Book G-22 page 231 conveyed unto Springlawn Corporation, (Pa. Corp.).

UNDER AND SUBJECT to certain Reservations, Rights, Covenants, as of record.

BEING as to Premises A, Premises B, and the flooding rights as aforesaid the same premises which Springlawn Corporation, a Pennsylvania Corporation, conveyed unto George Strawbridge Jr., Individually, and Girard Bank, George Strawbridge, Sr., and Charles N. Morris, Jr., Trustees Under the Deed of Trust of George Strawbridge, Jr., Dated January 20, 1971: by Indenture dated the eighteenth day of October, 1978 and recorded in Chester County Deed Book W53 page 573.

AND BEING as to the flooding rights aforesaid the same premises which Delaware Trust Company, Jean Ellen duPont McConnell and William S. Potter, Trustees Under the Will of William duPont Jr., deceased, conveyed unto George Strawbridge Jr., Individually and Girard Bank, George Strawbridge, Sr., and Charles N. Morris, Jr., Trustees under the Deed of Trust of George Strawbridge Jr., dated January 20, 1971; by Indenture dated the twentieth of November, 1978 and recorded in Chester County Deed Book E54 page 291.

Rec in Chester Co. Pa
in Deed Bk # B64
Pg 175
Elaine S. Weil
Recorder of Deeds

RECORDER'S OFFICE CHESTER COUNTY, PA.

B 64 180

REV-183 FD (7-80)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF REVENUE
BUREAU OF FIELD OPERATIONS

REALTY TRANSFER TAX
AFFIDAVIT OF VALUE

B 025-172nd

FOR RECORDER'S USE ONLY
BOOK NUMBER 1964
PAGE NUMBER 187
DATE RECORDED 6/03/86

COMPLETE APPLICABLE SECTIONS IN FULL AND FILE IN DUPLICATE WITH RECORDER OF DEEDS WHEN (1) THE FULL CONSIDERATION IS NOT SET FORTH IN THE DEED, (2) THE TRANSFER IS WITHOUT CONSIDERATION OR A GIFT, OR (3) A TAX EXEMPTION IS CLAIMED. (REFER SECT. 8, RTT ACT OF DEC. 27, 1951, P.L. 1742 AS AMENDED)

SECTION I
(COMPLETE FOR ALL TRANSACTIONS)

Girard Bank, George Strawbridge, Sr. Trustees u/d 1/20/71 — GRANTOR (S)
Broad & Chestnut Streets, Phila., PA 19101 — ADDRESS, ZIP CODE

Delaware Trust Co., George Strawbridge, Sr. & William C. Lickle, Trustees u/d 1/20/71 — GRANTEE (S)
Market Street Mall, Wilmington, DE 19801 — ADDRESS, ZIP CODE

LOCATION OF LAND, TENEMENTS AND HEREDITAMENTS:

30% interest 1688 acres — P.O. STREET & NUMBER OR OTHER DESCRIPTION
London, Britain, Franklin & Elk — NAME OF LOCAL GOVERNMENTAL UNIT
Chester County — COUNTY

FULL CONSIDERATION $ -0-
HIGHEST ASSESSED VALUE $ 158140.00
FAIR MARKET VALUE $ 825,000.00
REALTY TRANSFER TAX PAID $

TAX EXEMPT TRANSACTIONS: IF TRANSFER IS PARTIALLY OR WHOLLY EXEMPT, SHOW AMOUNT EXEMPT, REASON (S) AND CITE PORTION OF LAW. This is a transfer by law from one set of trustees to new trustees under same deed of trust.

IF THIS IS A TRANSFER FROM A STRAW, AGENT OR TRUST AGREEMENT, COMPLETE THE REVERSE SIDE.

SECTION II
(COMPLETE ONLY IF PROPERTY WAS SUBJECT TO LIEN OR MORTGAGE AT THE TIME OF TRANSFER)

EXISTING MORTGAGE: $ ~~510,000.00~~ DISPOSITION
Delaware Trust Co., Trustee — MORTGAGEE
Market Street Mall, Wilmington, DE 19801 — ADDRESS

EXISTING MORTGAGE: $ DISPOSITION
MORTGAGEE — ADDRESS

EXISTING LIEN OR OBLIGATION: $ DISPOSITION
LIENHOLDER — ADDRESS

EXISTING LIEN OR OBLIGATION: $ DISPOSITION
LIENHOLDER — ADDRESS

SECTION III
(COMPLETE ONLY IF TRANSFER IS RESULT OF JUDICIAL SALE)

OFFICIAL CONDUCTING SALE — NAME, ADDRESS, TITLE
SUCCESSFUL BIDDER — NAME, ADDRESS, TITLE

	JUDGEMENT PLUS PRIOR LIENS	BID PRICE	HIGHEST ASSESSED VALUE
HIGHEST ASSESSED VALUE			$
JUDGEMENT PLUS INTEREST	$		
BID PRICE		$	
PRIOR RECORDED LIEN	$	$	
PRIOR RECORDED MORTGAGE	$	$	
PRIOR RECORDED MORTGAGE	$	$	
UNPAID REAL ESTATE TAXES	$	$	
WATER RENT DUE	$	$	
SEWAGE RENT DUE	$	$	
ATTORNEY FEES	$	$	
OTHER (COSTS, ETC.)	$	$	
TOTAL	$	$	

NOTE: CALCULATIONS MUST BE SHOWN IN ALL COLUMNS.

SWORN AND SUBSCRIBED BEFORE ME THIS 25th DAY OF August 19 86
Nita Goodilow
NOTARY PUBLIC
MY COMMISSION EXPIRES
NITA GOODILOW
Notary Public, Phila., Phila. Co.
My Commission Expires Sept. 17, 1987

ALL OF THE INFORMATION ENTERED ON BOTH SIDES OF THIS AFFIDAVIT IS TRUE, FULL AND COMPLETE TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF.

Henry T. Dunn

☐ GRANTEE ☒ AGENT FOR GRANTEE
☐ GRANTOR ☐ AGENT FOR GRANTOR
☐ STRAW ☐ TRUSTEE

B 64 187

Tax Parcel # 72-6-1 & Part of 71-4-32

Prepared By: Benjamin J. Berger
Prickett, Jones, Elliott, Kristol & Schnee
1310 King Street, P.O. Box 1328
Wilmington, DE 19899

Return to:
Prickett, Jones, Elliott, Kristol & Schnee
1310 King Street, P.O. Box 1328
Wilmington, DE 19899

INDIVIDUAL DEED

THIS DEED, MADE THIS 31st day of **March** in the year of our LORD one thousand nine hundred and ninety-seven (1997).

BETWEEN **Jane F. Trimble**, party of the first part,

- A N D -

George Strawbridge, Jr., party of the second part,

WITNESSETH, that the said party of the first part for and in consideration of the sum of **TWO HUNDRED SIXTY NINE THOUSAND NINE HUNDRED DOLLARS AND 00 CENTS ($269,900.00)**, lawful money of the United States of America, the receipt whereof is hereby acknowledged, hereby grants and conveys unto the said party of the second part, His Heirs and Assigns.

ALL that certain tract of ground, situate in New London and Franklin Townships, Chester County, State of Pennsylvania, and being more particularly bounded and described in accordance with a Plan prepared by George E. Regester, Jr. & Sons, Inc., dated September 1, 1982, as follows, to-wit:

BEGINNING at a point in the bed of Public Road TR841 known as Lewisville-Chesterville Road, said road leading in an Easterly direction to Chesterville and in a Southerly direction to Lewisville, said point of Beginning marking a corner of this about to be described tract and a corner of other lands of J. Robert Frederick, being Parcel A on said Plan, said point of Beginning being the following three (3) described courses and distances to wit along the Lewisville-Chesterville Road from a point marking a corner of said Parcel A and a corner of lands now or formerly of Charles G. Woods: (1) North 80 degrees 12 minutes 00 seconds East, 129.48 feet to a point; (2) North 55 degrees 56 minutes 00 seconds East, 366.29 feet to a point; and (3) North 73 degrees 18 minutes 00 seconds East, 340.81 feet to said point of Beginning; thence leaving said point of Beginning and continuing along said Lewisville-Chesterville Road, North 73 degrees 18 minutes 00 seconds East, 265.91 feet to a point marking a corner of this and a corner of other lands now or formerly of J. Robert Frederick; thence leaving said Lewisville-Chesterville Road and along said other lands now or formerly of J. Robert Frederick, South 31 degrees 19 minutes 00 seconds East, crossing the township line dividing New London Township from Franklin Township, 1605.87 feet to a point marking a corner of this and a corner of lands of George Strawbridge, Jr., thence along said lands now or formerly of George Strawbridge, Jr., South 47 degrees 01 minute 00 seconds West, 790.69 feet to a point in the bed of the Big Elk Creek marking a corner of this, a corner of said lands now or formerly of George Strawbridge, Jr., and a corner of lands now or formerly of Louis T. Staats, Jr.; thence along said lands now or formerly of Louis T. Staats, Jr., North 77 degrees 37 minutes 30 seconds West, recrossing the aforementioned township line dividing New London Township from Franklin Township, 804.30 feet to a point marking a corner of this and a corner of the aforementioned lands now or formerly of Charles G. Woods, North 04 degrees 10 minutes 00 seconds West, 667.00 feet to a point marking a corner of this and a corner of the aforementioned Parcel A; thence along said Parcel A, the following two (2) described courses and distances, to-wit: (1) South 74 degrees 00 minutes 00 seconds West, 476.33 feet to a point; and (2) South 09 degrees 00 minutes 00 seconds East, 881.53 feet to the first mentioned point and place of **BEGINNING**. Be the contents thereof what they may.

EXCEPTING THEREOUT AND THEREFROM all that certain premises which J. Robert Frederick and Marion B. Frederick, his wife, by Deed dated October 3, 1984, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book Z-64, Page 132, did grant and convey unto Department of Transportation, in fee.

SUBJECT to Rights as granted to Southern Pennsylvania Power Company, of record in the Office of the Recorder of Deeds, in and for Commonwealth of Pennsylvania, in Deed Book 86, Page 43.

BEING a part of the same lands and premises which J. Robert Frederick, Executor of the Estate of Marion B. Frederick, deceased, by Deed dated July 15, 1989, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book 1631, Page 290, did grant and convey unto Jane F. Trimble, in fee. (As to a one-half interest therein).

BK1158PG1495

BEING a part of the same lands and premises which J. Robert Frederick, Executor of the Estate of Marion B. Frederick, deceased, by Deed dated July 25, 1989, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book 1631, Page 299, did grant and convey unto J. Robert Frederick and Jane F. Trimble, as joint tenants with right of survivorship, in fee. (As to the remaining one-half interest therein).

AND the said J. Robert Frederick, did depart this life on or about February 8, 1993, leaving a will dated June 22, 1982, duly probated April 19, 1993 and remaining of record in the Office of the Register of Wills, in and for Chester County and Commonwealth of Pennsylvania, File No. 15-93-0467, wherein he appointed Jane F. Trimble and David L. Myers, Executor to whom Letters Testamentary were granted.

TOGETHER with all and singular the buildings improvements, ways, streets, alleys, driveways, passages, waters, water-courses, rights, liberties, privileges, hereditaments and appurtenances, whatsoever unto the hereby granted premises belonging, or in anywise appertaining, and the reversions and remainders, rents, issues, and profits thereof; and all the estate, right, title, interest, property, claim and demand whatsoever of the said grantors, as well as law as in equity, of, in and to the same.

TO HAVE AND TO HOLD the said lot or piece of ground described hereditaments and premises hereby granted, or mentioned and intended to be so, with the appurtenances, unto the said Grantee, his heirs and assigns, to and for the only proper use and behoof of the said Grantee, his heirs and assigns, forever.

AND the said Grantors, their heirs, successors, executors and administrators do covenant, promise and agree, to and with the said Grantee, his heirs and assigns, by these presents, that the said Grantors and their heirs, all and singular the hereditaments and premises hereby granted or mentioned and intended so to be, with appurtenances, unto the said Grantee, his heirs and assigns, against the said Grantors and their heirs, and against all and every person and persons whosever lawfully claiming or to claim the same or any part thereof, by, from or under or any of them, shall and will

Transfer tax for Franklin and New London Townships are based on $8000.90 per acre.

Franklin Township = $8000.90 x 14.4 acres = $115,328.16 or $1,153.28 in transfer tax.

New London Township = $8000.90 x 19.3 acres = $154,571.77 or $1,545.72 in transfer tax.

BK4158PG1496

Grantees Address:
2003 Chesterville Road
Lincoln University,PA 19352

Grantees Address:
3801 Kennett Pike
Wilmington, DE 19807

BEING a part of the same lands and premises which J. Robert Frederick, Executor of the Estate of Marion B. Frederick, deceased, by Deed dated July 15, 1989, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book 1631, Page 290, did grant and convey unto Jane F. Trimble. in fee. (As to a one-half interest therein).

BEING a part of the same lands and premises which J. Robert Frederick, Executor of the Estate of Marion B. Frederick, deceased, by Deed dated July 25, 1989, of record in the Office of the Recorder of Deeds, in and for Chester County and Commonwealth of Pennsylvania, in Deed Book 1631, Page 299, did grant and convey unto J. Robert Frederick and Jane F. Trimble, as joint tenants with right of survivorship, in fee. (As to the remaining one-half interest therein).

AND the said J. Robert Frederick, did depart this life on or about February 8, 1993, leaving a will dated June 22, 1982, duly probated April 19, 1993 and remaining of record in the Office of the Register of Wills, in and for Chester County and Commonwealth of Pennsylvania, File No. 15-93-0467, wherein he appointed Jane F. Trimble and David L. Myers, Executor to whom Letters Testamentary were granted.

BK11580P0149

IN WITNESS WHEREOF, the said party of the first part has put her hand and seal the day and year first above written.

SEALED AND DELIVERED IN THE PRESENCE OF:

_____ } Jane F. Trimble (SEAL)
Witness }
}
_____ } _____ (SEAL)
Witness

STATE OF PENNSYLVANIA }
} SS.
COUNTY OF CHESTER }

BE IT REMEMBERED, that on this 31st day of March in the year of our **LORD** one thousand nine hundred and ninety-seven (1997) personally came before me, the Subscriber, a Notary Public for the State and County aforesaid, Jane F. Trimble, party to this Indenture, known to me personally to be such, and acknowledged this Indenture to be her act and Deed.

GIVEN under my Hand and Seal of Office, the day and year aforesaid.

My Commission Expires:
December 16, 2001

_____ _____
~~Notary Public~~
Commissioner of Deeds

BK4158PG149B

DEED

Received for Record

A.D., 19

Recorder

Fee for Recording, &c., $

THIS DEED
PREPARED BY

PRICKETT
JONES
ELLIOTT
KRISTOL
&
SCHNEE

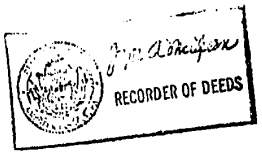
RETURN TO

1310 KING STREET
P.O. BOX 1328
WILMINGTON, DE 19899
(302) 888-6500

State of Delaware,
)
) ss.
County)

Recorded in the Office for the Recording of Deeds, &c., at .....in and for the said County of ..... in Deed Record ..... Vol. ..... Page ..... &c. the ..... day of ..... A.D. 19...
WITNESS my Hand and the Seal of said Office.

.....
Recorder.



17229

DATE: 04/02/1997 TIME: 11:33A INST NO.: 17229

CHESTER COUNTY, PA
OFFICE OF THE RECORDER OF DEEDS

RECEIPT NO : 008547 TYPE DOC : DEED
REC FEE : 13.00
LOC RTT : 1545.72
ST RTT : 2699.00
WRIT TAX : 0.50
DATE: 04/02/1997 TIME: 11:33A INST NO.:

CHESTER COUNTY, PA
OFFICE OF THE RECORDER OF DEEDS

RECEIPT NO : 008547 TYPE DOC : HOUSING
REC FEE : 13.00
LOC RTT : 0.00
ST RTT : 0.00
WRIT TAX : 0.00
DATE: 04/02/1997 TIME: 11:33A INST NO.: R17229

CHESTER COUNTY, PA
OFFICE OF THE RECORDER OF DEEDS

RECEIPT NO : 008547 TYPE DOC : DEED
REC FEE : 0.00
LOC RTT : 1153.28
ST RTT : 0.00
WRIT TAX : 0.00
DATE: 04/02/1997 TIME: 11:33A INST NO.:

CHESTER COUNTY, PA
OFFICE OF THE RECORDER OF DEEDS

RECEIPT NO : 008547 TYPE DOC : HOUSING
REC FEE : 0.00
LOC RTT : 0.00
ST RTT : 0.00
WRIT TAX : 0.00

BK4158PG1499

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

11578385 B: 9653 P: 523 DEE
11/20/2017 10:55:47 AM Page 1 of 20
Rec Fees: $218.00 Local: $0.00 State: $0.00
Rick Loughery Recorder of Deeds, Chester County, PA

Prepared by and return to:

Fidelity National Title Insurance Company
1515 Market Street
Suite 1325
Philadelphia, PA 19102

State Tax: EXEMPT
Local Tax: EXEMPT
Consideration: $4,385,000.00

File No: 170225PHI

Tax Parcel Nos.: 70-5-6; 70-5-7 ; 71-4-32.3;
72-6-1; 72-6-10

This Indenture dated 11-9-17 and made effective this 17th day of November, 2017;

Between

GEORGE STRAWBRIDGE, JR., individually

and

BNY MELLON, N.A. (f/k/a Mellon Bank, N.A.), R. STEWART STRAWBRIDGE and GEORGE J. BAXTER, Successor Trustees of the Trust under Deed of George Strawbridge, Jr., dated 1-20-1971

(hereinafter called the Grantors), of the one part, and

THE CONSERVATION FUND, a Non-Profit Corporation

(hereinafter called the Grantee), of the other part,

WHEREAS, the said, George Strawbridge, Jr. executed a written, irrevocable Agreement (Deed) of Trust Dated January 20, 1971, and wherein and whereby he appointed George Strawbridge, Sr., David G. Forman and Girard Trust Bank as trustees and authorized and empowered his said Trustees:

> "To sell at public or private sale, to exchange or to lease for any period of time, any real or personal property, and to give options for sales or leases;" and

WHEREAS, on July 19, 1977 David G. Forman appointed Charles H. Norris, Jr., as his successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, Springlawn Corporation, by indenture dated October 18, 1978 and recorded October 20, 1978 in the office of the recorder of deeds in and for the County of Chester in Deed Book W-53 page 573,

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

granted and conveyed unto George Strawbridge, Jr., individually (as to an undivided 70% interest) and Girard Bank (f/k/a Girard Trust Bank), George Strawbridge, Sr. and Charles H. Norris, trustees under Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 (as to an undivided 30% interest), in fee, certain premises more particularly described in said indenture, and a portion of the premises therein conveyed is part of the premises hereinafter more particularly described as Premises A, B, and E; and

WHEREAS, on July 21, 1981 George Strawbridge, Sr., removed Girard Bank (f/k/a Girard Trust Bank) and appointed Delaware Trust Company as the successor corporate trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, in 1981 Charles H. Norris, Jr., appointed William C. Lickle as his successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 and the said William C. Lickle accepted said appointment as trustee on July 28, 1981; and

WHEREAS, an Adjudication filed in Montgomery County Orphans' Court Division of Court of Common Pleas No. 84664 in re: Trust Inter Vivos: George Strawbridge, Jr., Settlor, and excerpt of Schedule of Distribution recorded August 23, 1984 in Chester County in Deed Book B-64 page 175 awarded the undivided 30% interest in Real Estate unto Delaware Trust Company, George Strawbridge and William C. Lickle, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971; and

WHEREAS, by Decree of Orphans' Court Division of Court of Common Pleas of Montgomery County, Pennsylvania, dated March 13, 1985, the trustees under Trust under Deed of George Strawbridge, Jr. dated January 20, 1971, were changed to Delaware Trust Company, Dorrance H. Hamilton and George J. Baxter; and

WHEREAS, by Removal Of Corporate Co-Trustee and Appointment of Successor Corporate Co-Trustee, by Dorrance H. Hamilton and George J. Baxter, trustees, dated December 16, 1998, the First Union National Bank (f/k/a Delaware Trust Company) was replaced as Corporate Co-Trustee of the Trust under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971 by Mellon Bank, N.A.; and

WHEREAS, on July 8, 2005 Dorrance H. Hamilton appointed R. Stewart Strawbridge as her successor trustee and resigned as a trustee of the Trust under Deed of George Strawbridge, Jr. dated January 20, 1971 and the said R. Stewart Strawbridge accepted said appointment as trustee on August 1, 2005;

WHEREAS, on July 1, 2008, Mellon Bank, N.A. changed its name to BNY Mellon, N.A.; and

WHEREAS, Jane F. Trimble by indenture dated March 31, 1997 and recorded April 2, 1997 in the Office of the Recorder of Deeds of Chester County in Record Book 4158, Page 1495, granted and conveyed unto George Strawbridge, Jr., in fee a certain premises more particularly described in said indenture, and the premises therein conveyed is more particularly described herein as Premises C and D; and

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

WHEREAS, Grantor and Grantee have agreed that George Strawbridge, Jr., identified individually as one of Grantors named in this Deed will convey with special warranty his interest in the property described herein on Exhibit A (the "Property"); and BNY Mellon, N.A., R. Stewart Strawbridge and George J. Baxter, identified Grantors in their capacity as trustees in this Deed will convey with title warranties typically provided by trustees, as more fully set forth herein, the Property, as described on Exhibit A; and

NOW THEREFORE, for and in consideration of the sum of Four Million Three Hundred Eighty-Five Thousand and 00/100 Dollars ($4,385,000.00) payment by the Grantee and receipt by the Grantors in lawful money of the United States of America of which is hereby acknowledged , the Grantors hereby have granted and conveyed, bargained and sold, released and confirmed, and by these presents do grant and convey, bargain and sell, release and confirm unto the Grantee:

> All those certain tracts of land situate in the Townships of Elk and Franklin, County of Chester, Commonwealth of Pennsylvania, which are more particularly described on Exhibit A attached hereto and made a part hereof; and

TOGETHER WITH all and singular the buildings and improvements, ways, streets, alleys, passages, waters, water-courses, mineral, timber and other surface and subsurface rights, liberties, privileges, hereditaments and appurtenances, whatsoever belonging, or in anywise appertaining to the Property, and the reversions and remainders, rents, issues, and profits thereof; and all the estate, right, title, interest, claim and demand whatsoever pertaining to the Property at law or in equity.

TO HAVE AND TO HOLD the Property, with the buildings and improvements thereon erected, hereditaments and premises hereby granted, and the appurtenances, unto the said Grantee, its successors and assigns forever.

AND the said GEORGE STRAWBRIDGE, JR., for himself and his heirs and assigns, does covenants, promises and agrees to and with the said Grantee, its successors and assigns, as to the Property only as described on Exhibit A that he, the said George Strawbridge, Jr., and his heirs and assigns, all and singular the hereditaments and premises hereby granted or mentioned and intended so to be, with the appurtenances, unto the said Grantee, its successors and assigns, against him, the said George Strawbridge, Jr., and his heirs and assigns, and against all and every person and persons whosoever lawfully claiming or to claim the same or any part thereof, by, from or under, him, them or any of them, shall and will WARRANT and forever DEFEND.

AND the said BNY MELLON, N.A. (f/k/a Mellon Bank, N.A.), R. STEWART STRAWBRIDGE and GEORGE J. BAXTER, Trustees under Deed of Trust of George Strawbridge, Jr. dated January 20, 1971, do as to the Property as described on Exhibit A covenant, promise and agree to and with said Grantee, its heirs and assigns, that they, the said Trustees, have not done, committed, or knowingly or willingly suffered to be done or committed, any act, matter or thing whatsoever whereby the premises hereby granted, or any part thereof, is, are, shall or may be impeached, charged or encumbered, in title, charge, estate, or otherwise howsoever.

UNDER AND SUBJECT to the terms and conditions of that certain Declaration of Covenants, Conditions and Restrictions given by The Conservation Fund, a Non-Profit Corporation, a Maryland

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

corporation, to the County of Chester, a Pennsylvania county of the third class, of even date herewith, and intended to be recorded in the Chester County Recorder of Deeds Office immediately after this Indenture.

THIS PROPERTY was acquired with funds provided by the Pennsylvania Department of Conservation and Natural Resources ("Department"). The source of the funds is the Keystone Recreation, Park and Conservation Fund – LT. This Property may not be converted to purposes other than those authorized under the Act for property acquired with Department funds. No change of use and no transfer of ownership, control or interest in the Property may occur, and no encumbrance may be placed on this Property, without the written consent of the Department or its successor. The restriction in this paragraph applies to both the surface and subsurface of the Property. This restriction has the effect of a covenant running in perpetuity and the land is binding upon the owner(s) of the Property and upon all subsequent owners, successors and assigns. This restriction is enforceable by the Department and its successors.

This Indenture may be signed in two or more counterparts (or with counterpart signature pages) which taken together, shall constitute a full executed indenture and shall be considered a single document. The parties intend that a fully executed Indenture containing the signatures of all of the parties shall be binding on the parties.

[SIGNATURES BEGIN ON THE FOLLOWING PAGE]

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

In Witness Whereof, the said Grantors have caused these presents to be duly executed under seal dated the day and year first above written.

George Strawbridge, Jr. (SEAL)

STATE OF DELAWARE)
) ss.:
COUNTY OF NEW CASTLE)

On the 13th day of November in the year 2017, before me, the undersigned, personally appeared George Strawbridge, Jr., personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

DIANA S. SKOMORUCHA MY COMMISSION EXPIRES AUG. 8 2020 NOTARY PUBLIC STATE OF DELAWARE

Notary Public
Commission Expires: August 8, 2020

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

BNY Mellon, N.A., (f/k/a Mellon Bank, N.A.), Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

By: _____ (SEAL)
Name: Frank Schickling
Title: Vice President

STATE OF Pennsylvania)
) ss.:
COUNTY OF Philadelphia)

On this, the 9th day of November 2017, before me, the undersigned officer, personally appeared Frank Schickling who acknowledged himself / herself to be the Vice President of BNY Mellon N.A., (f/k/a Mellon Bank N.A.), a national banking institution, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971 and that he / she as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the association in the capacity therein stated by himself/herself as such officer.

In Witness Whereof, I hereunto set my hand and official seal.

_____
Notary Public
Commission Expires:

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Sabrina Moore, Notary Public
City of Philadelphia, Philadelphia County
My Commission Expires April 30, 2019
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

George Baxter (SEAL)
George Baxter, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

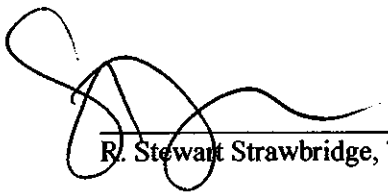
STATE OF Pennsylvania)
) ss.:
COUNTY OF Bucks)

On the 10 day of November in the year 2017, before me, the undersigned, personally appeared George Baxter, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Notary Public
Commission Expires: 10-21-2021

Commonwealth of Pennsylvania Notary Seal
KATHLEEN BRADFIELD, Notary Public
Bucks County
My Commission Expires October 31, 2021
Commission Number 1097214

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.



_____(SEAL)
R. Stewart Strawbridge, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971

STATE OF Maine)
) ss.:
COUNTY OF Cumberland)

On the 10th day of November in the year 2017, before me, the undersigned, personally appeared R. Stewart Strawbridge, Trustee under Deed of George Strawbridge, Jr., dated 1-20-1971, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Kim Paquette
Notary Public
Commission Expires: 12/2/23

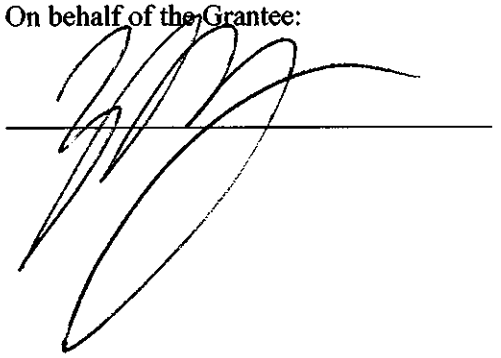
Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

File No: 170225PHI
Tax Parcel Nos. 70-5-6
70-5-7
71-4-32.3
72-6-1
72-6-10
Chesterville Road (A), Elk Township, Chester County, PA
Elk, Chester County, PA
New London, Chester County, PA

The complete address of the above named Grantee, The Conservation Fund, a Non-Profit Corporation is:

The Conservation Fund
1655 North Fort Myer Drive, Suite 1300
Arlington, Virginia 22209

On behalf of the Grantee:



Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

EXHIBIT "A"
Legal Description of the Property

Description of five premises to be conveyed to The Conservation Fund known as Strawbridge Phase II, as shown on the ALTA/NSPS Land Title Survey prepared by Transition Engineering Surveying dated September 26, 2017, project number 294.02.01.

Situated in Elk Township, New London Township, and Franklin Township, Chester County, Pennsylvania.

Premises A – Phase 1 (U.P.I. 70-5-6), known as #1001 Chesterville Road (Source of Title: Deed Record B, Volume 64, Page 175).

BEGINNING at a point (spike set call) in the bed and title line of Chesterville Road Pennsylvania Route No. 841 at 33' wide, said point being a common corner for the premises herein being described and lands known as #985 Chesterville Road now or formerly of N. Philip Dougherty and Marie A. Dougherty his wife, and others, and further located along the bed and centerline of said Chesterville Road, the thirteen (13) following described courses and distances from the intersection formed by the said centerline of Chesterville Road with the centerline of Strickersville Road at 33' wide:

1. N 09° 34' 12" E, 36.50' to a point;
2. N 04° 30' 16" E, 51.95' to a point;
3. N 04° 13' 24" E, 51.60' to a point;
4. N 04° 21' 37" E, 231.05' to a point;
5. Along the arc of a circle curving to the left (radius = 756.48') (chord = 231.41', chord bearing = N 05° 37' 36" W), an arc distance of 232.32' to a point;
6. N 14° 25' 29" W, 31.67' to a point;
7. N 14° 41' 12" W, 155.83' to a point;
8. N 15° 18' 38" W, 216.99' to a point;
9. Along the arc of a circle curving to the right (radius = 1950.54') (chord = 193.39', chord bearing = N 10° 49' 03" W), an arc distance of 193.47' to a point;
10. N 07° 58' 34" W, 77.87' to a point;
11. N 05° 59' 57" W, 278.48' to a point;
12. N 07° 49' 48" W, 253.42' to a point; and
13. N 09° 28' 35" W, 220.39'.

THENCE from the said point of beginning, along the title line of said Chesterville Road the four (4) following described courses and distances:

1. N 09° 50' 40" W, 498.86' to a point (spike set call);
2. N 20° 54' 10" W, 418.51' to a point (spike set call);
3. N 18° 10' 07" W, 251.55' to a point (spike set call); and
4. N 05° 32' 50" E, 467.25' to a point, a corner for Premises B;

THENCE by the same, the twelve (12) following described courses and distances:

1. N 86° 55' 18" E, 220.91' to a point;
2. Along the arc of a circle curving to the left (radius = 263.00') (chord = 204.44', chord bearing = N 64° 03' 00" E), an arc distance of 209.97' to a point;
3. N 41° 10' 42" E, 227.72' to a point;
4. N 51° 17' 58" E, 193.36' to a point;
5. N 40° 53' 01" E, 174.72' to a point;

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

6. N 47° 22' 34" E, 221.77' to a point;
7. N 37° 28' 20" E, 334.01' to a point;
8. N 45° 17' 00" E, 314.29' to a point;
9. N 38° 35' 57" E, 259.33' to a point;
10. N 41° 05' 26" E, 200.80' to a point;
11. Along the arc of a circle curving to the right (radius = 180.00') (chord = 303.92', chord bearing = S 81° 19' 17" E), an arc distance of 361.84' to a point; and
12. S 23° 44' 01" E, 127.53' to a point, a corner for Phase 3 lands known as #633 Strickersville Road, now or formerly of Delaware Trust Company and George Strawbridge and others (Deed Record B, Volume 64, Page 175) (U.P.I 70-5-8);

THENCE by the same, the ten (10) following described courses and distances:

1. S 07° 24' 24" W, 192.19' to a point;
2. S 25° 52' 31" W, 296.59' to a point;
3. S 08° 28' 56" W, 281.55' to a point;
4. S 13° 43' 33" E, 367.71' to a point;
5. S 07° 50' 14" E, 297.19' to a point;
6. S 13° 44' 47" W, 271.14' to a point;
7. S 05° 57' 22" E, 258.81' to a point;
8. S 03° 22' 21" W, 233.11' to a point;
9. S 31° 51' 37" W, 412.83' to a point; and
10. S 15° 41' 21" W, 376.60' to a point, said point being a common corner for the premises herein being described, said lands known as #633 Strickersville Road, lands known as #112 Schoolhouse Road now or formerly of Christ S. King and Anna M. King his wife (Deed Book 9034, Page 527), (U.P.I. 70-5-9), and the aforesaid lands known as #985 Chesterville Road;

THENCE along said lands known as #985 Chesterville Road, S 86° 21' 20" W, 1350.72' to a point in the aforesaid bed of Chesterville Road, the first mentioned point and place of beginning.

CONTAINING within said described metes and bounds 94.9239 acres of land, be the same more or less.

Premises B – Phase 1 (U.P.I. 70-5-7), known as #1 Springlawn Road (Source of Title: Deed Record B, Volume 64, Page 175).

BEGINNING at a point (spike set call) in the bed and title line of Chesterville Road Pennsylvania Route No. 841 at 33' wide, said point being a common corner for the premises herein being described as Premises A, and further located along the bed and title line of said Chesterville Road, the seventeen (17) following described courses and distances from the intersection formed by the said centerline of Chesterville Road with the centerline of Strickersville Road at 33' wide:

1. N 09° 34' 12" E, 36.50' to a point;
2. N 04° 30' 16" E, 51.95' to a point;
3. N 04° 13' 24" E, 51.60' to a point;
4. N 04° 21' 37" E, 231.05' to a point;
5. Along the arc of a circle curving to the left (radius = 756.48') (chord = 231.41', chord bearing = N 05° 37' 36" W), an arc distance of 232.32' to a point;

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

6. N 14° 25' 29" W, 31.67' to a point;
7. N 14° 41' 12" W, 155.83' to a point;
8. N 15° 18' 38" W, 216.99' to a point;
9. Along the arc of a circle curving to the right (radius = 1950.54') (chord = 193.39', chord bearing = N 10° 49' 03" W), an arc distance of 193.47' to a point;
10. N 07° 58' 34" W, 77.87' to a point;
11. N 05° 59' 57" W, 278.48' to a point;
12. N 07° 49' 48" W, 270.82' to a point;
13. N 09° 37' 02" W, 203.00'.
14. N 09° 50' 40" W, 498.86' to a point (spike set call);
15. N 20° 54' 10" W, 418.51' to a point (spike set call);
16. N 18° 10' 07" W, 251.55' to a point (spike set call); and
17. N 05° 32' 50" E, 467.25'.

THENCE from the said point of beginning along the title line of said Chesterville Road, N 05° 32' 50" E, 8.95' to a point (spike set call), a corner for lands known as #1075 Chesterville Road now or formerly of David Cooper and Sharon Cooper his wife (Deed Record U, Volume 50, Page 144) (U.P.I. 71-5-2), said point also being the southwest corner of a water rights right of way easement.

THENCE along said lands known as #1075 Chesterville Road and along the southeasterly side of said water rights right of way easement, the fifteen (15) following described courses and distances:

1. N 80° 18' 52" E, 321.87' to a point (iron pin call);
2. N 46° 11' 57" E, 150.43' to a point (iron pin call);
3. N 42° 35' 57" E, 242.61' to a point (iron pin call);
4. N 56° 15' 57" E, 102.98' to a point (iron pin call);
5. N 38° 55' 57" E, 155.16' to a point (iron pin call);
6. N 46° 33' 57" E, 187.97' to a point (iron pin call);
7. N 48° 59' 57" E, 90.78' to a point (iron pin call);
8. N 36° 46' 57" E, 125.30' to a point (iron pin call);
9. N 38° 08' 57" E, 214.76' to a point (iron pin call);
10. N 44° 59' 57" E, 189.98' to a point (iron pin call);
11. N 42° 53' 57" E, 227.40' to a point (iron pin call);
12. N 37° 48' 57" E, 360.43' to a point (iron pin call);
13. N 40° 47' 57" E, 288.73' to a point (iron pin call);
14. N 53° 47' 57" E, 209.01' to a point (iron pin call); and
15. N 45° 09' 57" E, 67.71' to a point, said point being a common corner for the premises herein being described said lands known as #1075 Chesterville Road and said easement Premises D, now or formerly of George Strawbridge Jr. (Deed Book 4158, Page 1495) (U.P.I. 72-6-1), and Phase 2 lands known as #99 Bullock Road now or formerly of Delaware Trust Company and trustee for Strawbridge (Deed Record B, Volume 64, Page 175) (U.P.I. 72-6-4);

THENCE along said lands known as #99 Bullock Road, and along new title (tie) lines of Big Elk Creek, the forty-four (44) following described courses and distances:

1. S 67° 47' 50" E, 63.22' to a point;
2. S 28° 51' 08" E, 347.66' to a point;
3. S 14° 26' 10" E, 397.54' to a point;
4. S 23° 53' 55" E, 460.54' to a point;

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

5. S 40° 43' 49" E, 141.24' to a point;
6. S 62° 40' 24" E, 160.48' to a point;
7. N 72° 51' 22" E, 177.80' to a point;
8. N 89° 14' 08" E, 115.53' to a point;
9. N 64° 53' 11" E, 130.54' to a point;
10. N 36° 17' 09" E, 217.50' to a point;
11. N 17° 11' 40" E, 99.01' to a point;
12. N 13° 53' 09" W, 194.74' to a point;
13. N 06° 34' 29" W, 666.92' to a point;
14. N 23° 26' 54" W, 139.08' to a point;
15. N 24° 31' 14" E, 114.90' to a point;
16. N 54° 58' 01" E, 237.29' to a point;
17. N 84° 25' 34" E, 146.37' to a point;
18. S 69° 20' 47" E, 132.00' to a point;
19. S 34° 00' 01" E, 128.70' to a point;
20. S 81° 36' 22" E, 210.89' to a point;
21. S 83° 58' 21" E, 228.35' to a point;
22. S 32° 20' 03" E, 167.44' to a point;
23. S 84° 17' 05" E, 150.48' to a point;
24. S 74° 32' 54" E, 170.50' to a point;
25. S 77° 38' 15" E, 250.88' to a point;
26. N 78° 03' 10" E, 111.54' to a point;
27. S 41° 46' 56" E, 369.15' to a point;
28. S 74° 20' 31" E, 302.37' to a point;
29. S 43° 19' 31" E, 235.57' to a point;
30. S 13° 01' 47" E, 138.20' to a point;
31. S 15° 10' 32" E, 87.18' to a point;
32. S 04° 11' 42" W, 534.08' to a point;
33. S 15° 45' 23" W, 362.93' to a point;
34. S 14° 13' 18" E, 363.08' to a point;
35. S 18° 10' 41" E, 316.20' to a point;
36. S 51° 04' 59" E, 86.98' to a point;
37. S 21° 56' 11" E, 208.51' to a point;
38. S 78° 05' 35" E, 494.00' to a point;
39. S 69° 58' 20" E, 722.25' to a point;
40. S 53° 42' 31" E, 450.90' to a point;
41. S 68° 35' 19" E, 225.52' to a point;
42. S 32° 08' 25" E, 141.01' to a point;
43. S 20° 15' 51" W, 124.86' to a point; and
44. S 35° 00' 10" W, 49.64' to a point in the bed and title line of Strickersville Road at 33' wide;

THENCE along the bed and title line of Strickersville Road, S 69° 30' 51" W, 474.02' to a point, a corner for Phase 3 lands known as #633 Strickersville Road now or formerly of Delaware Trust Company and George Strawbridge and others (Deed Record B, Volume 64, Page 175) (U.P.I. 70-5-8), said point being in the centerline of Springlawn Road T-354 vacated, said point being in the terminus of a public trail easement at 33' wide;

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

THENCE along said Phase 3 lands known as #633 Strickersville Road, along the title lines of said easement and said vacated road, the forty-two (42) following described courses and distances:

1. N 06° 43' 32" W, 177.09' to a point;
2. Along the arc of a circle curving to the left (radius = 545.00') (chord = 176.07', chord bearing = N 16° 01' 17" W), an arc distance of 176.84' to a point;
3. N 25° 19' 02" W, 200.01' to a point;
4. Along the arc of a circle curving to the left (radius = 475.00') (chord = 233.25', chord bearing = N 39° 31' 49" W), an arc distance of 235.66' to a point;
5. N 53° 44' 36" W, 114.99' to a point;
6. Along the arc of a circle curving to the left (radius = 425.00') (chord = 127.82', chord bearing = N 62° 23' 32" W), an arc distance of 128.30' to a point;
7. N 71° 02' 26" W, 182.93' to a point;
8. N 64° 57' 51" W, 204.61' to a point;
9. Along the arc of a circle curving to the left (radius = 350.00') (chord = 168.68', chord bearing = N 78° 54' 28" W), an arc distance of 170.35' to a point;
10. S 87° 08' 55" W, 85.18' to a point;
11. Along the arc of a circle curving to the right (radius = 225.00') (chord = 105.31', chord bearing = N 79° 19' 04" W), an arc distance of 106.29' to a point;
12. N 65° 47' 03" W, 243.43' to a point;
13. Along the arc of a circle curving to the right (radius = 245.00') (chord = 237.24', chord bearing = N 36° 49' 33" W), an arc distance of 247.65' to a point;
14. N 07° 52' 03" W, 351.37' to a point;
15. N 05° 11' 35" W, 147.17' to a point;
16. N 11° 39' 14" W, 109.67' to a point;
17. Along the arc of a circle curving to the left (radius = 425.00') (chord = 311.84', chord bearing = N 33° 10' 37" W), an arc distance of 319.30' to a point;
18. N 54° 42' 00" W, 37.68' to a point;
19. N 10° 26' 17" W, 252.23' to a point;
20. N 37° 36' 37" W, 248.38' to a point;
21. Along the arc of a circle curving to the right (radius = 830.00') (chord = 129.16', chord bearing = N 33° 08' 52" W), an arc distance of 129.29' to a point;
22. N 28° 41' 07" W, 356.00' to a point;
23. Along the arc of a circle curving to the left (radius = 350.00') (chord = 130.71', chord bearing = N 39° 26' 49" W), an arc distance of 131.48' to a point;
24. N 50° 12' 32" W, 246.80' to a point;
25. N 63° 56' 17" W, 108.82' to a point;
26. Along the arc of a circle curving to the left (radius = 150.00') (chord = 67.45', chord bearing = N 76° 55' 54" W), an arc distance of 68.03' to a point;
27. N 89° 55' 31" W, 535.10' to a point;
28. N 89° 58' 22" W, 221.46' to a point;
29. Along the arc of a circle curving to the left (radius = 235.00') (chord = 275.93', chord bearing = S 54° 04' 35" W), an arc distance of 294.91' to a point;
30. S 18° 07' 31" W, 185.56' to a point;
31. Along the arc of a circle curving to the left (radius = 336.81') (chord = 172.60', chord bearing = S 03° 16' 44" W), an arc distance of 174.55' to a point;
32. Along the arc of a circle curving to the right (radius = 215.00') (chord = 250.02', chord bearing = S 23° 59' 07" W), an arc distance of 266.82' to a point;
33. S 59° 32' 16" W, 225.93' to a point;
34. S 69° 30' 06" W, 325.39' to a point;

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

35. S 42° 55' 32" W, 126.26' to a point;
36. Along the arc of a circle curving to the right (radius = 100.00') (chord = 77.14', chord bearing = S 65° 36' 41" W), an arc distance of 79.19' to a point;
37. S 88° 17' 51" W, 110.71' to a point;
38. Along the arc of a circle curving to the right (radius = 180.00') (chord = 168.56', chord bearing = N 63° 47' 02" W), an arc distance of 175.42' to a point;
39. N 35° 51' 55" W, 160.89' to a point;
40. N 28° 20' 22" W, 260.11' to a point;
41. N 16° 28' 43" W, 327.85' to a point;
42. N 23° 44' 01" W, 182.64' to a point, a corner for the aforesaid lands known as Premises A;

THENCE still along the title lines of said easement and said vacated road, the twelve (12) following described courses and distances:

1. N 23° 44' 01" W, 127.53' to a point;
2. Along the arc of a circle curving to the left (radius = 180.00') (chord = 303.92', chord bearing = N 81° 19' 17" W), an arc distance of 361.84' to a point;
3. S 41° 05' 26" W, 200.80' to a point;
4. S 38° 35' 57" W, 259.33' to a point;
5. S 45° 17' 00" W, 314.29' to a point;
6. S 37° 28' 20" W, 334.01' to a point;
7. S 47° 22' 34" W, 221.77' to a point;
8. S 40° 53' 01" W, 174.72' to a point;
9. S 51° 17' 58" W, 193.36' to a point;
10. S 41° 10' 42" W, 227.72' to a point;
11. Along the arc of a circle curving to the right (radius = 263.00') (chord = 204.44', chord bearing = S 64° 03' 00" W), an arc distance of 209.97' to a point;
12. S 86° 55' 18" W, 220.91' to a point in the bed of said Chesterville Road, the first mentioned point and place of beginning;

CONTAINING within said described metes and bounds 66.8385 acres of land, be the same more or less.

Premises C – Phase 1 (U.P.I. 71-4-32.3) and Premises D - Phase 1 (U.P.I. 72-6-1), known as #2057 Chesterville Road (Source of Title: Deed Book 4158, Page 1495).

BEGINNNG at a point in the bed and title line of Chesterville Road Pennsylvania Route No. 841 at 33' wide, said point being a common corner for the premises herein being described and lands known as #2003 Chesterville Road now or formerly of Rosemary Pushkarewicz (Deed Book 8728, Page 1624) (U.P.I. 71-4-32), said point being further located along the title lines of said Chesterville Road the three (3) following described courses and distances from the point of intersection formed by the title line of said Chesterville Road with the title line of another section of Chesterville Road at 33' wide, at the southerly terminus of the title line of Lewisville Road at 33' wide:

1. N 78° 03' 12" E, 185.07' to a point;
2. N 53° 47' 12" E, 366.29' to a point; and
3. N 71° 09' 12" E, 340.81.

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

THENCE from the said point of beginning along the title line of said Chesterville Road, N 71° 09' 12" E, 265.91' to a point, a corner for lands known as #2097 Chesterville Road, now or formerly of Michael E. Chaga and Doris J. Chaga his wife (Deed Book 3781, Page 1752) (U.P.I. 71-4-32.2 and U.P.I. 72-6-1.2);

THENCE by the same, S 33° 27' 48" E, 1605.87' to a point (iron pin call), a corner for Phase 2 lands known as #99 Bullock Road, now or formerly of Delaware Trust Company and trustee for Strawbridge (Deed Record B, Volume 64, Page 175) (U.P.I. 72-6-4);

THENCE by the same, S 44° 44' 34" W, 782.85' to a point, said point being a common corner for the premises herein being described, said lands known as #99 Bullock Road, Premises B, and lands known as #1075 Chesterville Road, now or formerly of David Cooper and Sharon S. Cooper his wife (Deed Record U, Volume 50, Page 144) (U.P.I. 71-5-2);

THENCE along said lands known as #1075 Chesterville Road, N 79° 28' 33" W, 810.16' to a point, a corner for lands known as #2001 Chesterville Road, now or formerly of Charles G. Woods and Lois A. Woods his wife (Deed Record Q, Volume 40, Page 991) (U.P.I. 71-4-31);

THENCE by the same, N 06° 18' 48" W, 652.55' to a point, a corner for said lands known as #2003 Chesterville Road;

THENCE by the same, the two (2) following described courses and distances:

1. N 71° 51' 12" E, 476.33' to a point; and
2. N 11° 08' 48" W, 881.53' to a point in the bed of said Chesterville Road, the first mentioned point and place of beginning;

CONTAINING within said described metes and bounds 33.6346 acres of land, be the same more or less.

Premises E – Phase 1 (U.P.I. 72-6-10), known as #401 Strickersville Road (Source of Title: Deed Record B, Volume 64, Page 175).

BEGINNING at a point in the bed and title line of Strickersville Road at 33' wide, said point being a common corner for the premises herein being described and the subdivision of Mt. Olivet Farms (extended) (Microfilm No. 1408) said point being further located the three (3) following described courses and distances from the westerly end of a 25.00' radius junction curve joining the northerly side of said Strickersville Road with the westerly side of Peter Christopher Drive at 50' wide:

1. S 10° 34' 49" W, 13.58' to a point in the title line of said Strickersville Road;
2. THENCE by the same, N 79° 25' 11" W, 87.91' to an angle point; and
3. Along another title line of Strickersville Road, N 79° 54' 11" W, 112.74'.

THENCE from the said point of beginning, continuing along the bed and title lines of Strickersville Road the two (2) following described courses and distances:

1. N 80° 18' 01" W, 519.80' to a point; and
2. N 84° 49' 31" W, 470.28' to a point, a corner for lands known as #421 Strickersville Road now or formerly of Ronald M. Basara (Deed Book 5135, Page 319) (U.P.I. 72-6-11);

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

THENCE by the same, N 05° 33' 36" E, 294.47' to a point;

THENCE still by the same and along lands known as #423 Strickersville Road now or formerly of James E. Nowland (Deed Book 5113, Page 741) (U.P.I. 72-6-12), N 77° 06' 45" W, 437.88' to a point, a corner for Phase 2 lands known as #99 Bullock Road, now or formerly of Delaware Trust Company and trustee for George Strawbridge (Deed Record B, Volume 64, Page 175) (U.P.I. 72-6-4);

THENCE by the same (along new title lines for Mt. Olivet Road, at 33' wide), the eight (8) following described courses and distances:

1. N 10° 22' 42" W, 454.24' to a point;
2. N 10° 44' 27" E, 481.21' to a point;
3. N 28° 03' 06" E, 1020.62' to a point;
4. N 22° 22' 46" E, 237.42' to a point;
5. N 08° 55' 54" E, 159.65' to a point;
6. N 14° 01' 33" E, 607.00' to a point;
7. N 14° 47' 21" W, 384.05' to a point; and
8. N 36° 03' 37" W, 230.03' to a point in the bed of Walker Road at 33' wide;

THENCE along the title line of said Walker Road, S 85° 18' 09" E, 56.76' to a point (iron pin call), a corner for lands known as #2 Johnson Lane now or formerly of John R. Griffith and Ann P. Griffith his wife (Deed Record P, Volume 65, Page 386) (U.P.I. 72-6-8.44);

THENCE by the same, S 40° 05' 09" E, 439.64' to a point (iron pin call);

THENCE still by the same, and along lands known as #10 Ways Run now or formerly Jeffrey D. Bennett and Juanita S. Bennett his wife (Deed Record Z, Volume 63, Page 521) (U.P.I. 72-6-8.57), S 05° 56' 51" W, 1054.09' to a point (iron pin call);

THENCE still along said lands known as #10 Ways Run, S 42° 57' 35" E, 473.49' to a point (iron pin call);

THENCE still along said lands known as #10 Ways Run and along said subdivision of Mt. Olivet Farms, S 08° 16' 00" E, 2150.90' to a point in the said bed of Strickersville Road, the first mentioned point and place of beginning;

CONTAINING within said described metes and bounds 59.0579 acres of land, be the same more or less.

As to Premises A, B and E

Being part of the same premises which Springlawn Corporation, a Pennsylvania corporation by Deed dated 10-18-1978 and recorded 10-21-1978 in Chester County in Deed Book W 53 Page 573 conveyed unto George Strawbridge, Jr., Individually, an undivided seventy (70%) percent interest and Girard Bank, George Strawbridge, Sr. and Charles H. Norris, Jr., Trustees under Deed of Trust of George Strawbridge, Jr., dated 1-20-1971, the remaining thirty (30%) percent interest as a tenancy in common as to the whole thereof, in fee.

Also being part of the same premises which vested in Delaware Trust Company, George Strawbridge and William C. Lickle, Trustees under Deed of George Strawbridge, Jr. dated

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

January 20, 1971, thirty percent interest, by Certificate of Award of Real Estate, Trust Inter Vivos: George Strawbridge, Jr., Settlor No. 84664 by the Orphans' Court Division of the Court of Common Pleas for the County of Montgomery dated 8-7-1984 and recorded 8-23-1984 in Deed Book B 64 page 175.

As to Premises C and D

Being the same premises which Jane F. Trimble by Deed dated 3-31-1977 and recorded 4-2-1997 in Chester County in Record Book 4158 Page 1495 conveyed unto George Strawbridge, Jr., in fee.

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

REV-183 EX (2-15)

pennsylvania
DEPARTMENT OF REVENUE
Bureau of Individual Taxes
PO BOX 280603
Harrisburg, PA 17128-0603

REALTY TRANSFER TAX STATEMENT OF VALUE

See reverse for instructions.

RECORDER'S USE ONLY
State Tax Paid
Book Number
Page Number
Date Recorded

Complete each section and file in duplicate with Recorder of Deeds when (1) the full value/consideration is not set forth in the deed, (2) the deed is without consideration or by gift, or (3) a tax exemption is claimed. If more space is needed, please attach additional sheets. A Statement of Value (SOV) is not required if the transfer is wholly exempt from tax based on family relationship or public utility easement. However, it is recommended that a SOV accompany all documents filed for recording.

A. CORRESPONDENT – All inquiries may be directed to the following person:

Name			Telephone Number:
Jodi R. O'Day, Vice President and Regional Counsel, The Conservation Fund			(443) 482-2826
Mailing Address	**City**	**State**	**ZIP Code**
410 Severn Avenue, Suite 204	Annapolis	MD	21403

B. TRANSFER DATA

Date of Acceptance of Document				
11/17/17				
Grantor(s)/Lessor(s)	**Telephone Number:**	**Grantee(s)/Lessee(s)**		**Telephone Number:**
George Strawbridge, Jr. and Trustees		The Conservation Fund		
Mailing Address		**Mailing Address**		
Greenville Center, Building B-100		1655 North Fort Myer Drive, Suite 1300		
City	**State / ZIP Code**	**City**	**State**	**ZIP Code**
Greenville	DE 19807	Arlington	VA	22209

C. REAL ESTATE LOCATION

Street Address	City, Township, Borough	
Various Properties (see attached)	Elk, Franklin, New London Townships	
County	**School District**	**Tax Parcel Number**
Chester	Oxford Area, Avon Grove	See Attached

D. VALUATION DATA

Was transaction part of an assignment or relocation? ☐ Y ☐ N

1. Actual Cash Consideration	2. Other Consideration	3. Total Consideration
4,385,000.00	+0.00	= 4,385,000.00
4. County Assessed Value	**5. Common Level Ratio Factor**	**6. Computed Value**
1,287,870.00	x 1.89	= 2,434,074.30

E. EXEMPTION DATA - Refer to instructions for exemption status.

1a. Amount of Exemption Claimed	1b. Percentage of Grantor's Interest in Real Estate	1c. Percentage of Grantor's Interest Conveyed
$ 4,385,000.00	100.00 %	100.00 %

2. Check Appropriate Box Below for Exemption Claimed.

- ☐ Will or intestate succession. _____ (Name of Decedent) _____ (Estate File Number)
- ☐ Transfer to a trust. (Attach complete copy of trust agreement identifying all beneficiaries.)
- ☐ Transfer from a trust. Date of transfer into the trust _____
  If trust was amended attach a copy of original and amended trust.
- ☐ Transfer between principal and agent/straw party. (Attach complete copy of agency/straw party agreement.)
- ☐ Transfers to the commonwealth, the U.S. and instrumentalities by gift, dedication, condemnation or in lieu of condemnation. (If condemnation or in lieu of condemnation, attach copy of resolution.)
- ☐ Transfer from mortgagor to a holder of a mortgage in default. (Attach copy of mortgage and note/assignment.)
- ☐ Corrective or confirmatory deed. (Attach complete copy of the deed to be corrected or confirmed.)
- ☐ Statutory corporate consolidation, merger or division. (Attach copy of articles.)
- ☒ Other (Please explain exemption claimed.) Exempt pursuant to 72 P.S. Sec 8102-C.3-18

Under penalties of law, I declare that I have examined this statement, including accompanying information, and to the best of my knowledge and belief, it is true, correct and complete.

Signature of Correspondent or Responsible Party	Date
The Conservation Fund By: Jodi R. O'Day, Vice President	11/17/17

FAILURE TO COMPLETE THIS FORM PROPERLY OR ATTACH REQUESTED DOCUMENTATION MAY RESULT IN THE RECORDER'S REFUSAL TO RECORD THE DEED.

Documents provided by DataTree LLC via it's proprietary imaging and delivery system. Copyright 2003, All rights reserved.

EXHIBIT TO TRANSFER TAX STATEMENT OF VALUE

Grantors: George Strawbridge, Jr. and the trustees of George Strawbridge Jr. Trust
Grantee: The Conservation Fund, a Non-Profit Corporation

Tax Parcel Number	Assessed Value	Township
70-5-6	$222,130.00	Elk
70-5-7	$151,410.00	Elk
71-4-32.3	$487,710.00	New London
72-6-1	$85,870.00	Franklin
72-6-10	$340,750.00	Franklin
Total Assessed Value:	$1,287,870.00	

APPENDIX D

SITE PHOTOGRAPHS

Photo 1: General view of fields, looking north.

Photo 2: General view of fields, looking east.

Photo 3: View of remnant of house within central portion of Property.

Photo 4: View across fields, looking northeast.

Photo 5: View of Springlawn Road trail.

Photo 6: View of building ruins along Big Elk Creek.

Photo 7: Typical configuration of wire mesh fencing observed within Property.

Photo 8: View of field showing steep topographic relief.

APPENDIX E

ENVIRONMENTAL PROFESSIONAL
QUALIFICATIONS

David P. Bailey
Senior Environmental Scientist

EDUCATION

B.S., Agriculture, University of Delaware, 1997
Post Graduate Coursework, University of Maryland, Graduate Studies in Environmental Management

TRAINING

Wetlands Delineation, Cook College Rutgers University, 2003
Hydrology of Wetlands, Cook College Rutgers University, 2004
Advanced Wetland Delineation, Environmental Concern, Inc. 2005
Lake Management, Cook College, Rutgers University, 2007
Introduction to Groundwater Investigations, U.S. Environmental Protection Agency, 2008
Hazardous Waste Operations and Emergency Response (HAZWOPER) 40 Hour Training
8-Hour OSHA Annual Refresher Courses

Background / Skills

Mr. Bailey has been working as a project manager / senior environmental scientist in the field of environmental consulting for over 10 years. His project experience includes Preliminary Environmental Site Assessments, Phase I and II environmental site assessments, subsurface site investigations, hydrogeologic evaluations, stormwater recharge evaluations, underground storage tank investigations, environmental health and safety monitoring, asbestos surveys, and lead-based paint surveys. Mr. Bailey's typical job responsibilities include: writing proposals, work plans, health and safety plans, and reports; coordinating, performing, and supervising field sampling; and interpreting and modeling analytical data. His field experience includes soils identification and classification, monitoring-well installations, soil and groundwater sampling, and field investigations for vapor intrusion modeling.

SELECTED PROJECT EXPERIENCE

Project Manager – Environmental Site Assessments, Various Sites

Mr. Bailey has served as a Project Manager and Senior Environmental Scientist for environmental site assessments of multi-family residential, commercial (retail and office), and industrial facilities in over 18-states nationwide. His work on these types of projects included aerial photographic interpretation, participation in magnetic surveys to locate subsurface features such as tanks and piping, historical research, visual site reviews, and interaction with local and state agencies.

Senior Environmental Scientist – Industrial Facility, Salisbury, Maryland

Mr. Bailey served as a Senior Environmental Scientist on a large scale Remedial Investigation (RI) of an approximately 18-acre, 400,000 square foot facility which had manufactured gasoline pumps / dispensers for approximately 65 years. His work on this project consisted of performing historical research, reviewing environmental regulatory files provided by the U.S. Environmental Protection Agency (EPA) and the State of Maryland Department of the Environment (MDE), cataloging all relevant environmental documents, reviewing soil borings collected by direct-push and hollow-stem auger methods, providing oversight during the installation of groundwater monitoring wells, collecting soil and groundwater samples, and interpreting laboratory analysis data.

Senior Environmental Scientist – 22-Acre Parcel Environmental Site Assessment, Rehoboth Beach, Delaware

Mr. Bailey completed a Phase I Environmental Site Assessment and subsequent Limited Subsurface Evaluation of an approximately 22-acre undeveloped parcel located in Rehoboth Beach, Delaware. Historically the property had been undeveloped vacant land, however, the site investigation revealed that miscellaneous solid waste and containers of unknown contents had been left on-site and presented an environmental concern. In order to evaluate these conditions, Mr. Bailey performed a limited subsurface evaluation of the property which included a magnetometer survey, test pit excavations, soil sampling and laboratory analysis, and providing an estimated cost to properly dispose of the solid waste and impacted soils identified during the assessment. Through this limited evaluation, Mr. Bailey was able to provide a basis for which the prospective purchaser was able to renegotiate the selling price of the property.

Senior Environmental Scientist – Remedial Investigation / Feasibility Study (RI/FS), Wilmington, Delaware

Mr. Bailey assisted in preparing an Addendum to an existing RI/FS for a property that had previously entered into the State of Delaware's Voluntary Cleanup Program (VCP). Mr. Bailey's work on the project consisted of analyzing laboratory data generated during the addendum to evaluate a potential human health risk associated with the migration of vapors into the building from site soils and groundwater impacted with trichloroethene (TCE) and tetrachloroethene (PCE). The evaluation was performed using the EPA approved Johnson & Ettinger Model for Subsurface Vapor Intrusion in Buildings.

Senior Environmental Scientist – Health and Safety Monitoring, Wilmington, Delaware

Mr. Bailey served as a Senior Environmental Scientist on a federally funded construction site providing environmental health and safety monitoring to document site workers exposure to constituents of concerns. Mr. Bailey's work on the project included reviewing trenching, excavation, and other soil disturbance activities, and monitoring air vapors and dust, which posed a potential health and safety risk to site workers.

Senior Environmental Scientist - Wetland Delineations and Permitting, Statewide

Mr. Bailey has performed wetland delineations, for submittal to the United States Army Corps of Engineers, on properties ranging in size from 4-acres to approximately 300-acres. Mr. Bailey's work on these projects included identifying hydric soils, hydrology, and cataloguing wetland and upland plant species. Also prepared Nationwide Permits and / or Subaqueous Lands Permits for the United States Corps of Engineers / State of Delaware Department of Natural Resources and Environmental Control associated with residential subdivisions, commercial development, and improvements to existing commercial properties. Tasks included reviewing civil engineering construction drawings specific to potential wetland impacts,

Senior Environmental Scientist – Stormwater Recharge Evaluations, Statewide

Mr. Bailey has performed stormwater recharge evaluations in support of residential and commercial development for various projects within the State of Delaware. The evaluations generally consisted of classifying soils, estimating seasonal high-water, determining the depth to groundwater when not obvious, and the suitability of site soils for subsurface recharge capability.

Senior Environmental Scientist – Pond Restoration, Residential Subdivision, St. Georges, DE

Mr. Bailey assisted with evaluating a residential stormwater pond to improve its aesthetic qualities and ensure it maintained compliance with current New Castle County stormwater pond maintenance guidelines. The evaluation consisted of monitoring water quality parameters, collecting water samples, and devising a plan of action to achieve the goals of the neighborhood association. A power point presentation was presented to the neighborhood association outlying different steps they could take to achieve one or more of their goals.

APPENDIX I
SHPO Coordination

Pennsylvania State Historic Preservation Office
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION

April 17, 2018

Alex Tatanish
Department of Conservation and natural Resources
Bureau of Recreation and Conservation
5th Floor, 400 Market Street
Harrisburg, PA 17101

Re: File No. ER 2018-1211-029-A
NPS Land & Water Conservation Program: Strawbridge 2 Property Acquisition, Elk, Franklin & New London Twps., Chester Co.

Dear Mr. Tatanish:

Thank you for submitting information concerning the above referenced project. The Pennsylvania State Historic Preservation Office (PA SHPO) reviews projects in accordance with state and federal laws. Section 106 of the National Historic Preservation Act of 1966, and the implementing regulations (36 CFR Part 800) of the Advisory Council on Historic Preservation, is the primary federal legislation. The Environmental Rights amendment, Article 1, Section 27 of the Pennsylvania Constitution and the Pennsylvania History Code, 37 Pa. Cons. Stat. Section 500 et seq. (1988) is the primary state legislation. These laws include consideration of the project's potential effects on both historic and archaeological resources.

Archaeological Resources

There is a high probability that archaeological resources are located in the project area. In our opinion, your acquisition of this property will have no effect on such resources. However, prior to any development or ground disturbing activities, a Phase I archaeological survey of the project area should be conducted. If significant archaeological resources are identified, an appropriate avoidance or mitigation plan will need to be developed. Guidelines and instructions for conducting Phase I surveys are available on our web site http://www.phmc.pa.gov/Preservation/About/Documents/SHPO-Guidelines-Archaeological-Investigation.pdf

Above Ground Resources

Based on our files and the information provided, it is our opinion that there are no above ground historic properties present. Should new information be brought to your attention regarding historic properties located within the area of potential effect, please notify the PA SHPO at (717) 783-8947 for reconsideration of the project.

If you need further information in this matter, please consult Doug McLearen at dmclearen@pa.gov or (717) 772-0925.

Sincerely,

Douglas C. McLearen, Chief
Division of Environmental Review

DCM/tmw

APPENDIX J
Tribal Coordination

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

IN REPLY REFER TO:

8A2 (PWR-PPR)
Grant 42-00580 et al

Chester Brooks, Chief
Delaware Tribe of Indians
5100 Tuxedo Boulevard
Bartlesville, OK 74006

Dear Chief Brooks:

RE: LWCF conversion replacement addition to White Clay Creek Preserve, Chester County, PA

The National Park Service (NPS) is responsible for administering the Land and Water Conservation Fund State Assistance Program (LWCF) providing matching grants to states and, through states, to local governments and tribes for the acquisition and development of public outdoor recreation areas and facilities. When accepting LWCF funds from NPS, applicants commit to managing funded areas for recreation use in perpetuity. A conversion of perpetual grant related responsibilities from one site to another can only occur if NPS agrees the sites are equivalent and eligible under program requirements. NPS has no ongoing management authority or ownership in these recreation areas.

NPS is writing to invite you to participate in consultation on an undertaking in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and as set forth in the Advisory Council on Historic Preservation rules, 36 CFR 800.2(c)(2). NPS is considering an upcoming undertaking for which we believe you may have special expertise that could help NPS address the potential for impacts to historic properties.

Your input would be especially helpful for reviewing the proposed area of potential effect (APE) and providing any suggested revisions. It would also be helpful if you can share information about historic properties within the APE, and whether you recommend survey work, monitoring, or other investigation be completed as part of our review.

The NPS undertaking being reviewed is to approve a grant amendment that would convert administrative responsibilities from portions of parks currently subject to LWCF requirements to the Strawbridge property, which will become part of White Clay Creek Preserve. The NPS undertaking is an administrative action to 1) agree to the equivalency of the two properties and amend the relevant contracts; or 2) request an alternative replacement park be provided. NPS would require that this property be open to the public for outdoor recreation use. The property is already developed with a trail, and will be managed for preservation of existing natural resources. Therefore, in addition to the administrative action of adjusting grant agreement requirements, NPS has concluded this undertaking also includes evaluating the potential impacts associated with acquiring this new parcel for public recreation purposes.

The conversion includes concurrent actions that are subject to state law, but are not part of the NPS undertaking because no NPS approval is required, nor is any funding being provided. These actions will result in a series of small road expansions, well pads, or temporary impacts in excess of 180 days on properties primarily owned by the Commonwealth of Pennsylvania and managed by the Department of Conservation and Natural Resources. They will be responsible for ensuring that they comply with all state cultural resource laws when processing those concurrent actions.

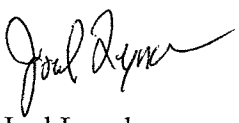
The enclosed package includes maps showing the location of this undertaking, and the proposed direct and indirect APE. If you are interested in consulting on this project, please contact the address below within 30 days of receiving this documentation.

Heather Ramsay, Program Officer
National Park Service
909 First Avenue
Seattle, WA 98104

heather_ramsay@nps.gov
206-220-4123

Alternatively, I can be reached at Joel_Lynch@nps.gov or 202-354-6905.

Sincerely,



Joel Lynch
Chief, State and Local Assistance Programs Division

Enclosure (1)

cc: Susan Bachor, East Coast Preservation Representative
Delaware Tribe of Indians
P.O. Box 64
Pocono Lake, PA18347

Ashley D. Rebert, Chief, Land Conservation & Stewardship Section
Pennsylvania Department of Conservation and Natural Resources
Bureau of Recreation and Conservation
Community Parks and Conservation Division
400 Market Street, 5th Floor
Harrisburg, PA 17101-2301

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

IN REPLY REFER TO:

8A2 (PWR-PPR)
Grant 42-00580 et al

Deborah Dotson, President
Delaware Nation, Oklahoma
PO Box 825
Anadarko, OK 73005

Dear President Dotson:

RE: LWCF conversion replacement addition to White Clay Creek Preserve, Chester County, PA

The National Park Service (NPS) is responsible for administering the Land and Water Conservation Fund State Assistance Program (LWCF) providing matching grants to states and, through states, to local governments and tribes for the acquisition and development of public outdoor recreation areas and facilities. When accepting LWCF funds from NPS, applicants commit to managing funded areas for recreation use in perpetuity. A conversion of perpetual grant related responsibilities from one site to another can only occur if NPS agrees the sites are equivalent and eligible under program requirements. NPS has no ongoing management authority or ownership in these recreation areas.

NPS is writing to invite you to participate in consultation on an undertaking in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and as set forth in the Advisory Council on Historic Preservation rules, 36 CFR 800.2(c)(2). NPS is considering an upcoming undertaking for which we believe you may have special expertise that could help NPS address the potential for impacts to historic properties.

Your input would be especially helpful for reviewing the proposed area of potential effect (APE) and providing any suggested revisions. It would also be helpful if you can share information about historic properties within the APE, and whether you recommend survey work, monitoring, or other investigation be completed as part of our review.

The NPS undertaking being reviewed is to approve a grant amendment that would convert administrative responsibilities from portions of parks currently subject to LWCF requirements to the Strawbridge property, which will become part of White Clay Creek Preserve. The NPS undertaking is an administrative action to 1) agree to the equivalency of the two properties and amend the relevant contracts; or 2) request an alternative replacement park be provided. NPS would require that this property be open to the public for outdoor recreation use. The property is already developed with a trail, and will be managed for preservation of existing natural resources. Therefore, in addition to the administrative action of adjusting grant agreement requirements, NPS has concluded this undertaking also includes evaluating the potential impacts associated with acquiring this new parcel for public recreation purposes.

The conversion includes concurrent actions that are subject to state law, but are not part of the NPS undertaking because no NPS approval is required, nor is any funding being provided. These actions will result in a series of small road expansions, well pads, or temporary impacts in excess of 180 days on properties primarily owned by the Commonwealth of Pennsylvania and managed by the Department of Conservation and Natural Resources. They will be responsible for ensuring that they comply with all state cultural resource laws when processing those concurrent actions.

The enclosed package includes maps showing the location of this undertaking, and the proposed direct and indirect APE. If you are interested in consulting on this project, please contact the address below within 30 days of receiving this documentation.

Heather Ramsay, Program Officer
National Park Service
909 First Avenue
Seattle, WA 98104

heather_ramsay@nps.gov
206-220-4123

Alternatively, I can be reached at Joel_Lynch@nps.gov or 202-354-6905.

Sincerely,

Joel Lynch
Chief, State and Local Assistance Programs Division

Enclosure (1)

cc: Kimberly Penrod, Director of Cultural Resources & Section 106
Delaware Nation, Oklahoma
PO Box 825
Anadarko, OK 73005

Ashley D. Rebert, Chief, Land Conservation & Stewardship Section
Pennsylvania Department of Conservation and Natural Resources
Bureau of Recreation and Conservation
Community Parks and Conservation Division
400 Market Street, 5th Floor
Harrisburg, PA 17101-2301

From: **Kimberly Penrod** <kpenrod@delawarenation.com>
Date: Tue, Nov 6, 2018 at 6:12 AM
Subject: [EXTERNAL] RE: White Clay Creek Preserve, Chester County, Pennsylvania
To: heather_ramsay@nps.gov <heather_ramsay@nps.gov>

Heather,

The protection of our tribal cultural resources and tribal trust resources will take all of us working together.

We look forward to working with you and your agency.

With the information you have submitted we can concur at present with this proposed plan.

Our main concerns at the Delaware Nation on these types of projects are as follows:

1. Keeping a 50-100 ft (at least) area of protection around known sites.
2. Maintaining the buffer area and not allowing heavy equipment to impact these areas. Compression is an issue of concern for us. Be mindful of material staging/storage areas.
3. Protection of indigenous plants and/or re-introduction of the indigenous plants to the area is important to the Delaware Nation. Many of these are considered Traditional Cultural Properties for our people.
4. And if something is found, halting all work, contacting us within 48 hours and when work resumes discussion of a monitor if needed.

As with any new project, we never know what may come to light until work begins.

The Delaware Nation asks that you keep us up to date on the progress of this project and if any discoveries arise please contact us immediately.

Our department is trying to go as paper free as possible. If it is at all feasible for your office to send email correspondence we would greatly appreciate.

If you need anything additional from me please do not hesitate to contact me.

Respectfully,

Kim Penrod

Delaware Nation

Director, Historic Preservation

31064 State Highway 281

PO Box 825

Anadarko, OK 73005

(405)-247-2448 Ext. 1403 Office

(405)-924-9485 Cell

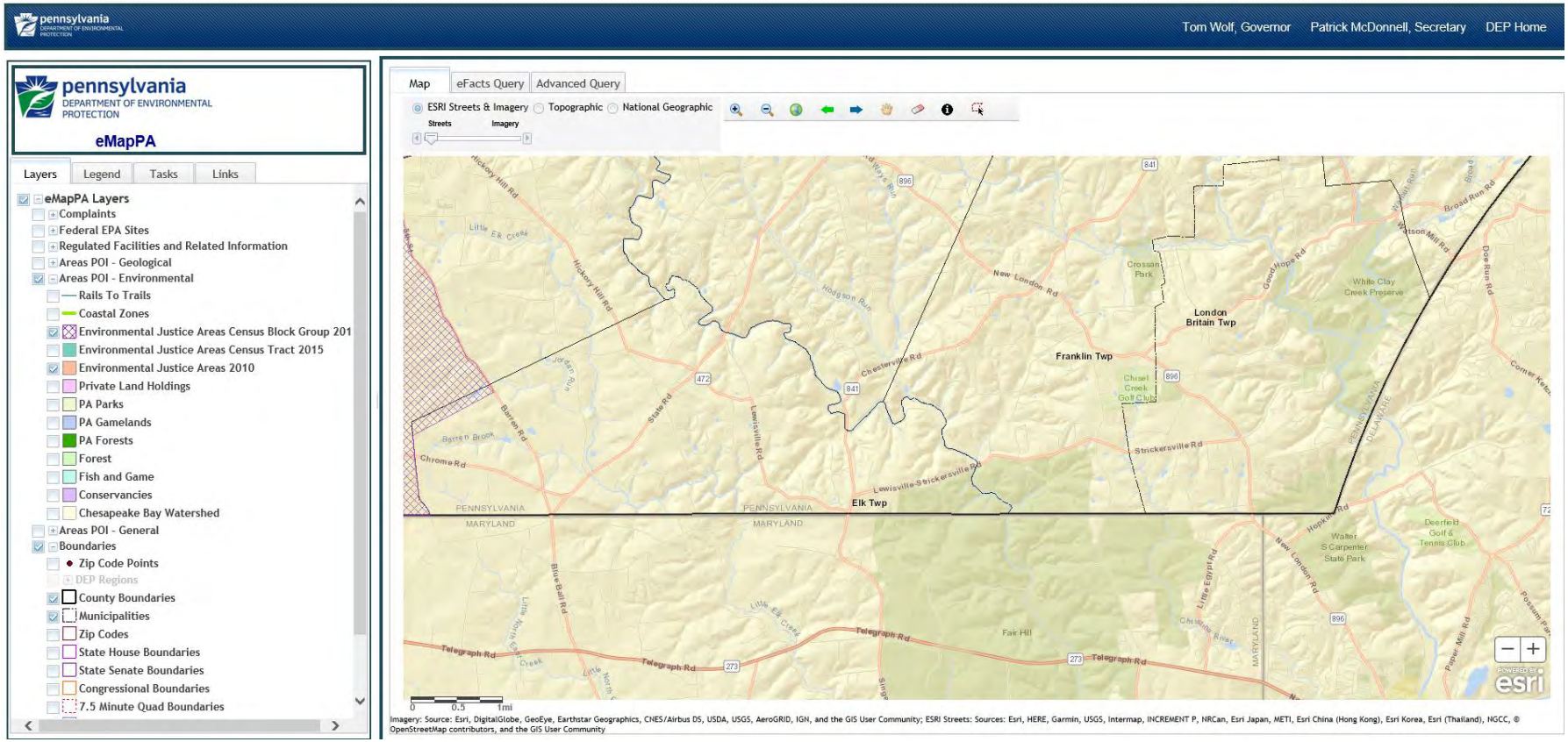
kpenrod@delawarenation.com

Unless someone like you cares a whole awful lot, nothing is going to get better. It's not. ~Dr. Seuss

CONFIDENTIALITY NOTE:

This e-mail (including attachments) may be privileged and is confidential information covered by the Electronic Communications Privacy Act 18 U.S.C. 2510-2521 and any other applicable law, and is intended only for the use of the individual or entity named herein. If the reader of this message is not the intended recipient, or the employee or agent responsible to deliver it to the intended recipient, you are hereby notified that any retention, dissemination, distribution or copying of this communication is strictly prohibited. Although this e-mail and any attachments are believed to be free of any virus or other defect that might affect any computer system in to which it is received and opened, it is the responsibility of the recipient to ensure that it is virus free and no responsibility is accepted by Delaware Nation or the author hereof in any way from its use. If you have received this communication in error, please immediately notify us by return e-mail. Thank you.

APPENDIX K
Environmental Justice Analysis


pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Tom Wolf, Governor
Patrick McDonnell, Secretary
DEP Home
pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
eMapPA
Layers
Legend
Tasks
Links
eMapPA Layers
Complaints
Federal EPA Sites
Regulated Facilities and Related Information
Areas POI - Geological
Areas POI - Environmental
Rails To Trails
Coastal Zones
Environmental Justice Areas Census Block Group 201
Environmental Justice Areas Census Tract 2015
Environmental Justice Areas 2010
Private Land Holdings
PA Parks
PA Gamelands
PA Forests
Forest
Fish and Game
Conservancies
Chesapeake Bay Watershed
Areas POI - General
Boundaries
Zip Code Points
DEP Regions
County Boundaries
Municipalities
Zip Codes
State House Boundaries
State Senate Boundaries
Congressional Boundaries
7.5 Minute Quad Boundaries
Map
eFacts Query
Advanced Query
ESRI Streets & Imagery
Topographic
National Geographic
Streets
Imagery
London Britain Twp
Franklin Twp
Elk Twp
PENNSYLVANIA
MARYLAND
Chesterville Rd
New London Rd
Lewisville-Strickersville Rd
Strickersville Rd
Telegraph Rd
Fair Hill
Crossan Park
White Clay Creek Preserve
Chisel Creek Golf Club
Deerfield Golf & Tennis Club
Water S Carpenter State Park
Hodgson Run
Little Elk Creek
Barren Brook
Chrome Rd
Blue Ball Rd
Hickory Hill Rd
Good Hope Rd
Broad Run Rd
Doe Run Rd
Hopkins Rd
Paper Mill Rd
Little Elkton Rd
Chesapeake & Delaware Canal
0
0.5
1mi
esri
Imagery: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; ESRI Streets: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

APPENDIX L
Public Comments and Responses to Comments

TABLE OF CONTENTS

I.	**PUBLIC COMMENTS RECEIVED**	**1**
	April Schmitt Email	**2**
	PennFuture Letter	**5**
II.	**RESPONSES TO PUBLIC COMMENTS**	**20**

I. PUBLIC COMMENTS RECEIVED

The Environmental Assessment (EA) report was posted on the PA Bulletin for review and public comment from January 19 to March 4, 2019. One comment from the public was received for the EA document during the public comment period (see email chain below) and a letter on behalf of Citizens for Pennsylvania's Future (PennFuture) was received on March 4, 2019. No members of the public requested a public hearing.

From: Ford, Thomas P
Sent: Tuesday, February 19, 2019 8:42 AM
To: Marci Mowery; 'Shenk, Kyle'
Cc: Rebert, Ashley; Eschenmann, Michael; Ford, Thomas P
Subject: RE: [External] RE: New Question About Big Elk Section, Strawbridge 2 Conveyance to DCNR

Good Morning

We are purchasing Strawbridge 2 to be added to Strawbridge 1 and to be managed by State Parks as part of White Clay
Creek Preserve.

There is a tremendous monetary value and recreational utility value provided with this purchase and for this reason we also plan to use the acquisition to help us with some Commonwealth and local Land and Water Conservation Fund conversions that we have been working to resolve.

There is a conversion process that is employed by NPS that includes the opportunity for the State to create what is called an "excess value bank" and to use this bank to resolve preexisting conversions.

Let me know if I can help answer any additional questions.

Tom

Thomas P. Ford| Director, Bureau of Recreation and Conservation
Department of Conservation & Natural Resources
Bureau of Recreation and Conservation
5th Floor, 400 Market St | Harrisburg, PA 17105 Phone: 717.783.2659| Fax: 717.787.9577
http://www.dcnr.state.pa.us/brc/|
www.ExplorePAtrails.com

From: Marci Mowery <mmowery-ppff@pa.net>
Sent: Monday, February 18, 2019 9:34 AM
To: 'Shenk, Kyle' <KShenk@conservationfund.org>
Cc: Ford, Thomas P <thoford@pa.gov>
Subject: [External] RE: New Question About Big Elk Section, Strawbridge 2 Conveyance to DCNR

ATTENTION: *This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.*

Tom, see thread below.

From: Shenk, Kyle [mailto:KShenk@conservationfund.org]
Sent: Friday, February 15, 2019 9:57 AM
To: Marci Mowery <mmowery-ppff@pa.net>; 'Dysinger, Ryan' <rydysinger@pa.gov>
Subject: Re: New Question About Big Elk Section, Strawbridge 2 Conveyance to DCNR

Hi Marci,

I'm no expert on conversions, but I think Scotty has it correct below. Infrastructure projects that are in violation of the stipulations of LWCF funding occuring on properties funded through LWCF, but deemed necessary, can be mitigated by putting unprotected projects under the LWCF stipulations as a "replacement".

I'd defer to DCNR Bureau of Rec and Con for a more detailed and accurate answer.

Kyle

From: Marci Mowery <mmowery-ppff@pa.net>
Sent: Thursday, February 14, 2019 11:49 AM
To: 'Dysinger, Ryan'
Cc: Shenk, Kyle
Subject: FW: New Question About Big Elk Section, Strawbridge 2 Conveyance to DCNR

Can either of you enlighten me?

From: Scotty Crowder [mailto:crowderscotty@gmail.com]
Sent: Wednesday, February 13, 2019 11:11 AM
To: April Schmitt <april.schmitt27@gmail.com>
Cc: Marci J. Mowery <mmowery-ppff@pa.net>
Subject: Fwd: New Question About Big Elk Section, Strawbridge 2 Conveyance to DCNR

April, I reviewed the information on Page 371 of this document. It looks like the State was making it's case for the purchase of Strawbridge #2 by using the resources offered by the

Strawbridge #2 property to offset the small changes occurring with other state properties, like bridge expansion and oil well installation etc. Marci may have more comments on the other state properties that are undergoing some changes and loss of resources (usually less than 5 acres for each case, based on the data in Appendix C).

Thanks for questions. Marci may have more insight on what all this means...

Scotty
---------- Forwarded message ---------
From: **April Schmitt** <april.schmitt27@gmail.com>
Date: Tue, Feb 12, 2019 at 2:40 PM
Subject: New Question About Big Elk Section, Strawbridge 2
Conveyance to DCNR To: Scotty Crowder <crowderscotty@gmail.com>

Hi Scotty,

I'm hoping that you can ask PPFF about.

I was reading through the below long and complicated report, regarding the great plan to add
963 more acres to WCC Preserve. This is the "Strawbridge 2 properties", north of Strickersville Road. Evidentially, the properties are set to be purchased under the "Land and Water Conservation Fund" land exchange.

I may be totally mistaken, but this is very worth asking Marcy about. There may be some power play decisions, regarding that finalization. If I'm reading this correctly, it may involve competition for other park projects: bridges but also adding additional undesired oil well drilling related projects. Hopefully, I'm mistaken. But if there is any advocating, that we can do ...to try to have more new parkland in parks and less new oil wells in parks ...it would seem priceless!

Please see Appendix C (may be page 371):
http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/DCNR_20033787.pdf

Thank You,
~April

March 4, 2019

Via First Class Mail and Email

Thomas Ford, Director

Bureau of Recreation and Conservation

PA Department of Conservation and Natural Resources

400 Market Street

Rachel Carson State Office Building, 5th Floor
Harrisburg, PA 17101-2301

RA-NRBRC_CONVERSIONS@pa.gov

Re: Public Comment on Conversion of LWCF State Forest Lands – Environmental Assessment of Acquisition of Land to be Acquired by the Department for the Purpose of Resolving Multiple LWCF Conversions ("Department Acquisition of Strawbridge Property") 49 Pa. Bull. 284 (January 19, 2019)

Dear Mr. Ford:

On behalf of Citizens for Pennsylvania's Future ("PennFuture"), please accept these public comments on the Pennsylvania Department of Conservation and Natural Resources' ("DCNR" or "Department") Environmental Assessment of the "Acquisition of Land to be Acquired by the Department of Conservation and Natural Resources for the Purpose of Resolving Multiple Land and Water Conservation Fund Conversions" as noticed in the January 19, 2019 *Pennsylvania Bulletin*, 49 Pa. Bull. 284. The report upon which these comments are based is entitled "Environmental Assessment: Strawbridge 2 – White Clay Creek Preserve Addition (Replacement Property) for Multiple Land and Water Conservation Fund Conversions throughout Pennsylvania,

Elk, Franklin and New London Townships, Chester County, PA" and is dated September 30, 2018 ("Strawbridge Property EA").

Northeast: 425 Carlton Road Suite 1 Mount Pocono, PA 18344
Southeast: 1429 Walnut Street Suite 400 Philadelphia, PA 19102
Central: 610 North Third Street Harrisburg, PA 17101
Southwest: 200 First Avenue Suite 200 Pittsburgh, PA 15222
Website: www.pennfuture.org

PennFuture is a state-wide public interest environmental organization dedicated to leading the transition to a clean energy economy in Pennsylvania and beyond. PennFuture strives to protect our air, water and land, and to empower citizens to build sustainable communities for future generations. PennFuture has long been dedicated to improving and protect our public lands, including state forests, across Pennsylvania through public outreach and education, advocacy, and litigation.

As is set forth in detail below, DCNR's actions fail to comply with both the National Environmental Policy Act ("NEPA") and the Land and Water Conservation Fund ("LWCF") Act, regulations, and the guidelines in the National Park Service ("NPS") LWCF Manual. Specifically,

DCNR:

- Failed to seek NPS approval of the conversions before allowing LWCF state forest land to be converted to industrial oil and gas development;
- Failed to undertake any analysis of the conversion of LWCF state forest land to industrial gas development, let alone the requisite "hard look" under NEPA;
- Appears to have inappropriately segmented its NEPA analysis of the natural gas conversions of LWCF state forest lands;
- Failed to conduct an EIS for the conversion of LWCF state forest land to industrial gas development;
- Failed to consider appropriate NEPA alternatives to the conversion of LWCF state forest land to industrial gas development;
- Failed to analyze both the local impacts of the converted uses and the impacts of the conversions on the remaining LWCF lands in accordance with the LWCF regulations;
- Failed to appropriately select a replacement property in accordance with the LWCF regulations; and
- Failed to appropriately use the replacement property as a "bank" for "recreational usefulness"

Consequently, DCNR must rescind its Strawbridge Property EA; actually evaluate the environmental impacts of the conversion of LWCF state forest land to natural gas well pads – including taking the requisite "hard look" under NEPA; and undertake and Environmental Impact Statement for the

significant environmental impacts of these industrial natural gas well pads on state forest lands. Critically, DCNR must ensure that for all future conversions of LWCF state forest lands to natural gas extraction facilities and appurtenances, it appropriately follows both the letter and spirit of both LWCF and NEPA by requesting NPS approval and taking a hard look at the environmental consequences of such an act prior to allowing the conversion to take place.

I. "CONVERSIONS" UNDER LWCF

The LWCF is a federal program designed to promote outdoor recreation in America.[1] To realize this goal, the LWCF program provides states with federal funding to acquire or develop lands on the condition that the land will only be used for "public outdoor recreation uses."[2] Any change of LWCF land to non-outdoor recreational uses, whether temporary or permanent, must undergo the "conversion" process, which requires replacement of all converted land (i.e., the

LWCF land removed from outdoor recreational use purposes) with substitute property.

Conversions are only permitted with the approval of NPS in accordance to 54 U.S.C. § 200305(6)(f)(3); 36 C.F.R. § 59.3; and the procedures set forth in the NPS's LWCF State Assistance Program Manual[3] ("LWCF Manual").

States are required by law to obtain NPS approval prior to converting any LWCF land: "No property acquired or developed with assistance under [LWCF] shall, without the approval of the Secretary, be converted to other than public outdoor recreation use."[4] The LWCF Manual sets forth in detail the formal process that must be followed for conversions.[5]

A conversion of LWCF land to a non-recreational use can only be approved by NPS if (1) it is consistent with the then existing comprehensive statewide outdoor recreation plan and (2) it provides for the substitution of other suitable replacement properties "of at least equal fair market value and of reasonably equivalent usefulness and location" to the converted land.[6] The LWCF Manual further states that generally all 6(f)(3) conversions, as they are also known, are subject to NEPA environmental impact review, requiring at least an EA that examines the environmental impacts of both the conversion from recreational use in the LWCF lands and to the development of the replacement parkland.[7] Thus, a conversion approval must consist of approval of both the converted land and the replacement land as a whole.[8] Consequently, failure to assess the environmental impacts to the converted land is a fatal deficiency in conversion EAs and proposals.

---

[1] *See* National Park Service, Land and Water Conservation Fund webpage, https://www.nps.gov/subjects/lwcf/index.htm (last visited March 4, 2019).
[2] 54 U.S.C. § 200305(b).
[3] NPS, Land And Water Conservation Fund State Assistance Program Manual (2008), https://www.nps.gov/subjects/lwcf/upload/lwcf_manual.pdf (hereinafter, "LWCF Manual").
[4] 54 U.S.C. § 200305(6)(f)(3); 36 C.F.R. § 59.3(a).
[5] *See, generally,* LWCF Manual Chs. 4 and 8.
[6] 54 U.S.C. § 200305(6)(f)(3); 36 C.F.R. § 59.3(b).
[7] *Id.* at Ch. 4-6 (emphasis added).
[8] *See Weiss v. Sec'y of U.S. Dep't of Interior*, 459 F. App'x 497 (6th Cir. 2012) (considering the "proposed conversion and substitution," or "land swap," as a whole).

If an unauthorized – i.e., unapproved – conversion is discovered by NPS, NPS shall request the non-outdoor recreational activity "cease immediately" and notify the state that it must preclude the project sponsor from "proceeding further with the conversion, use, or occupancy" of the land pending NPS review of the conversion proposal.[9] Approval by NPS, however, is not automatic for conversions: "This approval is a discretionary action and should not be considered a right of the project sponsor."[10] The proposal process for these unauthorized conversions is not distinguished from timely proposals in any statute or regulation, as such, it shows that neither

Congress nor NPS intended to create separate requirements for untimely conversion proposals. Thus, an after-the-fact conversion proposal should be as similar to a timely proposal as possible and should be assessed under the same standards.

II. DCNR'S ENVIRONMENTAL ASSESSMENT VIOLATES BOTH THE LETTER AND THE SPIRIT OF NEPA

A. PURPOSE OF NEPA

In 1970, NEPA, codified at 42 U.S.C. §§ 4321, *et. seq.*, was established in recognition of our human impact on the environment around us.[11] With NEPA, Congress created a framework for environmental review within federal agency decision-making and established the Council on Environmental Quality ("CEQ") to administer the program.[12] NEPA guarantees that federal agencies account for the environmental costs of their actions, promoting environmental protection through the procedural process.[12] While not outcome determinative, NEPA's goal is to foster informed decision-making within the federal agencies, and as a corollary ensure citizen involvement within the process.[13] As the CEQ's website states briefly:

> The ultimate goal of the NEPA process is to foster excellent action that protects, restores, and enhances our environment. This is achieved through the utilization of environmental assessments (EAs) and environmental impact statements (EISs), which

[9] *Id.* at Ch. 8-11.
[10] *Id.* at Ch. 4-6.
[11] 42 U.S.C. § 4331; *see also* Congressional White Paper, 19th Cong., Congressional White Paper on a National Policy for the Environment (1968); *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 348 (1989) ("Section 101 of NEPA declares a broad national commitment to protecting and promoting environmental quality.").
[12] 42 U.S.C. § 4331.
[12] *See Robertson*, 490 U.S. at 349 (citing *Kleppe v.Sierra Club*, 427 U.S. 390, 409 (1976)); *Weinberger v. Catholic Action of Hawaii/Peace Educ. Project*, 454 U.S. 139, 143 (1981).
[13] *Weinberger*, 454 U.S. at 143 (NEPA serves twin aims of "inject[ing] environmental considerations into the federal agency's decisionmaking process" and "inform the public that the agency has considered environmental concerns"); *see Robertson*, 490 U.S. at 349 ("[NEPA gives the public the assurance that the agency 'has indeed considered environmental concerns in its decisionmaking process,' . . . perhaps more significantly, provides a springboard for public comment") (quoting *Baltimore Gas & Elec. Co. v. Nat'l Resources Def. Council, Inc.*, 462 U.S. 97 (1983)). *See, generally,* CEQ, A Citizen's Guide to the NEPA (2007), https://ceq.doe.gov/docs/getinvolved/Citizens_Guide_Dec07.pdf.

> provide public officials with relevant information and allow a "hard look" at the potential environmental consequences of each proposed project.[14]

NEPA's main tools for achieving these goals lies within the Environmental Assessment ("EA") and Environmental Impact Statement ("EIS") requirements of environmental review process. Whereas the purpose of an EA is to determine the significance of the environmental effects and to look at alternative means to achieve the agency's objectives,[16] preparation of an EIS is required for all "major Federal actions significantly affecting the human environment."[15] While an EIS contains a more in-depth analysis, both EAs and EISs must at least contain identification of all feasible alternatives, including the proposed action, and a "hard look" analysis of their corresponding environmental impacts both direct and indirect.[16]

Critically, NEPA further mandates public involvement as an integral part of analysis of the potential environmental impacts of an action. As the Supreme Court recognized, one of NEPA's goals is to give "the public the assurance that the agency 'has indeed considered environmental concerns in its decisionmaking process,' . . . perhaps more significantly, provide[] a springboard for public comment."[17] When agencies fail to properly prepare an EA and/or an EIS, as DCNR has done here, they frustrate the purpose of NEPA by allowing the agency to make a decision without recognizing the environmental detriments of the proposed action and denying the public its right to be involved in the process. The Supreme Court in *Robinson* stated:

> NEPA ensures that the agency will not act on incomplete information, only to regret its decision after it is too late to correct. Similarly, the broad dissemination of information mandated by NEPA permits the public and other government agencies to react to the effects of a proposed action at a meaningful time.[18]

DCNR's actions are not only a violation of the statutory and regulatory requirements, but also a serious public policy issue.

B. DCNR Erroneouly Narrowed the Scope of Its NEPA Analysis of the Significant Environmental Impacts of the Converted Properties

DCNR's NEPA analysis of the relevant 6(f)(3) conversions of LWCF state forest lands to industrial natural gas well pads suffers from several procedural problems which complicates matters. First, DCNR failed to seek approval from NPS prior to allowing LWCF state forest land to be converted. Therefore, the well-pad conversions at issue here are retroactive conversions. This in-and-of-itself raises procedural and timing issues, and in many cases seems to be the root cause for DCNR's failure to comply with either NEPA or the LWCF Act. Second, DCNR seems to have segmented its NEPA analysis of the natural gas

[14] CEQ, National Environmental Policy Act "Welcome" page, https://ceq.doe.gov/ (last visited March 4, 2019).
[16] 40 C.F.R. § 1501.4(b)-(c).
[15] 42 U.S.C. § 4332(C).
[16] *See* 43 C.F.R. § 46.310 (EA Requirements); 40 C.F.R §§ 1502.14, 1502.16 (EIS Requirements).
[17] *Robertson*, 490 U.S. at 349.
[18] 490 U.S. at 349.

extraction that occurs within its LWCF state forest lands into arbitrary, smaller segments (e.g., well pads, pipelines, etc) in violation of NEPA. By doing so, DCNR has again too narrowly defined the proposed action, which results in the minimizing of potential impacts and likely avoidance of an EIS.

The Strawbridge Property EA defines the proposed federal action for NEPA purposes to be for NPS "to approve this exchange,"[19] which DCNR states as necessary to "resolve multiple LWCF conversions throughout Pennsylvania."[20] DCNR made quite clear that it did not include approval of the conversion of the LWCF lands to industrial gas well pads as part of the federal action under NEPA.[21] Thus, DCNR defined the scope of NEPA review as limited to the environmental impacts regarding the replacement property only. By doing so, DCNR erroneously defined the proposed federal agency action to be analyzed creating too narrow a scope for purposes of NEPA review.

As is set forth above, 6(f)(3) conversions are subject to NEPA analysis. A 6(f)(3) conversion necessarily includes both the conversion of the LWCF land to non-outdoor recreational use and the replacement of the converted LWCF lands with property of at least equal fair market value and reasonably equivalent usefulness. Thus, it is uncontroverted that the NEPA analysis must likewise consider both the environmental impacts of the conversion of the LWCF lands and the replacement of that land with different property. Indeed, many agencies in other states have clearly been able to understand and comply with this very basic understanding of LWCF conversions and NEPA.[24]

Here, however, and perhaps as a direct result of DCNR's failure to timely seek approval of the well-pad conversions at issue, DCNR's Strawbridge Property EA completely fails to acknowledge that the NEPA review of the LWCF conversion process must inherently include an analysis of the environmental impacts of changing state forest lands that provide important outdoor recreational uses within Pennsylvania to industrial well pads and appurtenances that serve the natural gas extraction industry and scar the landscape and diminish the recreational enjoyment of those state forest lands. As is discussed below, this failure to properly identify the scope of the proposed federal agency action and NEPA analysis is a fundamental flaw of DCNR's Strawbridge Property EA and results in the failure of DCNR to undertake any analysis of the environmental impacts of converting LWCF state forest lands to industrial gas well-pads. This failure also results in DCNR's failure to consider appropriate NEPA alternatives (also discussed below). Moreover, as a result, NPS and the public are prevented from reviewing complete information in a way and at a time that is meaningful. Consequently, the very purposes of NEPA are being frustrated by

[24] *See, e.g.,* NYS Office of Parks, Recreation and Historic Preservation, Environmental Management Bureau, *Final Environmental Assessment for Conversion of a Portion of Fort Niagara State Park for adaptive re-use of Historic Buildings and acquisition of replacement lands at Bear Mountain State Park* (March 2013), *available at* https://parks.ny.gov/inside-our-agency/documents/FortNiagara/FortNiagaraStateParkConversion.pdf; City of Westfield, Massachusetts, *Environmental Assessment, Cross Street Playground, Westfield, Massachusetts* (March 2015), *available at* https://www.cityofwestfield.org/DocumentCenter/View/2247/Environmental-AssessmentFINAL; Roaring Fork School District RE-1, *Draft NEPA Environmental Analysis of the Proposed Land*

[19] Strawbridge Property EA, at 2.
[20] *Id.*
[21] *Id.* ("It would not change whether or not the Pennsylvania conversion parcels are used for non-recreation purposes and federal approval of those uses is not part of the federal action.").

Exchange for 6F Designation in Glenwood Springs, Colorado (Sept. 26, 2017), *available at* http://www.gwsco.gov/DocumentCenter/View/3039/DRAFT-NEPA-Environmental-Assessment-of-ProposedVogellar-Park-Land-Exchange-?bidId; City of Yakima Parks and Recreation, *NEPA Environmental Assessment, RCO Conversion at Chesterly Park* (April 2017), *available* at https://yakimaparks.com/assets/EA-Chesterly-Parkand-Replacement-Park.pdf; Minnesota Department of Natural Resources, *Environmental Assessment, Conversion of Land and Water Conservation Fund Lands in Lake Bronson State Park for the Sale of Lots within the Lakeside Subdivision, Kittson County, Minnesota* (February 2015), *available at* https://files.dnr.state.mn.us/input/environmentalreview/lake-bronson/ea.pdf.

DCNR's failure to appropriately identify the proposed project and define the scope of the agency action.

C. DCNR Failed to Undertake *Any* Analysis of the Environmental Impacts of the Conversion of LWCF Lands to Well Pads, Let Alone the Requisite "Hard Look"

As a direct consequence of DCNR's failure to timely seek approval of the 6(f)(3) conversions before they happened, its erroneous definition of the proposed federal project, and its failure to recognize the appropriate scope of the conversion (as discussed above), DCNR failed to appropriately consider the environmental impacts of converting almost 100 acres[22] of LWCF state forest land to industrialized natural gas extraction well pads, in clear violation of NEPA. As detailed above, "the essential requirement of the NEPA is that before an agency takes major action, it must have taken a 'hard look' at environmental consequences."[26] Yet, the Strawbridge Property EA states nothing more with respect to the loss of LWCF state forest lands than to summarily recite the "recreation lost" for each of the well pad conversions.[23] Even then, the language used for each conversion is almost exactly the same and fails to show any site-specific considerations or analyses. To be clear: there is absolutely no analysis of the environmental impacts of the conversion from LWCF-funded recreational outdoor state forest land to industrial natural gas well pads. This is in direct contravention to the NEPA environmental impact review requirements, LWCF regulations, and the NPS LWCF Manual.

Thus, DCNR must immediately rescind its Strawbridge Property EA and revise it to include the appropriate hard look at the potential environmental impacts of the conversion of LWCF state forest lands to industrial natural gas well pads. Correspondingly, DCNR must also re-notice the correct NEPA environmental review – in this case we believe it should be an EIS as discussed below – and accept public comment on its revised NEPA analysis.

D. An Environmental Impact Statement Should be Undertaken for the Conversions of LWCF Lands to Natural Gas Well Pads

DCNR's own *Shale Gas Monitoring Report* (July 2018) acknowledges that "[t]he development of traditional and alternative forms of energy may not be consistent with the LWCF protection of land for public outdoor recreational use."[24] PennFuture believes that the environmental impacts of the

[22] *See* Strawbridge Property EA, Appendix C (Recreational Usefulness Table).
[26] *New York v. Kleppe*, 429 U.S. 1307, 1311 (1976) (quotations omitted).
[23] *See* Strawbridge Property EA, Appendix C (Recreational Usefulness Table).
[24] DCNR, *Shale Gas Monitoring Report* (July 2018), at 11.

conversion of LWCF state forest lands to industrial well pads results in a significant impact that warrants a full EIS. Through the EIS analysis, DCNR is required to take a hard look at a variety of permanent and temporary, direct, indirect, and cumulative impacts of the 6(f)(3) conversions. It is almost impossible for PennFuture to indicate the significant environmental impacts of the 6(f)(3) conversions at issue here because, as explained above, DNCR completely failed to undertake any analysis of the environmental impacts of the conversions to well pads. But we do know that DCNR recognizes that the scale of well pads on state forest lands is quite large:

> The average gas pad has six wells, but could host up to 24, that may be drilled to the Marcellus or Utica formations. . . . Wells are drilled vertically until they reach the target depth and then laterally between 4,000 and 10,000 feet from the pad. A pad with six wells will typically have three north and three south wells. Since the beginning of Marcellus development in 2008, the well laterals have greatly increased in length and the well pads have remained about the same size. Both these developments mean less surface conversion per well drilled. . . . Each pad and its network of wells forms a unit. The unit concept is used to ensure the correct amount of lease land is committed to the development and each well has the appropriate area to drain.
>
> Older shale gas wells were generally spaced 750 feet apart and drilled to a lateral length of 3,500 feet. These wells were set up to drain approximately 60 acres. However, newer wells are being drilled to an 8,000 feet lateral length, or greater, and are spaced at 1,000 feet apart . . . . These newer wells are designed to drain approximately 180 acres or more. Therefore, a current six well pad can drain approximately 1,100 acres or 1.7 square miles. Future wells will likely take advantage of longer laterals and be optimized for 1,000 feet spacing and may drain substantially greater areas from a single well pad.[25]

Yet even with these impacts, a well pad cannot be viewed in isolation; shale gas development represents a permanent change of land use that will impact recreational opportunities for generations. Natural gas development facilities and operations must be viewed comprehensively because the individual structures effect change to a much larger area. For example, the interconnected well pads, gathering lines, compressor stations and road construction represent an obvious loss of recreational opportunities and environmental impacts both individually and cumulatively, direct and indirect. Indeed, activities that effect change are not limited to the physical structure (e.g., security that is a part of shale gas development means the public is precluded from using a substantial area beyond the physical infrastructure, and heavy vehicle traffic reduces both the opportunity and enjoyment of the outdoor experience). This infrastructure will remain active for generations (e.g., the addition of wells to pads over time, and re-fracking of existing wells will extend the period of impact for many years). And the impacts are both direct and indirect (e.g., aside from the obvious loss of opportunities associated with the construction of well pads, forest fragmentation caused by road construction will reduce the amount of core forests available to wildlife and birds, which in turn will cause a loss of wildlife and bird viewing experiences).

[25] DCNR, *Shale Gas Monitoring Report* (July 2018), at 16-17.

For all these and other reasons, it is unbelievable that a proper NEPA analysis would result in an EA or a finding of no significant impact from the 15 conversions identified in the Strawbridge Property EA. Thus, when done properly, and when applying the proper scope and definition of the proposed action (as DCNR failed to do in this case), the 6(f)(3) conversions at issue here will need to be analyzed under NEPA using the full and complete EIS process.

E. DCNR Failed to Consider Appropriate Alternatives Under NEPA

NEPA requires that reasonable alternatives of the proposed agency action be considered. In this case, as discussed above, NEPA analysis the 6(f)(3) conversion includes the entire conversion – including both the conversion of LWCF lands and the replacement property. Yet the "alternatives considered" section of the Strawbridge Property EA sets up a false alternatives analysis prescribed by DCNR's failure to timely act on its NEPA and LWCF 6(f)(3) conversion analysis. Essentially, DCNR removes the necessarily analysis of alternatives to converting the outdoor recreational use of LWCF state forest land to industrial natural gas well pads, including the critical "no alternatives" analysis which would be to not convert the state forest land to industrial uses. Instead, DCNR presents the fallacy that the "no action" analysis is to "not resolve the outstanding conversions, and therefore, not meet the purpose and need of the proposed action."[26]

In conclusion, for all the reasons discussed in this section, DCNR's Strawbridge Property EA fails to comply with the requirements of NEPA.

III. DCNR'S PROPOSED "CONVERSION" FAILS TO SATISFY LWCF REQUIREMENTS

A. DCNR Must Analyze Both the Local Impacts of the Converted Uses and the Impacts of the Conversions on the Remaining LWCF Lands

As discussed above, NEPA mandates inclusion of the local environmental impacts of the converted lands within the NEPA analysis.[27] Fulfillment of NEPA requirements is incorporated into the LWCF regulations as a prerequisite to conversion approval.[28] Accordingly, approval of a conversion without examination of the local effects of the converted use fails to satisfy all of the NEPA requirements and constitutes a violation of the LWCF regulations.

Additionally, LWCF regulations require that "the impact of the remainder shall be considered" for sites which are partially converted.[29] As DCNR recognizes, all of the oil-and-gas converted areas at issue in

[26] Strawbridge Property EA, at 2. Note that this, in turn, suffers from the erroneous description of the proposed action which fails to acknowledge the conversion of LWCF lands to well pads.
[27] *See also* LWCF Manual, at Ch. 8-8; 4-5 (scope of environmental review includes the entire Sec 6(f)(3) park proposed for conversion).
[28] 36 C.F.R § 59.3(b)(7).
[29] 36 C.F.R § 59.3(b)(5).

this EA are partial conversions. Therefore, it is undeniable that DCNR must analyze the impacts of the conversions on the remaining LWCF lands.

In particular, DCNR must include analysis of the cumulative impacts of the conversions, including the effects of forest fragmentation from the many small conversions on the overall recreational usefulness of the remaining LWCF lands.[30]

B. The Replacement Property Fails to Satisfy LWCF Requirements

1. DCNR Cannot Select Appropriate Replacement Land without Consideration of the Converted LWCF Lands

The LWCF regulations clearly require that the replacement land be selected based on the loss of outdoor recreation from the converted land and that the 6(f)(3) conversion (converted land and replacement land) be considered as a whole. Approval of a conversion is only allowed where there is substitution of properties "of at least equal fair market value and of reasonable equivalent usefulness and location."[35] Leaving aside all NEPA issues, it is clear that DCNR's failure to properly analyze the impacts of the conversion of LWCF state forest land to industrial gas facilities and operations negatively impacts the agency's ability to properly select a replacement property under LWCF.

It is obvious that DCNR cannot select a similar replacement without knowing what is being replaced. And while PennFuture is not arguing here that the Strawbridge Property is not a good addition to Pennsylvania's LWCF lands, we do take serious issue with DCNR's failure to follow the LWCF process in ensuring that the Strawbridge Property is an appropriate replacement property for the loss of state forest land resources to industrial shale gas development. Approval of the converted properties is not simply "processing paperwork"[31] as DCNR puts it, but rather a careful considered decision that may be denied, even for after-the-fact conversion requests.[32] To look at it otherwise, would gut LWCF's purpose of preserving outdoor recreation areas, by allowing states to use untimely proposals to bypass NPS approval and freely shift LWCF areas around at their own convenience.

2. DCNR Must Consider the Location and Usefulness of the Replacement Land Relative to the Converted Lands

The location of the converted land must be considered when choosing replacement land. Pursuant to 54 U.S.C. § 200305(6)(f)(3), the substitution property must have a reasonably equivalent location. This is critical to ensure that the communities that are losing the outdoor recreation will also benefit from the replacement land's recreational opportunities. The regulations recognize that some flexibility is needed in certain situations, and clarify that a "replacement property need not necessarily be directly adjacent to or close by the converted site."[38] However, this flexibility cannot be interpreted to completely

---

[30] Note that this LWCF analysis of impacts on outdoor recreational opportunities is distinct from its duty to analysis the significant environmental impacts under NEPA, but that DCNR has failed to properly undertake both.
[35] 54 U.S.C. § 200305(6)(f)(3); 36 C.F.R. § 59.3(a).
[31] Strawbridge Property EA, at 2.
[32] *See also*, affirmation of the NPS's authority to disapprove conversion requests in the paragraph directly following discussion of unauthorized conversions in the LWCF Manual, at Ch. 8-4. [38] 36 C.F.R. § 59.3(b)(3)(ii).

eliminate the state's obligation to consider the converted land's location. The regulations explain that generally replacement land will serve the same community(ies) or area as the converted land, unless there is an exception, such as a major demographic change.[33] As such, the regulations must be interpreted to require a recognition, analysis, and discussion of the locations of both converted and replacement land relative to one another and justification for any significant differences. Otherwise, the regulations would be in conflict with the statute, the community that has for so long relied on the outdoor recreation would be harmed, and "reasonably equivalent location" would be rendered meaningless.

In conjunction with location, DCNR must also take the recreational usefulness of the converted properties into account.[34] This is not simply a cursory look at how the converted property is being used, but also what recreational needs are being fulfilled and the types of outdoor resources and opportunities available in the area.[35] The focus of this factor is to find a replacement site that fulfills recreational needs of similar "magnitude and impact to the user community" as that of the converted land.[36] Consequently, the usefulness analysis is intimately connected to the location analysis as it relates to the community(ies) served.

3. DCNR Has Not Shown that a Site Over 200 Miles Away from the Majority of the Conversions Has "Reasonably Equivalent Usefulness and Location"

DCNR's barebones assertion that "[a]s a statewide provider, DCNR may consider replacement property anywhere in Pennsylvania" simply glosses over crucial considerations prescribed by LWCF's statutes and regulations. As shown above, the underlying purpose of the "reasonably equivalent usefulness and location" is to ensure that generally the recreational resources are maintained within the same community. To generalize an entire state as a community, as DCNR has done here, would frustrate the Congressional intent of this requirement.

The state of Pennsylvania is over 46,000 square miles and incredible diversity in landscapes, populations, and recreational opportunities. Travelling 200 miles by car from the converted sites to the proposed replacement in Chester County easily takes over three hours.[37] In reality, this distance effectively removes access to these resources for those near the converted sites. Not only are the communities distinguished by geography, but also demographics. The proposed replacement site lies within the wealthiest county in Pennsylvania.[38] Contrast that with the converted well pad LWCF land properties' counties, which rank from 22nd to 66th in terms of wealth, and whose per capital income averages about

---

[33] *Id.*

[34] Except for wetland conversions. 36 C.F.R. § 59.3(b)(3)(ii).

[35] 36 C.F.R. § 59.3 (3)(i).

[36] 36 C.F.R. § 59.2(3)(i).

[37] This is a rough estimate based on Google Map driving directions from Lycoming and Centre Counties to Replacement Area.

[38] US Census Bureau, *Quick Facts*, https://www.census.gov/quickfacts/fact/map/US/INC910217 (select *Per Capital Income in the past 12 months (in 2017 dollars), 2013-2017*: Pennsylvania).

half of that in Chester County.[39] To ignore such distinctions under the guise of a statewide "community" is out of step with the spirit of

LWCF's allowance for conversions and replacement of outdoor recreational opportunities lost. Just because a site is managed by a statewide provider, that cannot mean that it may be replaced with property anywhere in the state.

Moreover, DCNR's 6(f)(3) conversion proposal lacks any real consideration of either the location or usefulness of the converted sites leaving the replacement property selection deficient. While DNCR does provide a reason for consolidation of the replacement land, there is no explanation why it did not look at replacement sites in Central PA, closer to the majority of the conversions, nor why it failed to examine the impact on the communities near the converted sites. Chester County's increased need for outdoor recreation areas, does not necessarily mean that the communities in Central PA do not also have a need for such resources. Moreover, the total loss of outdoor recreational opportunities is 124.29 acres, with 99.72 acres coming from Central PA, an amount which could have a significant impact on the local communities, and a factor which should be taken more seriously by DCNR.

In brief, PennFuture requests that DCNR adequately account for the usefulness and location of the converted areas in their choice of replacement land, consider possible replacement sites closer to the bulk of the converted sites, and provide justification for any substantial deviations in communities served.

4. *DCNR Has Not Shown That the Replacement Land Is of at Least Equal Fair Market Value*

In addition to ensuring "reasonably equivalent usefulness and location" of the replacement property, LWCF requires that the converted properties and replacement properties be "of at least equal fair market value."[40]

Here, the Strawbridge Property EA contains zero mention of the actual fair market value of any of the converted properties nor is there indication that the converted LWCF lands were ever appraised. Rather, DCNR state that the replacement property "was appraised at more than 13 million dollars" and concludes, without any support, that this property "will, therefore, adequately provide more than enough value for the conversions being bundled."[41] Notwithstanding DCNR's apparently violation of LWCF regulations,[42] this is not, and cannot be, an acceptable justification. Therefore, without knowing the fair market value of the lost LWCF lands, the replacement land cannot be found to satisfy LWCF requirements. Thus, DCNR must supplement its analysis with appraisals of the converted land.

---

[39] US Census Bureau, Quick Facts, https://www.census.gov/quickfacts/fact/map/pa/INC910217 (select *Per Capital Income in the past 12 months (in 2017 dollars), 2013-2017*: "Clearfield, Centre, Clinton, Lycoming, Potter, and Tiago Counties"); US Census Bureau, Quick Facts, https://www.census.gov/quickfacts/fact/map/pa/INC910217 (select *Per Capital Income in the past 12 months (in 2017 dollars), 2013-2017*: "Chester County").

[40] 54 U.S.C. § 200305(6)(f)(3).

[41] Strawbridge Property EA, at 1.

[42] *See* 36 C.F.R. § 59.3(b)(2) (establishment of the fair market value of converted property is a prerequisite for conversion approval).

C. DCNR Erroneously Utilized a Conversion Replacement "Bank"

In the Strawbridge Property EA, DCNR proposes to establish a conversion replacement "bank" of "excess fair market value and recreational usefulness" which "would be eligible for replacing additional LWCF conversions for a period of up to five years."[43] As mentioned above, the argument here is not that the Strawbridge Property is not an appropriate consideration for LWCF lands, or even that "banking" is an inappropriate option under LWCF, but rather that DCNR has failed to properly apply the requirements of LWCF in analyzing whether it is appropriate for replacement of the outdoor recreational opportunities lost in this circumstance.

The LWCF Manual sets forth different requirements for banking of "fair market value" versus banking of "recreational usefulness." Whereas banking for "fair market value" is relatively straightforward, the LWCF Manual clearly requires that banking to satisfy the "equal usefulness criterion for subsequent conversions" can only be accomplished when "additional conversions are anticipated by the sponsor at the time of the original conversion request and the accompanying documentation clearly addresses how the replacement property would satisfy the equal usefulness criteria for the original conversion as well as those that are anticipated.[44] Here, DCNR has not indicated that has considered any additional conversions for which the Strawbridge Property would satisfy the equal usefulness criteria. Consequently, DCNR cannot use the Strawbridge Property as a bank for "recreational usefulness."

Even seemingly minor technical points such as this highlight DCNR's failure to properly follow both the letter and spirit of the LWCF conversion process, resulting in potential inequities to communities that are impacted by the loss of local LWCF lands through the 6(f)(3) conversion process.

In conclusion, for all the reasons discussed in this section, DCNR's Strawbridge Property EA fails to comply with the requirements of LWCF.

IV. DCNR FAILED TO COMPLY WITH ARTICLE I, SECTION 27 OF THE PENNSYLVANIA CONSTITUTION

The Environmental Rights Amendment (Article I, Section 27) of the Pennsylvania Constitution states:

> The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.

[43] Strawbridge Property EA, at 2.
[44] LWCF Manual, at Ch 8-9 (emphasis in original).

In 2017, the Pennsylvania Supreme Court in *Pa. Envtl. Def. Found. v. Commonwealth*[45] (commonly referred to as simply *PEDF*) recognized that Article I, Section 27 establishes a public trust that imposes obligations on the Commonwealth to prohibit the degradation, diminution, and depletion of our public natural resources for which the Commonwealth is the trustee.

Thus, the Environmental Rights Amendment imposes upon DCNR its greatest obligation in managing the Commonwealth's state forest resources: "Pennsylvania's public natural resources are the common property of all the people, including generations yet to come."[46] As trustee of these resources, DCNR (as a constituent agency of the Commonwealth) has a fiduciary duty to "conserve and maintain [the public natural resources] for the benefit of all the people."[47] Pennsylvania's state forest lands, including LWCF lands, are included in the public natural resources covered by this trustee obligation, and thus DCNR must work to conserve the air, land and water resources that make up the state forests entrusted to it, and ensure that the principal of the trust is conserved and maintained for future generations. DCNR has acknowledged their duty in their recent *Shale Gas Monitoring Report* where the agency stated: "Article 1 Section 27 of the Pennsylvania Constitution affirms DCNR's role as a trustee of the Commonwealth's public natural resources, charged with conserving and maintaining them for current and future generations."[48]

Yet DCNR's conversion of LWCF state forest lands for purposes of industrial natural gas facilities is contrary to its duty under Article I Section 27. As a trustee, DCNR should comply with all federal and state laws in compliance with the protections of the environmental rights under Article I, Section 27. Importantly, these duties require DCNR to sufficiently evaluate the impacts of natural gas extraction activities within Pennsylvania's state forest lands, which includes but is not limited to undertaking an appropriate environmental analysis under NEPA. Such a process would ensure that all environmental impacts of LWCF conversions regarding natural gas development that impact the public trust corpus are accounted for and evaluated, and also has the added benefit of allowing DCNR to gather information from the public about potential environmental impacts (which, as detailed above, it has failed to do).

V. CONCLUSION

In conclusion, DCNR has utterly failed to comply with LWCF and NEPA regarding the conversion of LWCF state forest lands to natural gas well pads. DCNR must rescind its Strawbridge Property EA; actually evaluate the environmental impacts of the conversion of LWCF state forest land to natural gas well pads – including taking the requisite "hard look" under NEPA; and undertake and Environmental Impact Statement for the significant environmental impacts of these industrial natural gas well pads on state forest lands.

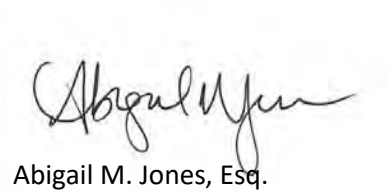
Critically, DCNR must ensure that for all future conversions of LWCF state forest lands to natural gas extraction facilities and appurtenances, it appropriately follows both the letter and spirit of both LWCF and NEPA by requesting NPS approval and taking a hard look at the environmental consequences of such

[45] 161 A.3d 911 (Pa. 2017).
[46] Pa. Const. art. I, § 27.
[47] *Id. See PEDF*, 161 A.3d 911 (Pa. 2017); *Robinson Twp. v. Commonwealth*, 83 A.3d 901, 978 (Pa. 2013).
[48] DCNR, *Shale Gas Monitoring Report*, at Preface.

an act prior to allowing the conversion to take place. Our comments herein therefore also apply to any future conversion of LWCF state forest land to natural gas extraction that DCNR may seek to undertake.

Thank you for your consideration of these comments. Should you wish to discuss anything PennFuture has raised in these comments or DCNR's processes and procedures for allowing natural gas extraction on LWCF state forest lands, please do not hesitate to contact us at jones@pennfuture.org or 570-216-3313.

Respectfully submitted,



Abigail M. Jones, Esq.
Staff Attorney

Victoria Leung, J.D.*
Legal Fellow

(*admission pending in NY)

Cc: State and Local Assistance Programs National Park Service

1849 C Street, NW, Org-2225
Washington, D.C. 20240

II. RESPONSES TO PUBLIC COMMENTS

The email comment/inquiry from April Schmitt on February 12, 2019 was resolved by a simple response clarifying the purpose of the Strawbridge EA document. In response to the letter from PennFuture, the Department requests that PennFuture review the draft "Resolution of Natural Gas Conversions on LWCF funded State Forest Land" Environmental Assessment that has been developed by the Department and will be available for public comments via a Pennsylvania Bulletin notice. The Gas Conversion EA may help address concerns enumerated in PennFuture's March 4, 2019 letter. The Department has been in communication with the National Park Service regarding the gas development on Bureau of Forestry land and has been diligently working through the conversion process as outlined in the Land and Water Conservation Fund State Assistance Program Manual, Chapter 8 – Post-Completion and Stewardship.

APPENDIX G
Visitor Use Monitoring Reports

Recreation on the Tiadaghton and Tioga State Forests: A Survey of User Characteristics, Behaviors, and Attitudes

by

Alan R. Graefe

Harry C. Zinn

Elizabeth A. Covelli

Department of Recreation, Park and Tourism Management

The Pennsylvania State University

and

Donald B. K. English

USDA Forest Service

Final Report Submitted to the Pennsylvania Bureau of Forestry
Department of Conservation and Natural Resources
Harrisburg, Pennsylvania

November 28, 2008

Table of Contents

Introduction....1
Objectives....1
Methodology....1
Organization of this Report....2
Survey Results....3
- Recreation Use Estimates....3
- Trip Visitation Patterns....8
- Demographic Characteristics....11
- Activity Participation....12

Satisfaction Addition....14
- Importance Ratings....15
- Average Importance and Satisfaction Ratings....16
- Crowding Ratings....17
- Facility Use....18
- Differences by Forest....19

Economics Addition....22
- Expenditure Categories....24

Experience Addition....25
- Other Visitor Satisfaction Ratings....25
- Forest Access....26
- Recreation Experience....26
- Place Attachment....27
- Pine Creek Fishing....30
- Motivations/Reasons for Visiting the State Forest....31
- Visitor Response to Potential Facilities and Services....33
- Information Services....35
- PA Wilds....36

Conclusion....37
Appendices....39
- Appendix A – Zip Codes of State Forest Visitors....39
- Appendix B – Visitor Responses to Open-ended Questions....41
- Appendix C – Survey Instrument....54

List of Tables

1 Description of the Sampling Sites....4
2 Summary of Mechanical and Observational Counts at Sampling Sites....6
3 Recreational Use Estimates for the Tioga and Tiadaghton State Forests....7
4 Trip Visitation Patterns in the State Forests....9
5 Demographic Characteristics of State Forest Visitors....11
6 Activity Participation of State Forest Visitors....12
7 Primary Activity Participation by Forest....13
8 Satisfaction Ratings for Customer Service Attributes in the State Forests....14
9 Importance Ratings for Customer Service Attributes in the State Forests....15
10 Summary of Importance, Satisfaction, and Gap Scores for Customer Service Attributes....16
11 Summary of Perceived Crowding Ratings....17
12 Reported Facility Use by State Forest Visitors....18
13 Differences in Satisfaction with Customer Service Attributes by Forest....19
14 Differences in Importance of Customer Service Attributes by Forest....20
15 Differences in Crowding by Forest....21
16 Reported Facility Use by Forest....21
17 State Forest Recreation Trip Profile (for economics section)....23
18 Summary of Trip Spending Patterns of State Forest Visitors....24
19 Visitor Satisfaction Ratings for Various Forest Attributes....25
20 Differences in Satisfaction with Forest Attributes by Forest....25
21 Visitor Ratings of Access to the State Forests....26
22 Differences in Satisfaction with Forest Attributes by Forest....26
23 Visitor Ratings for Various Recreation Experience Attributes....26
24 Differences in Outdoor Recreation Experience Attributes by Forest....27
25 Most Important Reason for this Visit to the State Forest....27
26 Differences in Primary Reason for Visiting by Forest....28
27 Summary of Place Attachment Scale Items....28
28 Differences in Place Attachment Items by Forest....29
29 Summary of Responses to Pine Creek Fishing Questions....30
30 Summary of Motivations/Reasons for Recreating in the State Forests....31
31 Differences in Motivations/Reasons for Visiting the Forest by Forest....32
32 Visitor Importance Ratings for Various Types of Facilities and Services....24
33 Differences in Importance Ratings for Various Types of Facilities and Services' by Forest....34
34 Visitor Responses to Questions about Information Services....35
35 Visitor Responses to Questions about the PA Wilds....36

List of Figures

1 Gap Score Analysis for Items Showing Significant Differences between Importance and Satisfaction.....17

2 Differences in Motivations for Visiting the State Forests, by Primary Activity ...33

Introduction

Resource managers in Pennsylvania's Bureau of Forestry have identified a need to better understand the recreational visitors who use the State Forests. This need includes understanding visitors' use patterns as well as their expectations, desires and satisfaction levels. Such understanding is particularly relevant in the State Forests within the PA Wilds region of Pennsylvania, due to the current high priority of marketing and planning for this part of the state.

The purpose of this study is to acquire recreation use data on Pennsylvania State Forest Land. Specifically, the study is being conducted on the Tiadaghton State Forest (District #12) and the Tioga State Forest (District #16) to measure recreation use and develop a profile of various types of State Forest visitors and their use patterns. This study is the initial phase of a planned multi-year project that will encompass other State Forest districts in Pennsylvania.

Objectives

1. To develop a profile of recreational trips to the two State Forests. This profile will include information on the origin of visitors, size and type of visiting groups, previous visitation history, length of stay in the area, activities pursued, and patterns of visitation across seasons and types of recreation areas within the forests.

2. To measure overall recreation use and specific visitation patterns within the two State Forests, including the number of visitors per vehicle and the distribution of use across different types of sites within the area.

3. To develop a demographic profile of State Forest visitors.

4. To identify visitor expectations and levels of satisfaction with various aspects of their visit.

5. To examine visitor opinions about possible future area management and facility development decisions.

6. To measure visitor expenditures and levels of economic impact on surrounding communities.

Methodology

Data were collected through the use of on-site interviews and use measurements at a stratified random sample of the forests' developed sites and dispersed areas open for recreation. The overall survey methodology and sampling design is directly comparable to and consistent with the procedures established for the U.S. Forest Service's national visitor use monitoring (NVUM) program. Details for the sampling and analysis approach for that program can be

found in a report titled "Forest Service National Visitor Use Monitoring Process: Research Method Documentation", which is available on the NVUM website: http://www.fs.fed.us/recreation/programs/nvum. A detailed sampling schedule, which identified the site, day, and time of day for on-site interviewing, was established for each forest in consultation with NVUM coordinators and Bureau of Forestry personnel. The sampling schedule provided for a total of 200 sampling days per forest, allocated over about 10 sampling strata per forest, and distributed throughout the calendar year.

Sampling for the survey was designed to obtain a database that accurately describes overall use of the forests as well as use of selected types of sites and individual areas of particular interest within the State Forests. All on-site interviewing, data entry, and analysis were conducted by trained project staff. Concurrent with the visitor survey, area use patterns were measured through traffic and trail counters and observations of vehicles using the area. Both the visitor count data and visitor survey data will later be used to validate and calibrate visitor use monitoring methods for future application in the State Forests.

On-site face-to-face interviews were used to obtain data from a sample of recreationists visiting the Tiadaghton and Tioga State Forests. The on-site survey took approximately 5-15 minutes to complete, depending on the version of the instrument that was used in the interview. Approximately one-third of the visitors were interviewed with the basic version/experience addition, another third received the basic/satisfaction addition and the remaining third completed the basic/economic addition.

Organization of this Report

This report summarizes the results of visitor surveys conducted on the State Forests during the period May 16, 2007 through May 15, 2008. The results are organized by topic area, with different sections corresponding to different versions of the survey. Each section follows a consistent format, beginning with the overall results for the entire sample. Results are then broken down by forest. Appendices to the report include a copy of the survey instrument used, responses to open-ended questions in the survey, and a summary of the zip codes of forest visitors.

Survey Results

Field work was conducted during the period, May 16, 2007 - May 15, 2008. A total of about 180 sampling days were completed on each forest district. The sampling rates varied across strata from about 10 percent of days in the population to about 0.4 percent. In general, sampling rates were higher for days when greater volumes of visitation were expected; and lower when the volume was expected to be smaller. Over half of the sampling days occurred in General Forest Area sites; this type of site accounted for over 60 percent of all the days in the population for the two forests.

Overall, 590 interviews with forest visitors were conducted. All of the sampling for this study followed a detailed sampling schedule and took place between 8:00 am and 8:00 pm, during a morning shift or an afternoon shift. The morning sampling period ran from 8:00 am to 2:00 pm, while the afternoon sampling period ran from 2:00 pm to 8:00 pm.

A total of 541 of the 590 visitors approached for the study were willing to participate, for a response rate of 92%. Among these forest visitors, 83% stated they were visiting the forest for recreation, while the remaining individuals were working or commuting to work (6%), just passing through (7%), stopping to use the bathroom (2%) or there for some other reason (< 2%). Other reasons mentioned by respondents included cutting wood, bringing a trailer to someone else, getting their dog a drink of water, and stopping to see if fish had been stocked. Only those respondents who were visiting the forest for recreation were included in the estimates of recreation use and descriptions of visitors in this report.

Among the recreation visitors, 72% reported that they were leaving the forest for the last time during that visit. Use estimations were based on these exiting visitors, while the remaining 28% of the cases provided additional data on the characteristics of forest visitors.

Recreation Use Estimates

Following the NVUM protocols, recreation use of the State Forests was estimated through a process of obtaining mechanical traffic counts, calibrated by observation and on-site interviewing, at the sample of recreation sites and days scheduled throughout the study year. Mechanical traffic counts were obtained for a 24-hour period on the targeted sample days. Interviewers were on site for a 6-hour period. During that time, they would both visually calibrate the mechanical counter to exiting traffic, and interview a random sample of exiting traffic to determine what portion was finishing a recreation visit. State Forest sampling sites

included all potential places that recreation users could exit the forests, and were classified by types and exiting volume levels (Table 1). Most of the sampling days were conducted at general forest area (GFA) sites. Such sites provide access to the forest without concentrating use at the site itself, and include trailheads, river put-in and take-out points, forest roads, etc. Other sampling categories include day use developed sites (DUDS) such as picnic areas, scenic overlooks and the like, overnight use developed sites (OUDS) including campgrounds, cabins, resorts, etc., and "special areas." The latter category includes designated "natural" and "wild" areas of the state forests, and is similar to the designated Wilderness areas within the national forests.

Since most recreation use of the State Forests is dispersed rather than focused at developed day use or overnight use areas, GFA sites accounted for over 75 percent of the total sampling days across both forests. These sites provided an even greater percentage of the interviews conducted (84.5%), reflecting the fact that interviewers collected more interviews per day with visitors at these sites than at other types of forest sites.

Table 1. Description of the Sampling Sites.

	Percent of Sampling Days	**Percent of Interviews**
Site Type		
General Forest Area (GFA)	53.9	84.5
Day Use Developed Site (DUDS)	13.0	9.9
Overnight Use Developed Site (OUDS)	21.7	2.3
Special Area	11.4	3.3
Total	100.0	100.0
Use Level Stratum		
High	40.4	29.0
Medium	32.8	35.5
Low	26.0	29.3
None	0.8	6.2
Total	100.0	100.0

Sampling of State Forest sites was also stratified by level of recreational use, including four use levels as estimated by Bureau of Forestry personnel (Table 1). More specifically, the sampling strata were defined by volume of exiting recreation visitation, and classified as None, Low, Medium, and High. These estimated levels were based on relative criteria for each type of site and based on the collective knowledge and experience of Bureau of Forestry personnel. Visits were counted as individuals exiting the forest for the last time for the day. Counting and

interviewing visitors as they finish their visit ensures consistency in describing the visit, and avoids several sampling bias issues.

Stratification was necessary to reduce the overall variance of the visitation estimate, and to ensure an adequate representation of varying levels of recreation throughout the study year. About one-third of the sampling days and corresponding interviews were completed during high, medium, and low use periods, with a small number occurring at sites where no use was expected or allowed. Survey results were weighted to correctly represent the use distribution across the various types of sites within the State Forests.

Pneumatic traffic counters were used where vehicular use could be counted (80% of the counts), such as forest roads and parking lots. Infrared trail counters were used at areas where road counters were not feasible and individual forest users could be counted, such as trails (20% of the counts). In both cases, field personnel recorded counts at the end of each 6-hour sampling period and again after 24 hours had elapsed. Comparing the mechanical and observational counts at the end of the 6-hour period provides exiting-to-total-traffic calibration that can be used with the 24-hour mechanical count to obtain total exiting traffic. The survey screening questions discussed above were used to determine the proportion of exiting traffic that was completing a recreation visit, as compared to other uses of forest sites. Additional survey questions were used to convert vehicle counts to visitor estimates, based on the number of people per vehicle.

The 6-hour vehicular traffic counts ranged from 0 to 189, with a mean of 12.9 vehicles counted (Table 2). About one-fourth of these counts were zero, reflecting no traffic during the 6-hour sampling period. The 24-hour counts ranged from 0 to 485, with a mean of 42.8. Only about 8% of the 24-hour counts were zero, and about one-fourth of them were between 1 - 10 vehicles. The hand tally counts for the 6-hour sampling periods averaged 4.9, with about one-third (32.5%) zero values. These counts were naturally lower than the corresponding mechanical counts because the observational counts included only one-way (exiting) traffic while the mechanical counters recorded traffic moving in both directions.

Visitor use counts from the infrared trail counters tended to be lower than the vehicular traffic counts, as many of the relevant sites were low use areas. As with the pneumatic traffic counters, the trail counters recorded movement in both directions rather than one-way traffic. Over two-thirds (70%) of the 6-hour trail counts were zero, and the average was 5.1 people. The corresponding hand clicker counts averaged 2 people per 6-hour interval. The 24-hour counts averaged 10.8, with nearly one-third (31.7%) zeros.

Table 2. Summary of Mechanical and Observational Counts at Sampling Sites

	Valid Percent
Pneumatic Traffic Counter	
6-hour Traffic Counts	
0	24.9
1 - 2	18.3
3 - 5	12.9
6 - 9	15.4
10 - 30	17.0
31 or more	11.6
Total	100.1
Mean	12.9
24-hour Traffic Counts	
0	7.9
1 - 5	14.2
6 - 10	13.3
11 - 25	25.8
26 - 40	12.5
41 - 60	6.2
61 or more	20.0
Total	99.9
Mean	42.8
Hand Clicker Counts (6-hour)	
0	32.4
1 – 2	21.6
3 – 5	20.3
6 – 10	10.8
11 or more	14.9
Total	100.0
Mean	4.9
Infrared Trail Counter	
6-hour Counts	
0	70.0
1 – 2	11.7
3 – 6	6.7
7 or more	11.7
Total	100.1
Mean	5.1
24-hour Counts	
0	31.7
1 – 2	20.0
3 – 6	21.7
7 or more	26.7
Total	100.1
Mean	10.8
Hand Clicker Counts (6-hour)	
0	73.3
1 – 2	11.7
3 – 6	8.3
7 or more	6.7
Total	100.0
Mean	2.0

Results from the traffic counts and completed surveys were used to estimate total recreational use of the State Forests (Table 3). Data were extrapolated from the sampled site-day combinations to all site-days within each stratum and totaled for the entire forest. The results include two measures of recreational use per forest: 1) the total number of individual site visits, and, since a number of forest visits include visits to several individual sites, 2) the total number of recreational forest visits. Since most visits to Tiadaghton and Tioga Forests tend to include visits to more than one different site during each visit, the total site visits are considerably higher than the number of forest visits.

Table 3. Recreation Use Estimates for the Tioga and Tiadaghton State Forests

	Tiadaghton	**Tioga**
State Forest Visits		
Number of Visits	177,316	331,193
90% Confidence Interval Width (as % of total visits)	28.4	28.4
State Forest Site Visits		
Number of Visits	262,630	534,246
90% Confidence Interval Width (as % of total visits)	27.7	26.1

The Tiadaghton State Forest received an estimated 177,316 recreational visits during the study year (May 2007- May 2008). Because of the relatively wide range of daily traffic counts within each sampling stratum, the 90% confidence interval width on the visitation estimate is plus or minus 28.4% of this estimate, or between 126,958 and 227,674. These forest visits accounted for a total of 262,630 individual site visits, or about 1.5 site visits for each State Forest visit. The 90% confidence interval for site visits on the Tiadaghton State Forest (plus or minus 27.7%) ranges from 189,881 and 335,379 site visits.

The Tioga State Forest received about 331,193 recreational visits and 534,246 individual forest site visits during the same period (1.6 site visits per forest visit). The 90% confidence interval for forest visits ranges from 237,134 and 425,252. The 90% confidence interval range for total site visits on the Tioga State Forest was between 394,808 and 673,684 visits.

The total site visitation estimates include use of different overnight facilities, day use areas, and undeveloped areas within a State Forest visit. Table 4 provides more details on these use patterns, and Appendix B includes a listing of specific sites reported by forest visitors.

Trip Visitation Patterns on the State Forests

- About four-fifths of the visitors contacted (78.1%) were repeat visitors to the State Forest.
- Among those who were repeat visitors, nearly half (46.2%) had made their first visit to the Forest prior to 1980. Another one-quarter (24.6%) made their first visit during the 1980s and 7.8% first visited during the 1990s. About one-fifth (21.5%) were relatively new visitors, reporting their first visit between 2000 and 2008.
- Over half (54.8%) of the visitors contacted indicated that they typically make between 0 and 10 visits to the State Forest per year, and the average number of trips to the forest per year was about 21.
- Likewise, the majority (61.7%) of the visitors contacted indicated that they typically make between 0 and 10 visits to other forest areas each year, and the average number of trips to other forests per year was about 16.
- About one-third (31.3%) of the respondents had spent the previous night in the State Forest.
- Of those respondents who were overnight visitors, about two-thirds (67.8%) had spent only one or two nights, and the remaining one-third (32.2%) had stayed for three or more nights.
- About half of the respondents (54.2%) reported that they had used no overnight facilities during this trip, while 41.0% indicated that they used one overnight facility during this trip. Very few visitors (1.3%) reported using more than one overnight facility (These overnight facilities can include accommodations that are or are not located on the State Forest, including private cabins and both public and private campgrounds).
- About two-thirds of visitors (68.1%) indicated that they used no day use facilities during their visit, while the remaining visitors used one or more day use facilities on this trip.
- About one-half of the respondents (49.6%) reported spending one or more days in undeveloped areas of the Forest on this trip.
- About two-thirds (68.8%) of the respondents had just one or two people in their vehicle, while nearly one-fourth (22.8%) had 3-4 persons in their vehicle on this trip. The average number of persons per vehicle was 2.3.
- About one-fourth (22.6%) of the respondents reported that they had at least one child under the age of 16 with them.
- About one-third of the visitors contacted (34.2%) came to the Forest in family groups, with 26.6% coming in groups of friends and 14.9% in groups containing family and friends.
- Nearly one-fourth (23.9%) of the visitors came to the Forest alone.

Table 4. Trip Visitation Patterns in the State Forests

	Valid Percent*
Previous Visitation History	
First Time Visitor	21.9
Repeat Visitor	78.1
Total	100.0
Year of First Visit	
Prior to 1980	46.2
1980-1989	24.6
1990-1999	7.8
2000-2008	21.5
Total	100.1
Number of Visits to State Forest in Typical Year	
0-10	54.8
11-20	20.0
21-50	15.9
More than 50	9.4
Total	100.1
Mean	21.3
Number of Visits to Other Forests in Typical Year	
0-10	61.7
11-20	17.4
21-50	13.7
More than 50	7.2
Total	100.0
Mean	16.4
Length of Stay	
Overnight Visitor	31.1
Day User	68.9
Total	100.0
Number of Nights Spent (Overnight Visitors)	
1	33.9
2	33.9
3-5	16.9
6 or more	15.3
Total	100.0
Number of Overnight Facilities Used During This Trip	
0	56.2
1	42.5
2 or more	1.4
Total	100.1
Number of Day Use Facilities Used During This Trip	
0	68.1
1	14.2
2	7.0
3 or more	10.7
Total	100.0

Number of Days Spent in Undeveloped Areas During This Trip	**Valid Percent**
0	49.6
1	25.3
2	9.8
3-5	10.8
6 or more	4.5
Total	100.0
Number of People in Vehicle	
1-2	68.8
3-4	22.8
5 or more	8.4
Total	100.0
Mean	2.3
Number of People Less than 16 Years Old in Vehicle	
0	77.4
1	12.0
2	6.4
3 or more	4.2
Total	100.0
Type of Group	
alone	23.9
family	34.2
friends	26.6
family and friends	14.9
other	0.5
Total	100.1

*Percentages may not equal 100 because of rounding.

Demographic Characteristics of State Forest Visitors

- Nearly four-fifths (79.7%) of all the visits to these State Forests are made by males, and about 20.3% are made by females.
- Almost half of the visitors surveyed in the State Forests (47.3%) were between the ages of 30-49, while a similar proportion (45.5%) was 50 or older.
- The average age of State Forest visitors was 49.
- Almost all of the State Forest visitors surveyed (99%) reported their race/ethnicity as White/Caucasian.
- Other ethnicities reported by visitors included African-American (2), American Indian/Alaskan Native, Spanish/Hispanic, and Italian.
- Less than one-tenth of the visits (7.7%) included a person with a disability in their household.

Table 5. Demographic Characteristics of State Forest Visitors

	Valid Percent
Gender	
Male	79.7
Female	20.3
Age	
Under 20	0.5
20 to 29	7.6
30 to 39	20.3
40 to 49	26.0
50 to 59	19.0
60 to 69	18.7
70 or older	7.8
Mean	49
Ethnicity	
Caucasian	99.0
Other	1.0
Does anyone in your household have a disability?	
Yes	7.7
No	92.3

Activity Participation

The basic survey administered to all visitors included a detailed list of recreational activities. Respondents were asked to identify each activity that they had participated in (or planned to participate in) during their visit, as well as their primary activity on this trip (Table 6). The first column (activity participation) shows the range in numbers of visitors participating in the various activities, while the primary activity column reflects what the visitors considered their most important purpose for visiting the Forest on this trip.

- Many forest visits included various viewing and sightseeing activities, but relatively few people reported such activities as their primary recreation activity on the State Forests.
- About one-fourth of the visits (23.9%) involved biking as the primary recreation activity on the State Forests.

Table 6. Activity Participation of State Forest Visitors (during this recreation visit)

	Activity Participation*	**Primary Activity[+]**
Viewing and Sightseeing Activities		
Viewing natural features such as scenery, flowers, etc.	28.7	3.4
General viewing activities, sightseeing	18.6	2.8
Driving for pleasure on roads	9.8	0.5
Viewing while traveling off-forest	5.0	0
Nature study	4.8	1.6
Visiting a nature center, nature trail or visitor center	1.9	0.2
Visiting historic and prehistoric sites	1.3	0
Recreational Activities		
Hiking or walking	29.4	7.6
Bicycling, including mountain bikes	28.4	23.9
Fishing all types	21.2	15.0
Primitive camping	6.8	3.0
Camping in developed sites	12.3	6.5
Picnicking and family day gatherings	8.1	2.9
Off-highway vehicle travel	3.3	0.8
Resorts, cabins, other accommodations on FS lands	8.6	2.8
Backpacking	2.9	1.7
Other non-motorized activities (swimming, sports, games)	1.0	1.0
Non motorized water travel (canoe, raft)	4.0	2.4
Horseback riding	0.6	0.1
Gathering mushrooms, berries, or other natural products	1.3	0
Other motorized activities	1.5	0
Hunting - all types	17.7	16.0
Motorized water travel	0	0
Downhill skiing	0	0
Snowmobile travel	6.3	6.3
Cross-country skiing	1.4	1.4

*Percentages do not equal 100% because respondents could report more than one activity.
[+]Percentages may not equal 100 because of rounding.

- Many of the sampled visitors did some hiking during their visit (29.4%), but relatively few (7.6%) reported hiking or walking as their primary activity.
- Hunting (16%) and fishing (15%) were the next most popular activities and both tended to be the primary activity for those who participated in them.
- Over one-tenth of forest visitors surveyed reported some type of camping as their primary activity.

Differences by Forest

- The most popular activity among visitors sampled in both forests was biking. About one-quarter of the visitors to both the Tiadaghton (24.8%) and Tioga districts (23.5%) reported biking as their primary activity.
- Fishing was more common as a primary activity on the Tiadaghton (24.1%) than on the Tioga State Forest (10.5%).
- Camping was a more popular primary activity in the Tioga Forest (14.6%) than in the Tiadaghton Forest (4.5%).
- Hiking or walking was the more popular primary activity in the Tiadaghton (13.2%) than in the Tioga State Forest (4.9%).
- A small minority of the visitors in both forests reported viewing-related activities as their primary forest activity.

Table 7. Primary Activity Participation by Forest (Percent)*

Primary Activity	**Tiadaghton**	**Tioga**	**Total**
Viewing activities	5.1	10.1	8.5
Hiking or walking	13.2	4.9	7.6
Camping	4.5	14.6	11.3
Fishing	24.1	10.5	15.0
Biking	24.8	23.5	23.9
Hunting	13.8	17.1	16.0
Other	14.5	19.3	17.7

*Percentages may not equal 100 because of rounding.

Satisfaction Addition

This section of the survey asked forest users about the importance they attached to, and their satisfaction with, fourteen customer service attributes in the State Forest they visited. Respondents were provided with the opportunity to choose "not applicable" for any attributes that they did not experience during their visit.

- The State Forests were generally rated highly on each of the fourteen satisfaction attributes, with over 50% of the scores in the "very good" or "good" categories.
- State Forest visitors were most satisfied with the scenery (99% good/very good) and attractiveness of the forest landscape (97% good/very good).
- Attributes receiving the most "poor" or "fair" ratings included the adequacy of signage (13% poor/fair), condition of forest roads (12% poor/fair), and cleanliness of restrooms (10% poor/fair).
- The items that received the most not applicable (N/A) responses included value for fee paid (87% N/A), helpfulness of employees (72% N/A), cleanliness of restrooms (44% N/A), and condition of developed recreation facilities (29% N/A). Generally these responses reflect the fact that the visitors did not encounter these attributes during their visits.

Table 8. Satisfaction Ratings for Customer Service Attributes in the State Forests (Percent)

Satisfaction Item	Poor	Fair	Average	Good	Very Good	Not Applicable	Mean[a]
Scenery			0.9	22.8	76.3		4.7
Availability of parking		5.6	6.7	32.9	50.6	4.2	4.3
Parking lot condition		6.6	11.2	25.5	47.6	9.2	4.3
Cleanliness of restrooms	1.2	8.7	8.2	13.0	24.6	44.3	3.9
Condition of the natural environment	0.1		9.5	28.1	62.0	0.2	4.5
Condition of developed recreation facilities		0.4	8.2	27.5	35.3	28.7	4.4
Condition of Forest roads	1.2	10.9	19.0	33.6	26.9	8.5	3.8
Condition of Forest trails	0.3	0.9	7.2	25.7	47.9	18.0	4.5
Availability of information on recreation	2.4	6.3	10.4	27.2	27.8	25.9	4.0
Feeling of safety		1.9	10.9	22.3	63.5	1.5	4.5
Adequacy of signage	3.4	9.8	21.7	26.2	36.9	1.9	3.9
Helpfulness of employees			1.8	11.3	14.6	72.2	4.5
Attractiveness of the forest landscape			2.8	25.2	71.5		4.7
Value for fee paid				5.2	8.2	86.6	4.6

[a]Response Code: 1="Poor" through 5="Very good"

Importance Ratings

- Importance ratings for the customer service attributes generally followed the same pattern as the satisfaction ratings across the attributes.
- The condition of the natural environment (97% very important/most important), attractiveness of the forest landscape (96% very important/most important) and scenery (94% very important/most important) were the most important attributes to the State Forest visitors.
- The least important items included parking lot condition and availability (12% and 9% not important/least important, respectively), availability of information on recreation (8% not important/least important), and condition of developed recreation facilities (7% not important/least important).
- The greatest numbers of not applicable (N/A) responses were noted for value for fee paid (57%), and helpfulness of employees (41%).

Table 9. Importance Ratings for Customer Service Attributes in the State Forests (Percent)

Importance Item	1	2	3	4	5	Not Applicable	Mean
Scenery			5.3	13.9	80.0		4.8
Availability of parking	4.0	5.3	16.8	17.4	54.5	2.0	4.2
Parking lot condition	1.9	10.2	20.0	14.8	47.4	5.4	4.0
Cleanliness of restrooms	4.8	0.4	14.4	13.1	38.0	29.4	4.1
Condition of the natural environment			2.3	13.9	83.5	0.2	4.8
Condition of developed recreation facilities	2.3	4.7	17.7	17.6	40.5	17.1	4.1
Condition of Forest roads		5.7	17.8	22.5	49.2	4.7	4.2
Condition of Forest trails	1.9	5.1	11.7	16.6	53.6	11.1	4.3
Availability of information on recreation	5.3	2.8	24.0	13.5	38.8	15.5	4.0
Feeling of safety	2.0	5.1	11.6	15.3	64.1	1.9	4.4
Adequacy of signage		1.2	14.1	27.6	53.1	3.9	4.4
Helpfulness of employees	1.3	2.8	19.4	10.4	25.6	40.6	4.0
Attractiveness of the forest landscape			2.3	20.1	76.1	1.5	4.8
Value for fee paid	1.3	0.4	11.7	7.0	22.9	56.8	4.2

Average Importance and Satisfaction Ratings

Comparing the importance and satisfaction ratings for customer service attributes (also known as "gap score analysis") can help to identify how well the various attributes are meeting visitor expectations (Table 10). Items with very similar importance and satisfaction scores can be interpreted as matching visitor expectations. Those with positive differences (satisfaction greater than importance) may be exceeding their expectations, while those with negative differences (satisfaction lower than importance) may not be meeting expectations, and thus might be logical targets for managerial attention (Figure 1).

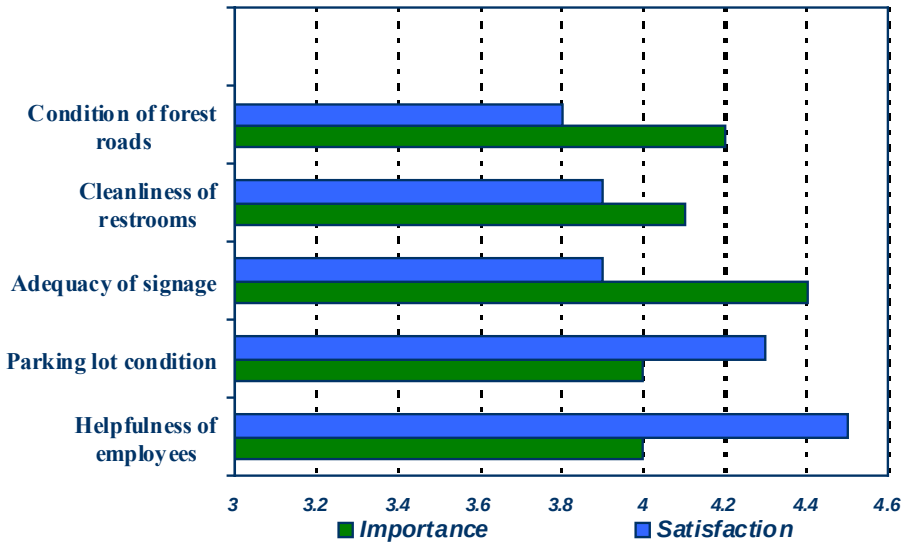
- Value for fee paid (.20), parking lot conditions (.17), and helpfulness of employees (.16) showed positive differences, suggesting that visitor expectations were exceeded for these attributes.
- Significant negative gap scores were found for three items: cleanliness of restrooms (-.47), condition of forest roads (-.41), and adequacy of signage (-.57). These results suggest there is room for improvement in the delivery of these services in the Forests.
- Gap scores for the remaining items were smaller, suggesting a closer match between visitor expectations and perceptions of on-site conditions.

Table 10. Summary of Importance, Satisfaction, and Gap Scores for Customer Service Attributes

Item	Average Satisfaction	Average Importance	Difference (Gap Score)*
Scenery	4.8	4.8	-.01
Availability of parking	4.3	4.2	.09
Parking lot condition	4.3	4.0	.17
Cleanliness of restrooms	3.9	4.1	-.47
Condition of the natural environment	4.5	4.8	-.29
Condition of developed recreation facilities	4.4	4.1	.17
Condition of Forest roads	3.8	4.2	-.41
Condition of Forest trails	4.5	4.3	.03
Availability of information on recreation	4.0	3.9	-.04
Feeling of safety	4.5	4.4	.12
Adequacy of signage	3.9	4.4	-.57
Helpfulness of employees	4.5	4.0	.16
Attractiveness of the forest landscape	4.7	4.8	-.07
Value for fee paid	4.6	4.2	.20

*Gap scores may not equal the apparent difference between importance and satisfaction scores due to "not applicable" responses (some respondents answering only the importance or satisfaction question).

Figure 1. Gap Score Analysis for Items Showing Significant Differences between Importance and Satisfaction.



Crowding Ratings

- Crowding scores tended to be relatively low, with about half of the respondents (57.5%) choosing 1 or 2, reflecting that they encountered "hardly anyone" during their visit.
- About one-fifth (17.5%) of the respondents chose a 3 or 4, indicating that they felt moderately crowded during this trip.
- Very few respondents indicated conditions near the "overcrowded" end of the scale.
- The average crowding score was 3.1 on the 10-point crowding scale.

Table 11. Summary of Perceived Crowding Ratings (Percent).

Perception of Crowding[a]	1	2	3	4	5	6	7	8	9	10
	30.8	26.7	8.3	9.2	9.6	3.2	7.5	2.2	1.8	0.8

[a] Response code: 1 = "hardly anyone" to 10 = "overcrowded"

Facility Use

- State Forest visitors were most likely to report using hiking, biking, or horseback trails (44.9%) and forest roads (44.2%).
- About one-tenth reported visiting designated wilderness (8.8%), probably referring to specially designated natural or wild areas within the Forests.

Table 12. Reported Facility Use by State Forest Visitors (Percent)

	Valid Percent
Developed campground	12.7
Swimming area	2.5
Hiking, biking, or horseback trails	44.9
Scenic byway	15.6
Designated wilderness	8.8
Visitor center, museum	1.2
Picnic area	13.4
Boat launch	11.4
Designated ATV area	2.7
Other forest roads	44.2
Interpretive sites	0.4

Differences by Forest – Satisfaction with Attributes

- Only one item (adequacy of signage) differed significantly between the two State Forests.
- In general, slightly higher satisfaction scores were reported in the Tiadaghton Forest.

Table 13. Differences in Satisfaction with Customer Service Attributes by Forest (Mean)

	Tiadaghton	**Tioga**
Scenery	4.7	4.8
Available parking	4.4	4.3
Parking lot condition	4.4	4.2
Cleanliness of restrooms	4.1	3.9
Condition of the natural environment	4.6	4.5
Condition of developed recreation facilities	4.5	4.3
Condition of forest roads	4.0	3.7
Condition of forest trails	4.4	4.5
Availability of information on recreation	4.0	4.0
Feeling of safety	4.5	4.5
Adequacy of signage*	4.1	3.7
Helpfulness of employees	4.5	4.4
Attractiveness of the forest landscape	4.6	4.7
Value for fee paid	4.8	4.5

[a]Response Code: 1="Poor" through 5="Very good"

* Differences between forests statistically significant

Differences by Forest – Importance of Attributes

- There were no significant differences in the importance ratings of customer service attributes between the two State Forests.

Table 14. Differences in Importance of Customer Service Attributes by Forest (Mean)

	Tiadaghton	**Tioga**
Scenery	4.6	4.9
Available parking	4.0	4.2
Parking lot condition	3.8	4.1
Cleanliness of restrooms	4.0	4.2
Condition of the natural environment	4.9	4.8
Condition of developed recreation facilities	4.1	4.1
Condition of forest roads	4.1	4.3
Condition of forest trails	4.1	4.3
Availability of information on recreation	3.9	4.0
Feeling of safety	4.1	4.5
Adequacy of signage	4.2	4.5
Helpfulness of employees	3.7	4.1
Attractiveness of the forest landscape	4.7	4.8
Value for fee paid	4.2	4.1

[a]Response Code: 1="Least important" through 5="Most important"

Differences by Forest – Perceived Crowding

- Perceived crowding did not differ significantly between users of the two State Forests.

Table 15. Differences in Crowding by Forest (Average)

	Tiadaghton	Tioga
Perceived Crowding[a]	2.6	3.3

[a] Response Code: 1 = "hardly anyone" through 10 = "overcrowded"

Differences by Forest - Facility Use

- Facility use differed significantly between users of the two State Forests for only two types of facilities (developed campgrounds and picnic areas).
- Tioga State Forest visitors were about four times as likely (17%) as Tiadaghton visitors (4%) to use developed campgrounds.
- Tioga Forest visitors were also more likely (17%) than Tiadaghton visitors (6%) to report using a picnic area.

Table 16. Reported Facility Use by Forest (Percent)

	Tiadaghton	Tioga	Total
Developed campground*	3.8	17.0	12.7
Swimming area	2.2	2.6	2.5
Hiking, biking, or horseback trails	55.5	39.6	44.9
Scenic byway	14.3	16.2	15.6
Designated wilderness	7.1	9.6	8.8
Visitor center, museum	3.8	0	1.2
Picnic area*	6.0	16.7	13.4
Boat launch	10.7	11.7	11.4
Designated ATV area	2.6	2.8	2.7
Other forest roads	40.9	45.8	44.2
Interpretive sites	0	0.5	0.4

* Differences between forests statistically significant

Economics Addition

About one-third of the survey respondents were asked about their monetary expenditures during their trip to the State Forest. Additional questions in the "economics addition" focused on the respondents' trip itinerary (Table 17). These questions were asked to establish a context for evaluation of the reported trip expenditures. Due to the small number of individuals answering some of these questions, only the overall results are presented for this section of the report. The number of respondents answering these questions was not sufficient for meaningful comparison of sub-groups of visitors.

- When asked what they would have done if, for some reason, they had been unable to go to the State Forest on this visit, the majority of the respondents (55.1%) stated that they would have gone somewhere else to pursue the same activity.
- Another one-fifth of the visitors (18.5%) said they would have come back another time.
- Very few of the visitors (4.2%) would have gone elsewhere for a different activity, but about one-fifth (21.3%) would have stayed home.
- Overnight visitors were mostly on trips of 3-5 days (48%) or longer (24.8%).
- Day visitors were more evenly divided in being away from their home for 1-2 hours (27.3%), 3-5 hours (28.1%), and more than 5 hours (44.6%).
- About four-fifths (79%) of the respondents surveyed were visiting only the State Forest on this particular trip, and 89% of them indicated that the State Forest was their primary destination.
- When queried about how they were paying their expenses, a variety of responses were noted. More than one-third of the visitors (39.2%) indicated that they were sharing expenses and another third (33.4%) were paying just their own expenses on this trip. The remaining 27.4% were paying expenses for themselves and others in their group.
- About three-fourths of the visitors (74.1%) reported visiting the State Forest specifically to participate in their primary activity 10 times or less during the previous year.
- Survey respondents reported spending between nothing and $50,000 on outdoor recreation activities, including equipment, recreation trips, memberships, and licenses per year.

Table 17. State Forest Recreation Trip Profile (for economics section)

	Valid Percent
What Visitor Would have done if Unable to Visit SF	
Gone elsewhere for same activity	55.1
Gone elsewhere for different activity	4.2
Come back another time	18.5
Stayed home	21.3
None of these	0.9
Total	100.0
Time Away from Home (Days)	
1-2	27.2
3-5	48.0
6 or more	24.8
Total	100.0
Time Away from Home (Hours)	
1-2	27.3
3-5	28.1
6 or more	44.6
Total	100.0
Single or Multiple Destination Trip	
Visited State Forest only	79.0
Visited other places	21.0
Total	100.0
Was State Forest Primary Destination for Trip	
Yes	89.4
No	10.6
Total	100.0
Annual Trips to State Forest for Primary Activity	
0-10	74.1
11-20	13.9
21-50	7.5
More than 50	4.5
Total	100.0
Mean	13.3
How Trip Expenses were being Handled	
Respondent sharing expenses with other people	39.2
Respondent paying for just his/her own expenses	33.4
Respondent paying for him/herself and others	27.4
Some one else paying respondents' expenses	0.0
Total	100.0
Annual Dollars Spent on Outdoor Recreation Equipment	
$500 or less	33.8
$501-$1,000	24.9
$1,001-$2,500	18.3
$2,501 or more	23.0
Total	100.0

Expenditure Categories

In the economics addition, visitors were asked how much they spent for ten categories of expenditures on this trip within 50 miles of the site visited (Table 18).

- Many respondents indicated that they spent no money at all on many of the expenditure categories listed on the survey instrument.
- Few visitors reported any spending for "other transportation" and "activities" (including guide fees and equipment rental).
- The greatest single expenditure was for food/drink at restaurants/bars (mean = $84.77) followed by gas/oil (mean = $79.15).
- A lesser amount of money went to the category of "other food and beverages" (mean = $38.85).

Table 18. Summary of Trip Spending Patterns of State Forest Visitors

Economic Expenditure Items	Proportion of Visitors Spending Something (percent)	Average Amount Spent
Government lodging	24.0	$12.58
Privately-owned lodging	21.1	$33.23
Food/drink at restaurants and bars	84.7	$84.77
Other food and beverages	69.2	$38.85
Gasoline and oil	95.0	$79.15
Other transportation	6.2	$2.22
Activities	8.2	$13.99
Entry, parking, or recreation use fees	8.7	$1.75
Souvenirs/clothing	37.0	$21.27
Any other expenses	11.2	$6.20

Experience Addition

This section of the survey asked a series of additional questions of interest to managers of the Pennsylvania State Forests. As was the case for the "satisfaction" and "economics" additions, about one-third of the respondents were asked these questions. Some of the questions enhanced other sections of the basic survey and have been reported earlier (e.g. previous visitation to the forest and group composition were reported with other visitor trip characteristics in Table 4). The results presented below focus on visitor motivations, feelings towards the Forest, and opinions about various topics in the Pennsylvania State Forests.

Other Visitor Satisfaction Ratings

- Most respondents indicated very favorable ratings (mean of 4.1 or above) for all of the items rated.

Table 19. Visitor Satisfaction Ratings for Various Forest Attributes (Percent)

	Awful	Fair	Good	Very Good	Excellent	N/A	Mean[a]
Sanitation and cleanliness	0.5		6.7	38.6	54.1		4.5
Safety and security			11.8	27.6	58.0	2.6	4.5
Condition of latrines, picnic pavilions & other facilities	3.7	1.2	12.9	21.7	37.4	23.0	4.1
Responsiveness of staff			6.4	3.9	22.7	67.0	4.5
Natural environment			5.1	18.2	76.6		4.7

[a] Response scale = 1 (awful) to 5 (excellent)

Differences by Forest

- There were no significant differences in these ratings between the two State Forests.

Table 20. Differences in Satisfaction with Forest Attributes by Forest (Mean)[a]

	Tiadaghton	Tioga
Sanitation and cleanliness	4.3	4.5
Safety and security	4.6	4.4
Condition of latrines, picnic pavilions & other facilities	4.1	4.2
Responsiveness of staff	4.8	4.4
Natural environment	4.6	4.8

[a] Response scale = 1 (awful) to 5 (excellent)

Forest Access

- Most respondents indicated favorable ratings for access to the State Forests by both roads and trails (mean of 4.5 – 4.6).

Table 21. Visitor Ratings of Access to the State Forests (Percent)

	1	2	3	4	5	Mean[a]
By roads			8.0	28.6	63.4	4.6
By trails	1.4	0.5	4.3	32.2	61.5	4.5

[a] Response scale = 1 (poor) to 5 (very good)

Differences by Forest

- There were no significant differences in the accessibility ratings between the two State Forests.

Table 22. Differences in Satisfaction with Forest Attributes by Forest (Mean)[a]

	Tiadaghton	Tioga
By roads	4.6	4.6
By trails	4.4	4.6

[a] Response scale = 1 (poor) to 5 (very good)

Recreation Experience

- Most respondents indicated favorable ratings (mean of 4.1 or above) for all of the recreation experience items rated.

Table 23. Visitor Ratings for Various Recreation Experience Attributes (Percent)

	Awful	Fair	Good	Very Good	Excellent	N/A	Mean [a]
Opportunity to recreate without feeling crowded	2.8	7.6	5.2	41.4	43.1		4.1
Places to recreate without conflict from other visitors	5.7	5.6	3.6	37.5	47.4		4.2
Compatibility of recreation activities at the area	3.3	0.4	13.7	26.5	52.6	3.6	4.3
Helpfulness/courteousness of Forest employees			3.1	5.4	29.1	61.6	4.7
Helpfulness/courteousness of people in surrounding communities		0.5	6.0	29.5	44.6	19.3	4.5

[a] Response scale = 1 (awful) to 5 (excellent)

Differences by Forest

- There were no significant differences in the outdoor recreation experience ratings between the two State Forests.

Table 24. Differences in Satisfaction with Outdoor Recreation Experience Attributes by Forest (Mean)[a]

	Tiadaghton	Tioga
Opportunity to recreate without feeling crowded	4.2	4.1
Places to recreate without conflict from other visitors	4.3	4.1
Compatibility of recreation activities at the area	4.4	4.3
Helpfulness/courteousness of Forest employees	4.6	4.7
Helpfulness/courteousness of people in surrounding communities	4.5	4.5

[a] Response scale = 1 (awful) to 5 (excellent)

Place Attachment

Visitors were asked to choose their most important reason for visiting the State Forest from a list of alternative choices.

- About one-fourth of the visitors (28.9%) said they went there because they "enjoy being in the forest."
- Another one-quarter of the visitors (24.3%) went there primarily to "spend more time with my friends/family."
- Most of the remaining respondents stated that the Forest is a good place for their chosen activity (hunting, hiking, biking, fishing, etc.).

Table 25. Which of the following was the most important reason for this visit to the State Forest?

	Valid Percent
I went there because I enjoy being in the forest	28.9
I went there because I wanted to spend time with friends/family	24.3
I went there because it's a good place to:	
Hunt	11.4
Hike	7.6
Bike	10.2
Fish	8.8
Horseback ride	0.0
Other Reason	8.6
Total	99.8

Differences by Forest

- Tioga State Forest visitors were more likely to select enjoying the forest or being with friends and family as their primary reason for visiting the forest, while Tiadaghton State Forest visitors were more likely to focus on their chosen activities.

Table 26. Differences in Primary Reason for Visiting by Forest (Percent)

	Tiadaghton	Tioga
I went there because I enjoy being in the forest	16.3	34.7
I went there because I wanted to spend time with friends/family	13.8	29.2
I went there because it's a good place to:		
Hunt	19.5	7.7
Hike	14.8	4.3
Bike	4.7	12.8
Fish	17.0	5.0
Horseback ride	0.0	0
Other Reason	13.9	6.2

Visitors also responded to a set of statements designed to measure the extent of place attachment to the State Forest.

- The vast majority of respondents (88.6%) agreed that the State Forest they visited "means a lot to them," with almost half strongly agreeing.
- Most also reported that they enjoy recreating in the State Forest more than at other places, and get more satisfaction out of visiting the State Forest than from visiting other places.

Table 27. Summary of Place Attachment Scale Items (Percent)

Place Attachment Items	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree	Mean[a]
This place means a lot to me			11.4	41.7	46.9	4.4
I enjoy recreating at this place more than other places I could visit		9.9	26.5	32.6	30.9	3.9
I am very attracted to this place	1.3	12.2	29.8	21.3	35.4	3.8
I get more satisfaction out of visiting this place than from visiting most places	2.9	10.6	37.9	23.9	24.7	3.6

[a] Response Code: 1="Strongly Disagree" and 5="Strongly Agree"

Differences by Forest

- In general, visitors to the Tiadaghton State Forest showed slightly more place attachment than those to the Tioga State Forest.

Table 28. Differences in Place Attachment Items by Forest (Mean)

	Tiadaghton	**Tioga**
This place means a lot to me	4.5	4.3
I enjoy recreating at this place more than other places I could visit	4.0	3.8
I am very attracted to this place	3.9	3.8
I get more satisfaction out of visiting this place than from visiting most places	3.8	3.5

[a] Response Code: 1="Strongly Disagree" and 5="Strongly Agree"

Pine Creek Fishing

State Forest visitors were asked a series of questions about their participation and attitudes towards fishing in Pine Creek.

- About one-fifth of the respondents reported fishing an average of 19.3 days per year in Pine Creek.
- A notable proportion of this fishing effort was spent in special regulation areas (5.5 days for delayed harvest, 3.4 days for catch-and-release, and 2.6 days for trophy trout areas).
- Nearly all of these anglers reported that they normally fish for trout.

Table 29. Summary of Responses to Pine Creek Fishing Questions.

How many days per year do you go fishing in the Pine Creek Valley? (Mean)	19.3 days
How many of your fishing days are made to special regulation areas in the Pine Creek Valley? (Mean)	
Delayed Harvest	5.5 days
Catch-and-Release	3.4 days
Trophy Trout Areas	2.6 days
What species of fish do you fish for when visiting this natural area?	
Trout	97.6%
Smallmouth Bass	2.4%
Walleye	
Other	
What would encourage you to fish more often in this area?	
More special regulation areas	13.1%
Larger fish	34.4%
More fish	29.1%
Fewer or simpler regulations	16.2%
Other	7.1%

Motivations/Reasons for Visiting the State Forest

- Visitors' most important motivations (reasons for visiting) the State Forest were to be outdoors (mean = 4.8) and to experience natural surroundings (mean = 4.7).
- Visitors also attached great importance to the opportunity to relax (mean = 4.6) and get away from their regular routine (mean = 4.7).
- Moderately important motives for visiting the forest included the social motives of family recreation (mean = 4.0) and being with friends (mean = 4.2), as well as getting physical exercise (mean = 4.0).
- Visitors were more evenly divided on the importance of seeking challenge or sport (mean = 3.6) and developing their skills (mean = 3.7).

Table 30. Summary of Motivations/Reasons for Recreating in the State Forests (Percent)

Reasons	Not at all important	Somewhat important	Moderately important	Very important	Extremely important	Mean[a]
To be outdoors			3.9	14.5	81.7	4.8
For relaxation			5.8	26.7	67.4	4.6
To get away from the regular routine		3.6	2.2	16.0	78.2	4.7
For the challenge or sport	11.6	8.3	24.3	24.4	31.5	3.6
For family recreation	7.3	6.7	13.8	24.1	48.2	4.0
For physical exercise	4.7	9.0	13.0	27.0	46.4	4.0
To be with my friends	7.5	0.5	15.3	20.9	55.8	4.2
To experience natural surroundings		1.8	2.7	17.1	78.5	4.7
To develop my skills	3.8	14.9	26.7	18.2	36.5	3.7

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Differences by Forest

- The only noteworthy difference between forests in responses to the motivations/reasons questions was that Tiadaghton Forest visitors showed greater importance for challenge/sport (mean = 4.0) than Tioga Forest visitors (mean = 3.4).

Table 31. Differences in Motivations/Reasons for Visiting the Forest by Forest (Mean)[a]

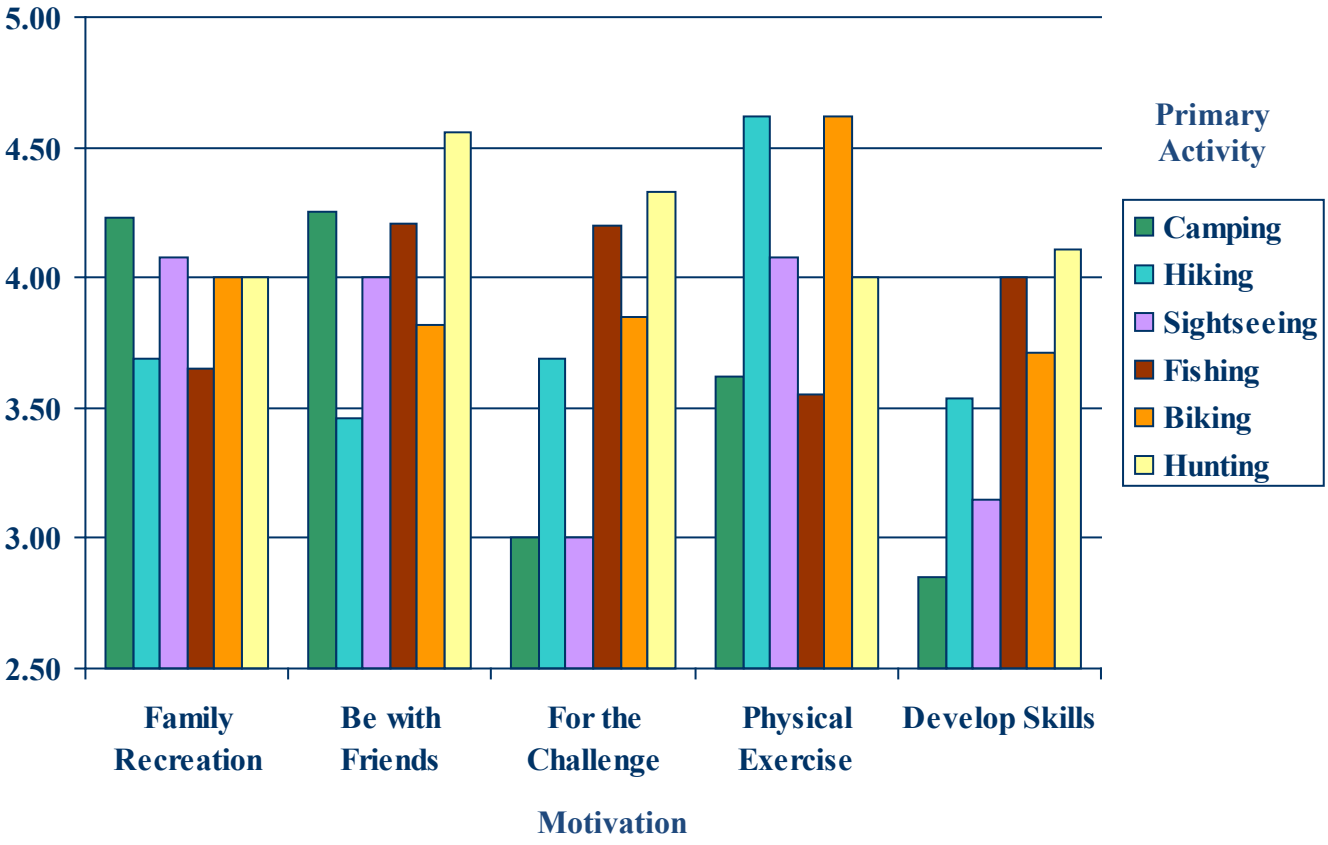
Reason	Tiadaghton	Tioga
To be outdoors	4.6	4.8
For relaxation	4.5	4.7
To get away from the regular routine	4.5	4.8
For the challenge or sport	4.0	3.4
For family recreation	4.0	4.0
For physical exercise	4.0	4.0
To be with my friends	3.9	4.3
To experience natural surroundings	4.5	4.8
To develop my skills	3.7	3.7

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Differences by Primary Activity

- There were several notable differences in the motivations of visitors participating in different primary activities (Figure 2).
- Campers attached the most importance to the social motives of family recreation and being with friends, and the least importance to challenge and skill development.
- Hikers and bikers were exceptionally motivated by getting physical exercise.
- Challenge and skill development were quite important to both the hunters and anglers.
- Campers and sightseers placed the least importance on challenge and skill development.

Figure 2. Differences in Motivations for Visiting the State Forests, by Primary Activity.



Visitor Response to Potential Facilities and Services

Visitors surveyed were asked what facilities/services in the State Forest are most important to them.

- The respondents attached the most importance to trails (mean = 4.4) and the Pine Creek Rail Trail in particular (mean = 4.0).
- Visitors also attached great importance to wildlife viewing areas or opportunities (mean = 3.9) and signs directing them to recreation facilities (mean = 3.8).
- Among the alternatives listed, they assigned the least importance to picnic areas (mean = 3.0).

Table 32. Visitor Importance Ratings for Various Types of Facilities and Services

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important	Mean[a]
Wildlife viewing areas or opportunities	4.9	5.0	23.4	28.6	38.0	3.9
Picnic areas	19.1	18.4	24.2	21.4	16.9	3.0
Parking	5.3	18.2	28.0	21.6	26.9	3.5
Signs directing me to recreation facilities	8.5	9.0	14.4	29.9	38.1	3.8
Pine Creek Rail Trail	11.4	2.2	17.8	16.4	52.3	4.0
Printed interpretive information	11.6	6.4	27.4	23.6	31.0	3.6
Trails	2.6	2.4	6.0	34.0	55.0	4.4
Interpretive Information	17.1	7.9	19.6	29.1	26.3	3.4

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Differences by Forest

- There were no significant differences in the importance ratings for facilities and services between the two State Forests.

Table 33. Differences in Importance Ratings for Various Types of Facilities and Services by Forest (Mean)[a]

	Tiadaghton	Tioga
Wildlife viewing areas or opportunities	3.8	4.0
Picnic areas	3.1	3.0
Parking	3.6	3.4
Signs directing me to recreation facilities	3.6	3.9
Pine Creek Rail Trail	4.0	3.9
Printed interpretive information	3.2	3.8
Trails	4.5	4.3
Interpretive Information	3.5	3.3

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Information Services

State Forest visitors were asked a series of questions about their use of various types of forest information.

- One-fifth of the visitors surveyed reported that they had obtained information about the area they visited during or in preparation for their trip.
- Nearly equal proportions of visitors sought the different types of information listed in the survey (maps, visitor guides, other information).
- Nearly all of those visitors who had obtained information did so before leaving home, in preparation for their trip.
- Nearly all of them also reported that the information obtained was helpful in planning their trips.

Table 34. Visitor Responses to Questions about Information Services

	Valid Percent
Did you obtain any information about this area during this trip or in preparation for it?	
No	79.4
Yes	20.6
What type of information did you obtain?	
State Forest map	20.5
Trail map	27.6
PA visitors guide	27.9
Other	24.0
When did you receive information?	
Before leaving home	86.0
After arriving here	14.0
Was the information you received helpful to plan your trip?	
Yes	97.4
No	2.6

PA Wilds

State Forest visitors were also asked a series of questions about the PA Wilds.

- Less than half of the visitors surveyed (37.4%) reported that they were familiar with the PA Wilds designation.
- Nearly all of the visitors surveyed (94%) indicated that the PA Wilds program did not influence their decision to visit the State Forest.
- Most of the respondents (92%) indicated they were not planning to visit any other areas in the PA Wilds during their forest visit.
- Among those who were familiar with the PA Wilds, most made favorable comments about the program. See Appendix B, page 53 for a listing of these comments.

Table 35. Visitor Responses to Questions about the PA Wilds

	Valid Percent
Are you familiar with the PA Wilds designation in North Central Pennsylvania?	
No	62.6
Yes	37.4
Did the PA Wilds program influence your decision to visit the state forest?	
No	94.0
Yes	6.0
Are you planning to visit any other areas in the PA Wilds during your visit?	
No	92.0
Yes	8.0

Conclusion

The results published in this report are a compilation of the data collected at numerous recreation sites during the period of May 16, 2007 through May 15, 2008 (n = 590 interviews). Besides the basic visitor use survey, three supplemental instruments were used to query visitors about their satisfaction levels, economic expenditures, and recreation experiences.

This report provides a summary of the characteristics, behaviors, and attitudes of visitors to the Tiadaghton and Tioga State Forests in north central Pennsylvania. The results indicate that the Tiadaghton and Tioga State Forests receive about 177,316 and 331,193 annual recreation visits, respectively. Forest visitors tend to go to more than a single site during their trips to the forests, resulting in a higher number of recreational site visits in each State Forest.

Most State Forest visitors are repeat users, and many have considerable years of experience in the forests. Regarding satisfaction levels, most respondents were clearly satisfied with their recreation experience and with the satisfaction attributes listed on the survey instrument. While the data suggest that there is room for some improvement in a few areas, it is equally important to recognize the numerous positive scores for various satisfaction attributes.

The economic section of the study asked visitors about their monetary expenditures in and near the State Forests. About half of the forest visitors indicated that they would have gone somewhere else to do the same activity if they had not been able to visit the State Forest, indicating that they were serious about pursuing their recreation activities on that trip. As expected, most visitors were not staying overnight, so there were few expenditures for lodging accommodations. The largest expenditures reported were for food/drink at restaurants and bars, gasoline and oil, and other food and beverages.

The experience section of the study was given to about one-third of the visitors, providing rich data about visitor attitudes, motivations, and management preferences. The data clearly show that State Forest visitors are interested in experiencing the outdoor natural surroundings available in the forest areas. Relaxing out of doors, getting away from the routine, and other nature-based social activities are very important to these recreationists. Motivations to recreate in the State Forests were different for those pursuing different activities. Hunters and anglers are more interested in pursuing outdoor recreation activities that involve skill development and challenge, while hikers and bikers seek physical exercise. All activity groups greatly value relaxing and getting away from their regular routine in an outdoor, natural environment.

Visitor responses to potential management options were examined to ascertain support or opposition to various management alternatives. The highest degree of support was seen for recreational trails, additional wildlife viewing areas or opportunities, and directional signs to recreation areas.

This report provides a representative snapshot of recreational use in two Pennsylvania State Forests. It thus provides a start on the development of baseline data on Pennsylvania State Forest visitors. It is hoped that Pennsylvania Bureau of Forestry managers will continue to support the development of this visitor use database to assist in their efforts to meet the needs of their recreation constituency.

Appendix A

Zip Codes of State Forest Visitors

	Valid Percent
State Visiting From	
Pennsylvania	86.6
New York	73.0
Maryland	2.1
Other	4.5
Total	100
Pennsylvania Counties	
Lycoming	21.8
Tioga	11.3
Clinton	8.1
Lancaster	6.2
Bradford	5.4
York	4.9
Centre	3.8
Berks	3.5
Montgomery	2.7
Dauphin	2.4
Cumberland	2.2
Schuylkill	2.2
Northumberland	1.9
Allegheny	1.6
Chester	1.6
Lebanon	1.6
Other	18.8
Total	100.0
Lycoming County MCD	
Jersey Shore	39.5
Williamsport	22.5
South Williamsport	8.6
Montoursville	8.6
Muncy	4.9
Woodward	3.7
Cummings	3.7
Other	91.5
Total	100
Tioga County MCD	
Wellsboro	61.9
Mansfield	19.0
Covington	3.7
Other	1.1
Total	100
Clinton County MCD	
Lock Haven	60.0
Avis	16.6
Other	23.3
Total	1000
Mean Travel Distance to Forest for All Respondents	101.9 miles
Mean Travel Distance to Forest for PA Residents	68.8 miles

Appendix B

Visitor Responses to Open-Ended Questions

If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do? (Experience Addition, question #8)

Facilities

Bathrooms
more bathrooms and trash cans
cleaner porta potties and more restrooms
more restrooms at each trailhead or parking area
more restrooms
better restrooms with showers
restroom access for kayakers, too difficult to get to from creek
flush toilets, running water, link to horseback riding info on the web
porta potties at all parking lots
turn on the water
more restrooms

Other
concrete area for accessibility
playground areas
parking at campsites to unload gear
playground, tent camping at pavilion
snack bar, drinks
trash cans
primitive campers only, too many regulations, no logging
more benches
benches along the trail at Ramsey, Slate Run, Clark Farm, picnic tables
ease regulations for overnight camping, make it simpler to get permits
trash cans at picnic areas
more campgrounds with amenities
more fire pits, lower restrictions
don't allow camping in parking areas of trail heads such as red run

Information

Maps and Information
comprehensive website for DCNR and fish and boat
maps available at sites
biking club info, maps available at trail, open jersey shore restrooms
friend of pine creek rail trail interactive web site
telephone, more information, should charge a fee, more sites, separate areas for tents
better maps along trail/ snowmobile information
more maps

snowmobile safety courses
pamphlets on snakes
better advertising, let people know what is here
better maps at visitor area
lack knowledge about trail with local government agencies

Signs

more wildlife identification signs
better sign for Bradley Whales and west rim road
signs informing people to not walk in ski tracks
better signs
more signs and better maps
increased signage, drinking water on rail trail
more signs and mile markers on rail trail

Ranger/patrols

rangers in campgrounds
ranger at campground
more rangers
no guns on rangers

Trails and roads

remove gates on some of the forest roads
open Trout Run to Cammal
crosswalks at road crossings on rail trail
more overlooks
atv trails
more rail trail access areas
more access to logging roads
atvs on trails
allow more roads to be open
keep gates closed to keep people off private property
more water stops on rail trail
groom the smaller trails
better roads and trail maintenance
cut brush
more road pull offs, more camp grounds
more roads open to public travel

Hunting/Fishing

fewer restrictions on fishing, more golf courses

stop killing deer
more deer, no beaver dams
more deer, don't shoot does
more deer
limit doe tags
more deer
stock more deer
stop doe hunting
more deer, better marking of county boundaries for hunting regulation
more deer
more fishing access
more fish
more fish

Forest management

bug control
bug control, even out the rail trail
ban generators from County Bridge

Other

trap shooting range, pistol range
cell tower for better reception

Is there some accommodation or assistance we could offer that would be helpful to you or anyone else in your group to improve your recreation experience? (Satisfaction Addition, question #2)

Facilities

Bathrooms

clean restrooms
more bathrooms
more bathrooms
cleaner bathrooms
flush toilets
hand sanitizer in bathrooms
more bathrooms
fix remote bathroom sites
keep a watch on toilet paper levels
more bathrooms
bathrooms with working water pumps
more restrooms for women

Other

cleanliness of facilities
phones, water fountains
add playgrounds
bear proof containers or bear ropes
clean graffiti on picnic tables
more trash cans
working water pumps
fix water pump at black walnut bottom
more pavilions at day use areas
first aide station
more recycling centers
more places to get drinking water
overnight parking at Tiadaghton camp
more benches on trails
be able to drive into Black Walnut to drop off gear
water at lookouts
allow people to drop gear at campsite (black walnut bottom)

Information and signage

more information signs, information center, mile markers
maps at recreation sites
printed information at trails

mile markers
more historical markers
more mile and trail markers
more online information
more information online
more signs on trails
better signs
better signage
maps and information about hiking
more trail markers
more maps

Ranger/patrol

more ranger patrol in areas
more rangers and dog control
more rangers
more rangers in the forest, especially on the rail trail
more rangers
more patrols

Trails and roads

pave the rail trail
pave rail trail
more equestrian trails and camps
fewer roads
oil roads to reduce dust
close open gates
fewer roads
update trail conditions
check hiker registry
open ATV trails
more access to trails
improve access to Tiadaghton picnic area
maintain more trails
more information about ATV trails
better trails and campgrounds
better roads
more orange blazes on west rim trails
more information about water stops on
west rim

Hunting/fishing

keep hunters involved, more deer
stop killing deer, need more deer for hunting
introduce elk
more deer
more fish
more deer
fix the jack dams or build a few more for the brook
trout
more wildlife viewing
deer control, stop doe archery
more fish
raise deer levels
maintain Sundays as no hunting days
cheaper out of state fishing licenses
more access to fishing areas

Forest management

private landowners abuse the forest
manage development in the area
less development
more timber harvesting
more clear cuts and more undergrowth
have someone else maintain the forest and start charging for use
pest management, gypsy moths, Asian longhorn beetle, elan span
worm, etc
cut down over hanging trees
manage lumber sales more carefully
more chestnut trees
budget more money for gypsy moth spraying
more clear cuts

Other areas visited or plan on visiting for recreation on this State Forest Trip (Basic Addition, question #4)

Sites and Areas Visited	Frequency
Pine Creek Gorge/Valley	45
Slate Run	21
Blackwell	18
PA Grand Canyon	16
Little Pine Creek State Park and Area	14
Cedar Run	9
Asaph Area	8
Darling Run	7
Tiadaghton Picnic/Camp	6
Sproul State Forest	5
Black Walnut Bottom	5
Colton Point	5
Waterville	5
West Rim Trail	4
Black Forest Trail and Area	4
Ansonia	3
Camal	3
Ramsey	3
Leonard Harrison State Park	3
East Rim	3
Jersey Mills	3
Clark Farm	3
Potter County	3
Bonnell Flats	2
Cherry Springs	2

Recreation Use on the State Forests Appendix

County Bridge	2
English Center	2
Francis Run	2
Jersey Shore	2
Turkey Path	2
Red Run	2
Barber Rock Trail	1
Big Meadows	1
Ross Run	1
Torbet Island Area	1
Whitetail	1
Wellsboro Area	1
Mill Run Road	1
Dire Road	1
Fishing Creek	1
Frying Pan Trail	1
Golden Eagle Trail	1
Hoffman Camp	1
Kettle Creek	1
Trout Run	1
Lebo Vista	1
Spring Brook	1
Stony Fork	1

List of other expenditures (Economics Addition, question #2)

Supplies for cabin

Heat

Wood

Motel

Other areas used or visited for recreation (Satisfaction Addition, question #4)

Lookouts

Areas for dog training

Cabin

Fishing Creek

Hunting

Pine Creek Rail Trail

Camp visit

Other most important reasons for this visit to the state forest (Experience Addition, question #4)

Driving through

Geocaching

Snowmobiling (2)

Skiing

Therapeutic healing

Solitude

Other species of fish sought while visiting the state forest (Experience Addition, question #4c)

Bass

Golden Trout

Trout (3)

Other reasons which would encourage you to fish more in the area (Experience Addition, question #4d)

More time (2)

Reduced cost of fishing license

Opinions about facilities for people with disabilities (Experience Addition, question #6a)

Set up really well and there are usually ramps

Yes, ramps are present

Yes, adequate (3)

Yes, but there need to be phones nearby in case of an emergency

Other type of information obtained for this trip (Experience Addition, question #11a)

Geocache guide

H2O levels online

Internet (2)

Rail trail pamphlet

Fishing conditions and phone numbers

Trail map

Travel guide

West Rim booklet (2)

Word of mouth

Where or from whom did you receive information (Experience Addition, question #11c)

Bureau of Forestry (3)

Book Shop

DCNR (2)

Friends (2)

Previous trips

Geocache.com

Internet (4)

Jersey Shore Library

Little Pine State Park

Local motel and people

Pine Creek Outfitters (3)

State Parks

Visitor Center (3)

What could have made the information more useful (Experience Addition, question #11d)

More detailed maps

Phones and cell phone coverage

Rules and regulations more clear

Other primary destination besides state forest (Experience Addition, question #14)

Allegheny National Forest

Golf Tournament in Wellsboro

Niagara Falls

Renovo

What do you think of the PA Wilds designation (question #15, Experience Addition)

Don't know much about it

Good (4)

Good for protection and bad for development

Good for some people

Good thing/idea (3)

Great (2)

Great for protection and tourism

Great idea, brings people into the woods

Great idea, made more public

Important

Helpful because there is more information on activities

Like it (2)

Nice to have designated areas

No opinion

Ok

Only heard of it, no opinion

Protects wildlife in the area

Vaguely familiar

Other areas visited in PA Wilds on this trip (Experience Addition, question #16)

Canyon Museum

Ives Run

Mt. Pisgah State Park

To see elk

Sproul State Forest

Worlds End

Appendix C

Survey Instrument

_____ State Forest:
2007 Recreational Use Survey
Developed Day Use and Overnight Version

Interviewer:_____ Site: _____ Date: _____

Time of Interview: _____ Vehicle Axle Count: _____ Clicker Count: _____

Section 1 (Screening Questions)

1. Would you be willing to take a few minutes to participate in this interview?
Yes No
❑ ❑ **If yes, continue, if no thank visitor and end the interview**

2. What is the primary purpose of your visit to this site?

❑ Recreation—CONTINUE INTERVIEW

❑ Working or commuting to work (stop interview)
❑ Just stopped to use the bathroom (stop interview)
❑ Just passing through, going somewhere else (stop interview)
❑ Some other reason (specify)_____

We are surveying only people who are here

Complete 3 and 3a for DUDS, OUDS and Proxy ONLY

3. Are you leaving (site name) for the last time today or will you return later?

❑ Leaving for last time today—CONTINUE INTERVIEW
❑ Will return later (CONTINUE INTERVIEW FOR INTERNAL USE)

3a. When did you first arrive at (site name) on this visit?
Month_____ Day_____ Year_____ Time (military)_____

Complete for GFA ONLY

4. Are you leaving the _____ SF for the last time today or will you return later?

❑ Leaving for last time today—CONTINUE INTERVIEW
❑ Will return later (CONTINUE INTERVIEW FOR INTERNAL USE)

Section 2 (Basic Information)

Now I want to ask you some more questions about where you went on your whole visit to the _____ SF, which includes the use of this area and other portions of the _____ SF.

1. Did you spend last night in the _____ SF?
No Yes

❑ ❑ **If yes, how many nights in a row did you spend in the _____ SF? _____**

2. When did you first arrive at the _____ on this recreation visit?
Month_____ Day_____ Year_____ Time (military)_____
❑ **Same as site arrival time**

3. When do you plan to finish your visit to the _____ SF on this recreation visit?
Month_____ Day_____ Year_____ Time (military)_____
❑ **Same as site arrival time**

4. What other areas did you visit, or do you plan to visit in the _____ SF for recreation on this trip?
(List sites or areas visited)

_____

_____

4a. How many different overnight lodging facilities (like campgrounds, cabins, or lodges) will you use on this trip to the _____ SF? Number_____

4b. How many other developed day use sites (like picnic areas or visitor centers), not including trailheads, will you use on this trip to the _____ SF? Number_____

4c. How many different days will you enter into undeveloped areas of the _____ SF on this trip? Number_____

5. In what activities on this list did you participate during this recreation visit at the _____ SF?		**6. Which of those is your primary activity for this recreation visit to the _____?**
Question 5 answers		**Question 6 answer**
	Camping in developed sites	
	Primitive camping	
	Backpacking	
	Resorts, cabins, organization camp use, and other accommodations on FS managed lands (private or FS)	
	Picnicking and family gatherings in developed site (family or group sites) (circle one)	
	Viewing while traveling off-forest	
	Viewing natural features such as scenery, wildlife, birds, flowers, fish, etc. (on FS lands) (circle one)	
	Visiting historic and prehistoric sites/areas (circle one)	
	Viewing a nature center, nature trail, or visitor center (circle one)	
	Nature study	

	General viewing activities, sightseeing	
	Fishing—all types	
	Hunting—all types	
	Off-highway vehicle travel	
	Driving for pleasure on roads	
	Snowmobile travel	
	Motorized water travel	
	Other motorized activities	
	Hiking or walking	
	Horseback riding	
	Bicycling, including mountain bikes (circle one)	
	Nonmotorized water travel (sailboarding, kayaking, rafting, etc.) (circle one)	
	Downhill skiing or snowboarding (circle one)	
	Cross-country skiing, snowshoeing (circle one)	
	Other nonmotorized activities	
	Gathering mushrooms, berries, firewood, or other natural products (circle one)	

7. NOT including this visit, about how many times did you come to the _____ SF for recreation in the past 12 months? Number_____

8. What is your home ZIP code or Canadian postal code? _____

❑ **Visitor is from a country other than USA or Canada**

9. How many people (including you) traveled here in the same vehicle as you? Number_____

9a. How many of those people are less than 16 years old? Number_____

11. What is your age? Age_____

12. Gender? Male Female

13. Which of the following best describes you?

- ❑ Black/African American
- ❑ Asian
- ❑ White
- ❑ American Indian/Alaskan Native
- ❑ Native Hawaiian or other Pacific Islander
- ❑ Spanish, Hispanic or Latino
- ❑ Other _____

Economics Addition

Section 1 (This Recreation Trip)

1. If for some reason you had been unable to go to the _____ SF for this visit what you would you have done instead:

- ❑ Gone elsewhere for the same activity
- ❑ Gone elsewhere for a different activity
- ❑ Come back another time
- ❑ Stayed home
- ❑ Gone to work at your regular job
- ❑ None of these: _____

2. About how much time, in total, will you be away from home on this recreation trip?

- ❑ Days _____ or
- ❑ Hours _____

3. On this trip, did you recreate at just the _____ SF, or did you go to other State Forests, parks, or recreation areas?

- ❑ Just the _____ SF (go to section 2)
- ❑ Other places (go to question 4)

4. Was the _____ SF your primary destination for this recreation trip?

❑ Yes ❑ No

Section 2 (Annual Recreation Use and Spending)

1. How many times in the last year have you visited the _____ SF specifically to participate in the primary activity that you mentioned previously? Number_____

2. About how much money (to the nearest $100.00) do you spend each year on all outdoor recreation activities, including equipment, recreation trips, memberships, and licenses? Dollar Amount_____

Section 3 (Trip Expenditure Profile)

1. For this trip are you:

- ❑ Sharing expenses with other people (report just what you spent)
- ❑ Paying just for your expenses (report just what you spent)
- ❑ Paying for yourself and others: How many others _____ (report what you spent for all these people)
- ❑ Someone else is paying for you (report your portion of the total that person spent)

. For the following categories, please report the amount spent within 50 miles of here on this trip.				
Government-owned lodging (campgrounds, etc)	Food/drink at restaurants and bars	Gasoline and oil	Activities (including guide fees and equipment rental)	Souvenirs and clothing
$	$	$	$	$
Privately-owned lodging	Other food and beverages	Other transportation (plane, bus, etc.)	Entry, parking or recreation use fees	Any other expenditures (list below)
List of “other” expenditures:				

Satisfaction Addition

This section asks about your satisfaction with the recreation services and facilities at the _____ SF.

1. This section asks you about your satisfaction with the recreation services and quality of the recreation facilities in the _____ SF. Please rate the following attributes of this recreation site or area of the forest. Also rate the importance of this attribute toward the overall quality of your recreation experience here. Rate importance from 1 (=not important) to 5 (=very important) in terms of how this attribute contributes to your overall recreation experience.

	Poor	Fair	Average	Good	Very Good	N/A	Importance				
Scenery	1	2	3	4	5						
Availability of parking	1	2	3	4	5						
Parking lot condition	1	2	3	4	5						
Cleanliness of restrooms	1	2	3	4	5						
Condition of the natural environment	1	2	3	4	5						
Condition of developed recreation facilities	1	2	3	4	5						
Condition of Forest roads	1	2	3	4	5						
Condition of Forest trails	1	2	3	4	5						
Availability of information on recreation	1	2	3	4	5						
Feeling of safety	1	2	3	4	5						
Adequacy of signage	1	2	3	4	5						
Helpfulness of employees	1	2	3	4	5						
Attractiveness of the forest landscape	1	2	3	4	5						
Value for fee paid	1	2	3	4	5						

2. Is there some accommodation or assistance we could offer that would be helpful to you or anyone else in your group to improve your recreation experience?

No ❑ Yes ❑ **If yes, what would that be?**

3. Please rate your perception about the number of people at this area today. Use a scale of 1 to 10, where 1 means there was hardly anyone else there, and 10 means that you thought the area was very overcrowded?

HARDLY ANYONE								VERY OVERCROWDED	
1	2	3	4	5	6	7	8	9	10

4. Finally, while at the _____ SF, which of the following did you visit or use for recreation?

- ❑ Developed campground
- ❑ Swimming area
- ❑ Hiking, biking, or horseback trails
- ❑ Scenic byway
- ❑ Designated wilderness
- ❑ Visitor center, museum
- ❑ Picnic area
- ❑ Boat launch
- ❑ Designated ORV area
- ❑ Other forest roads
- ❑ Interpretive sites
- ❑ Other _____

State Forest Experience Addition

1. Is this your first visit to the state forest?

❑ Yes ❑ No

[If no] In what year did you make your first visit to the state forest _____ year

In a typical year, how many days do you spend recreating in the state forest? _____ days

In a typical year, how many days do you spend recreating at other forest recreation sites outside of the state forest? _____ days

2. Which of the following best describes the composition of your group? [check only one]

❑ Alone ❑ Family

❑ Friends ❑ Family & friends

❑ Commercial group (group of people who paid a fee to participate in this trip) ❑ Organized group (club or other organization)

❑ Other [please specify]_____

3. Overall, how would you rate the quality of each of the following at the state forest:

	Awful	Fair	Good	Very Good	Excellent	Not applicable
Sanitation and cleanliness	1	2	3	4	5	NA
Safety and security	1	2	3	4	5	NA
Condition of latrines, picnic pavilions & other facilities	1	2	3	4	5	NA
Responsiveness of staff	1	2	3	4	5	NA
Natural environment	1	2	3	4	5	NA

4. Which of the following was the most important reason for this visit to the state forest? [Please check only one]

_____ I came here because I enjoy being in the forest

_____ I came here because it is a good place to spend time with friends/family

_____ I came here because it's a good place to :

_____ Hunt _____ Hike

_____ Bike _____ Horseback ride

_____ Fish (if yes, answer below questions)

_____ Other reasons for visit (cabin owner, private inholding):

4a. How many days per year do you go fishing in the Pine Creek Valley_____
4b. How many of your fishing days are made to special regulation area in the Pine Creek Valley, such as Delayed Harvest, Catch-and-Release and Trophy Trout Areas?

_____ Delayed Harvest _____ Catch-and-Release
_____ Trophy Trout Areas

4c. What species of fish do you fish for when visiting this natural area:

❑ Trout ❑ Smallmouth bass
❑ Walleye ❑ Other:

4d. What would encourage you to fish more often in this area?

❑ More special regulation areas ❑ Larger fish, indicate species:
❑ More fish, indicate species: ❑ Other
❑ Fewer or simpler regulations ❑ Other:

5. On a scale of 1 to 5, how do you feel about access to the forest: [1 poor, 5 very good]

By roads	1	2	3	4	5
By trails	1	2	3	4	5

6. Does anyone in your household have a disability?

❑ Yes ❑ No

6a. [If yes] Please tell us if you believe our facilities are adequate

7. Here is a list of possible reasons why people recreate at outdoor recreation sites. Please tell me how important each of the following benefits is to you when you visit a state forest in Pennsylvania.

[one is not at all important and five is extremely important] [N/A does not apply to this question. Should be able to answer for each]

REASON	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important
To be outdoors	1	2	3	4	5
For relaxation	1	2	3	4	5
To get away from the regular routine	1	2	3	4	5
For the challenge or sport	1	2	3	4	5
For family recreation	1	2	3	4	5
For physical exercise	1	2	3	4	5
To be with my friends	1	2	3	4	5
To experience natural surroundings	1	2	3	4	5
To develop my skills	1	2	3	4	5

8. If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

_____

9. We are interested in knowing what facilities/services in the state forest are most important to you. Please tell me how important each of the below listed items is to you.

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important	No Opinion
Wildlife viewing areas or opportunities	1	2	3	4	5	x
Picnic areas	1	2	3	4	5	x
Parking	1	2	3	4	5	x
Signs directing me to recreation facilities	1	2	3	4	5	x
Pine Creek Rail Trail	1	2	3	4	5	x
Printed interpretive information	1	2	3	4	5	x
Trails	1	2	3	4	5	x
Interpretive information	1	2	3	4	5	x

10. Please look at this list of statements that address your feelings about the recreation <u>area</u> that you visited on this trip in the state forest. Please indicate your level of agreement with each of the statements listed below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
This place means a lot to me	1	2	3	4	5
I enjoy recreating at this place more than other places I could visit	1	2	3	4	5
I am very attached to this place	1	2	3	4	5
I get more satisfaction out of visiting this place than from visiting most places	1	2	3	4	5

11. Have you obtained any information about this area during this trip or in preparation for it?

❑ Yes ❑ No

[If yes] Please continue with follow-up questions

11a. What type of information did you obtain?

❑ State forest map ❑ Trail map

❑ PA visitors guide ❑ Other:

11b. When did you receive information?

❑ Before leaving home ❑ After arriving here

11c. Where or from whom did you receive information?

11d. Was the information you received helpful to plan your trip?

❑ Yes ❑ No

[If no] what would have made the information more useful?

12. What services in nearby communities (OFF of the forest) do you wish were available? Please list:

_____

_____

13. This section asks about your satisfaction with your recreation experience at <u>this recreation site</u> or <u>area of the forest.</u> Please rate the following attributes of this recreation site or area of the forest.

	Awful	Fair	Good	Very Good	Excellent	Not applicable
Opportunity to recreate without feeling crowded	1	2	3	4	5	NA
Places to recreate without conflict from other visitors	1	2	3	4	5	NA
Compatibility of recreation activities at the area	1	2	3	4	5	NA
Helpfulness/courteousness of Forest employees	1	2	3	4	5	NA
Helpfulness/courteousness of people in surrounding communities	1	2	3	4	5	NA

14. Was the state forest your primary destination for this recreation trip?

❑ Yes ❑ No

[If no] Please list your primary destination for this recreation trip:_____

15. Are you familiar with the PA Wilds designation in North Central Pennsylvania?

❑ Yes ❑ No

[If yes] What do you think of this designation?

16. Did the PA Wilds program influence your decision to visit the state forest?

❑ Yes ❑ No

17. Are you planning to visit any other areas in the PA Wilds during your visit?

❑ Yes ❑ No

[If yes] Please indicate other areas you are planning to visit:

Visitor Use Monitoring of Pennsylvania's State Forests: Year 1 Report – Sproul and Susquehannock State Forests

by

Alan R. Graefe

Andrew J. Mowen

D. Kyle Olcott

Department of Recreation, Park and Tourism Management
The Pennsylvania State University

David A. Graefe
Marshall University

and

Donald B. K. English
USDA Forest Service

Final Report Submitted to the Pennsylvania Bureau of Forestry
Department of Conservation and Natural Resources
Harrisburg, Pennsylvania

August 1, 2014

Table of Contents

Introduction....1
Purpose....2
Objectives....2
Methodology....3
Organization of this Report....4
Recreation Use Estimates....5
Survey Results....11
- Trip Visitation Patterns....12
- Demographic Characteristics....15
- Activity Participation....16

Satisfaction Addition....18
- Satisfaction Ratings....18
- Importance Ratings....19
- Other Visitor Satisfaction Ratings....21
- Overall Satisfaction....21
- Crowding Ratings....22

Economics Addition....23
- Visitor Expenditures....25

Experience Addition....28
- Forest Access....28
- Recreation Experience....29
- Place Attachment....30
- Motivations/Reasons for Visiting the State Forest....32
- Visitor Response to Potential Facilities and Services....33
- Information Services....34
- Desired Services in Nearby Communities....35
- Visitor Response to Questions about Marcellus-Shale Related Activity....36

Summary and Conclusions....40
Appendices....43
- Appendix A – Visitor Responses to Open-ended Questions....43
- Appendix B – Zip Code Analysis of Sproul and Susquehannock Forest Visitors....74
- Appendix C – Survey Instrument....83

List of Tables

1 Description of the Sampling Sites....6
2 Summary of Mechanical and Observational Counts at Sampling Sites....8
3 Recreation Use Estimates for the Sproul and Susquehannock State Forests....10
4 Trip Visitation Patterns in the State Forests....13
5 Demographic Characteristics of State Forest Visitors....15
6 Activity Participation of State Forest Visitors....16
7 Satisfaction Ratings for Customer Service Attributes in the State Forests....18
8 Importance Ratings for Customer Service Attributes in the State Forests....20
9 Visitor Satisfaction Ratings for Various Forest Attributes....21
10 Overall Satisfaction of State Forest Visitors....21
11 Summary of Perceived Crowding Ratings....22
12 State Forest Recreation Trip Profile (for economics section)....24
13 Summary of Trip Spending Patterns of State Forest Visitors....25
14 Amount Spent for Various Categories of Trip Expenditures....26
15 Visitor Ratings of Access to the State Forests....28
16 Visitor Ratings for Various Recreation Experience Attributes....29
17 Most Important Reason for this Visit to the State Forest....30
18 Summary of Place Attachment Scale Items....31
19 Summary of Motivations/Reasons for Recreating in the State Forests....32
20 Visitor Importance Ratings for Various Types of Facilities and Services....33
21 Visitor Responses to Questions about Information Services....34
22 Responses to Services Visitors Wish Were Available in Nearby Communities....35
23 Visitor Responses to Questions about Marcellus Shale-Related Activity....36
24 Responses to How Marcellus Shale-related Activity has Changed your Use of the Forest....37
25 Responses to Why Marcellus Shale-related Activity has not Changed your Use of the Forest....38
26 Responses to How Marcellus Shale-related Activity has Changed your Recreation Experience at the Forest....39
27 Responses to Why Marcellus Shale-related Activity has not Changed your Recreation Experience at the Forest....39

Introduction

Resource managers in the Pennsylvania Department of Conservation and Natural Resources have identified a need to better understand the recreational visitors who use the State Forests and State Parks. This need includes understanding visitors' use patterns as well as their expectations, spending patterns, desires and satisfaction levels. Relevant questions asked by managers include:

i) Who are our customers?
   - What are the primary customer segments and sub segments?
   - What is the profile of each segment and sub segment?
   - What are the patterns of use, trip characteristics, purpose of visit, and demographic characteristics of our visitors?
   - What is our market niche?
   - What is the average number of vehicles entering/exiting State Forest/Park sites?
   - What is the average number of people per vehicle?

ii) What are our customers looking for?
   - What are their expectations and satisfaction levels?
   - What gaps exist between expectations and satisfaction levels?
   - What do they want in terms of information/interpretation, services, and amenities?
   - What kind of experience do they desire?
   - What are their preferences for facilities?
   - How well are we performing in key areas (service, facilities, law enforcement, information/interpretation, resource protection, and visitor experience)?
   - What is an acceptable level of services/maintenance given existing and projected budget constraints?
   - What are the barriers to participation?

iii) What is the economic impact of State Forest/Park visitors?
   - How are State Forest/Park visitors impacted by oil and gas drilling operations on and surrounding State Forests and State Parks?

Purpose

The purpose of this study is to develop a long-term, systematic approach for answering such questions about Pennsylvania State Forest and State Park visitors. The study will survey visitors to selected State Forests and Parks over a five year period to measure recreational use and gather data to provide a profile of recreational visitors. Sampling will be designed to measure and describe recreation use on two State Forests and six State Parks per year over a five-year study period. In total, 10 forests and 30 parks will be surveyed during the five-year duration of the project. After the initial study period, additional surveying may be conducted on other forests or parks.

This report provides results from the first year of the project. Specifically, surveys were conducted in the Sproul State Forest (District #10) and the Susquehannock State Forest (District #15) to measure recreation use and develop a profile of State Forest visitors and their use patterns. Concurrently, surveys were conducted in six State Parks located adjacent to or near these two State Forests (Bald Eagle, Kettle Creek, Hyner Run, Lyman Run, Cherry Springs, and Sinnemahoning). Results from the State Park surveys are presented in a separate report.

This project builds on earlier surveys and will incrementally create a database that can be used to better understand State Forest and State Park visitors and provide a longitudinal database for tracking trends in State Forest and State Park use. For example, results can be used to compare participation patterns and visitor characteristics for different individual forests and parks. As the database grows, findings can be extrapolated to the entire state systems and will ultimately represent all State Forests and State Parks within the Commonwealth by the end of the five-year study.

Objectives

1. To conduct surveys of visitors to selected Pennsylvania State Forest and State Park areas and develop a visitor profile, including information on the origin of visitors (e.g. local, non-local resident, out of state), trip context and purpose (e.g. day versus overnight visitor, primary purpose versus casual visitor), length of stay in the area, spending patterns, size and type of visiting groups, previous visitation history, activities pursued, and different patterns of visitation across seasons.

2. To measure overall recreation use and specific visitation patterns within the selected State Forests and State Parks, including the number of visitors per vehicle and the distribution of use across different types of sites within the area.

3. To develop a demographic profile of visitors at the designated State Forests/Parks.

4. To identify visitor expectations and levels of satisfaction with various aspects of their visit.

5. To examine visitor opinions about possible future State Forest and State Park management and facility development decisions.

6. To examine visitor reactions to oil and gas activities and the impacts of these activities on recreational visitation patterns and experiences.

7. To measure visitor expenditures and levels of economic impact on surrounding communities.

Methodology

Data were collected through the use of on-site interviews and use measurements at a stratified random sample of the forests' developed sites and dispersed areas open for recreation. The overall survey methodology and sampling design is directly comparable to and consistent with the procedures established for the U.S. Forest Service's National Visitor Use Monitoring (NVUM) program. Details for the sampling and analysis approach for that program can be found in a report by English et al. (2001), available on the USDA Forest Service website for the National Visitor Use Monitoring Program.[1] A detailed sampling schedule, which identified the site, day, and time of day for on-site interviewing, was established for each forest in consultation with Bureau of Forestry personnel. Prior to the survey, meetings were held with the district forester and key staff in each forest to identify the range of sampling locations for each forest. The potential survey sites were visited by project personnel to confirm their suitability for the study and identify an optimal protocol and design of the sampling station for each site. A sample site inventory was created, with input from each forest's staff, to categorize the use levels for all designated sites and days of the year. From this matrix, a detailed random sampling calendar was developed by Dr. Donald English, manager of the NVUM program for the USDA Forest Service. The sampling schedule provided for a total of 200 sampling days per forest, allocated over various sampling strata per forest, and distributed throughout the calendar year.

Sampling for the survey was designed to obtain a database that accurately describes overall use of the forests, as well as use of selected types of sites and individual areas of particular interest within the State Forests. All on-site interviewing, data entry, and analysis were conducted by trained project staff. Concurrent with the visitor survey, area use patterns

[1] English, D. B. K., Kocis, S. M., Zarnoch, S. J., & Arnold,. J. R. 2001. Forest Service National Visitor Use Monitoring Process: Research Method Documentation. http://www.fs.fed.us/recreation/programs/nvum

were measured through traffic counters and observations of vehicles using the area. Both the visitor count data and visitor survey data will later be used to validate and calibrate visitor use monitoring methods for future application in the State Forests.

On-site face-to-face interviews were used to obtain data from a sample of recreationists visiting the Sproul and Susquehannock State Forests. The on-site survey took approximately 5-15 minutes to complete, depending on the version of the instrument that was used in the interview. Approximately one-third of the visitors were interviewed with the basic version/experience addition, another third received the basic/satisfaction addition and the remaining third completed the basic/economics addition.

All of the sampling for this study followed a detailed sampling calendar and took place between 8:00 am and 8:00 pm, during a morning shift or an afternoon shift. The morning sampling period ran from 8:00 am to 2:00 pm, while the afternoon sampling period ran from 2:00 pm to 8:00 pm. These times were adjusted to fall within daylight hours during different seasons of the year.

Organization of this Report

This report summarizes the results of visitor surveys conducted on the State Forests during the period October 1, 2011 through September 30, 2012. The results are organized by topic area, with different sections corresponding to different versions of the survey. Each section follows a consistent format, with the results reported separately for each forest. Appendices to the report include responses to open-ended questions in the survey, a zip code analysis of the geographic origins of forest visitors, and a copy of the survey instrument used.

Recreation Use Estimates

Following the National Visitor Use Monitoring (NVUM) protocols, recreation use of the State Forests was estimated through a process of obtaining mechanical traffic counts, calibrated by observation and on-site interviewing, at the sample of recreation sites and days scheduled throughout the study year. Mechanical traffic counts were obtained for a 24-hour period on the targeted sample days. Interviewers were on site for a 6-hour period. During that time, they both visually calibrated the mechanical counter by observing and counting exiting traffic, and interviewed a random sample of exiting visitors. State Forest sampling sites included all potential places that recreation users could exit the forests, and were classified by types and use levels (Table 1). Most of the sampling days were conducted at general forest area (GFA) sites. Such sites provide access to the forest without concentrating use at the site itself, and include trailheads, river put-in and take-out points, forest roads, etc. Other sampling categories include day use developed sites (DUDS) such as picnic areas, scenic overlooks and the like, overnight use developed sites (OUDS) including camping areas, cabins, resorts, etc., and "special areas." The latter category includes designated "natural" and "wild" areas of the state forests, and is analogous to the designated Wilderness areas within the national forests.

In addition to these categories, field personnel spent six days in each Forest at "View Corridor" sites. The view corridor sites were located on the higher volume paved roads in each forest (Routes 120, 872, 44 and 144). The intent of sampling at those sites was to estimate the volume of scenic driving through the respective State Forests, above and beyond that occurring on the forest roads already included in the sampling of GFA sites. Since traffic on these state routes includes all types of vehicles (work and commuting vehicles, etc.) and cannot all be considered scenic driving in the State Forest, the total traffic counts were adjusted to estimate the number of vehicles that could be considered participating in sightseeing or scenic driving to any degree. As for the other types of sites, mechanical traffic counts were obtained after 6 hours and 24 hours. Simultaneously, traffic was observed and counted in hourly intervals and categorized as regular vehicles and commercial vehicles during the 6-hour field visit. The visual counts were used to validate the 6-hour mechanical traffic counts. No interviews were conducted at these sites due to safety concerns related to the higher speed and volume of traffic. The proportion of scenic driving was estimated using data from the National Visitor Use Monitoring study conducted in the Allegheny National Forest, and validated with the activity participation data collected in the current State Forest study.

Since most recreation use of the State Forests is dispersed rather than focused at developed day use or overnight use areas, GFA sites accounted for the greatest number of sampling days and completed interviews across both forests. Sampling of State Forest sites was also stratified by level of recreational use, including three use levels as estimated by Bureau of Forestry personnel (Table 1). More specifically, the sampling strata were defined by best available estimates of the daily volume of exiting recreation traffic at each site, and classified as Low, Medium, and High. These estimated levels were based on relative criteria for each type of site and based on the collective knowledge and experience of Bureau of Forestry personnel.

Table 1. Description of the Sampling Sites.

	Sproul		**Susquehannock**	
	Percent of Sampling Days*	**Percent of Interviews***	**Percent of Sampling Days***	**Percent of Interviews***
Site Type				
General Forest Area (GFA)	42.5	45.4	48.3	61.5
Day Use Developed Site (DUDS)	22.0	23.4	24.4	21.3
Overnight Use Developed Site (OUDS)	21.0	20.4	23.9	17.3
Special Area	11.5	10.7	0	0
View Corridor	3.0	0	3.3	0
Total	100.0	99.9	99.9	100.1
Use Level Stratum				
High	27.5	22.6	31.7	37.9
Medium	26.0	25.8	27.2	26.5
Low	46.5	51.5	41.1	35.6
Total	100.0	99.9	100.0	99.9

*Percentages may not equal 100 because of rounding.

Stratification was designed to reduce the overall variance of the visitation estimate, and to ensure an adequate representation of varying levels of recreation throughout the study year. About one-third of the sampling days and corresponding interviews were completed during high, medium, and low use periods. Survey results were weighted to the population of days in each stratum to correctly represent the use distribution across the various types of sites within the State Forests.

Pneumatic traffic counters were used to measure vehicular use at suitable locations such as forest roads and parking lots. Field personnel recorded counts at the end of each 6-hour sampling period and again after 24 hours had elapsed. Comparing the mechanical and observational counts at the end of the 6-hour period provides a calibration that can be used with the 24-hour mechanical counts to obtain an estimate of total daily exiting traffic. Survey

screening questions were used to determine the proportion of exiting traffic that was completing a recreation visit, as well as the proportion of recreational visitors compared to other users of forest sites. Non-recreational forest users included those who were working or commuting to work, just passing through, or there for some other reason. Additional survey questions were used to convert vehicle counts to visitor estimates, based on the number of people per vehicle.

The 6-hour mechanical traffic counts ranged from 0 to 864, with a mean of 21.4 vehicles counted on the Sproul and 25.1 vehicles on the Susquehannock (Table 2). About 10% of these counts were zero, reflecting no traffic during the 6-hour sampling period. The 24-hour counts ranged from 0 to 1325, with a mean of 62.4 on the Sproul and 53.6 on the Susquehannock. The hand tally counts for the 6-hour sampling periods averaged 7.7 and 5.7 on the Sproul and Susquehannock State Forests, respectively. These counts were naturally lower than the corresponding mechanical counts because the observational counts included only one-way (exiting) traffic while the mechanical counters recorded traffic moving in both directions. The 6-hour counts obtained via the hand tally clickers and mechanical traffic counters showed a high degree of correlation (.90 on the Sproul and .93 on the Susquehannock), lending additional validity to the estimates of visitor use levels.

Results from the traffic counts and completed surveys were used to estimate total recreational use of the State Forests. Data were extrapolated from the sampled site-day combinations to all site-days within each stratum and totaled for the entire forest. The results include two measures of recreational use per forest: 1) the total number of individual site visits, and 2) the total number of recreational forest visits. Since many visits to the Sproul and Susquehannock Forests tend to include visits to more than one different site during each visit, the total site visits are considerably higher than the number of forest visits.

Table 2. Summary of Mechanical and Observational Counts at Sampling Sites

	Sproul	Susquehannock
Pneumatic Traffic Counter		
6-hour Traffic Counts (Percent)		
0	10.2	13.1
1 - 2	9.6	14.9
3 - 5	12.8	14.3
6 - 9	19.3	12.6
10 - 30	32.1	33.1
31 or more	16.0	12.0
Total	11.0	100.0
Mean	25.1	21.4
24-hour Traffic Counts (Percent)		
0	1.3	2.6
1 - 5	6.3	13.6
6 - 10	6.4	9.1
11 - 25	25.5	29.2
26 - 40	19.7	11.7
41 - 60	14.0	13.0
61 or more	26.8	20.8
Total	100.0	100.0
Mean	62.4	53.6
6-hour Hand Clicker Counts (Percent)		
0	14.9	18.4
1 – 2	24.7	20.7
3 – 5	19.6	25.3
6 – 10	21.1	20.1
11 or more	19.6	15.5
Total	99.9	100.0
Mean	7.7	5.7

*Percentages may not equal 100 because of rounding.

A State Forest recreation visit is defined as “one person entering and exiting a State Forest for the purpose of recreation” (English et al., 2001). A single visitor may participate in any number of activities and visit any number of sites within a single visit. Also, a single visit can last multiple days or might be one person or group visiting a single site on a day trip for any amount of time. Site and forest recreation visits were estimated using the following process and data shown in Table 3. First, 24-hour traffic counts were used to measure the number of vehicles leaving the forest on any given day (Table 3, column 1). The vehicle counts within each stratum were multiplied by the percentage of exiting traffic whose purpose for visiting the forest was for recreation (column 2). To avoid double counting visitors who may be traveling to and from a site within the day, the next step was to multiply the number of vehicles on recreation trips by

the percentage of visitors reporting they were leaving the site for the last time that day (column 3). To convert the units from vehicles to people, the next step was to multiply by the average number of people per vehicle for each site-use stratum (column 4), resulting in an estimate of total daily recreation visits for each site-use category (column 5). One additional variable was used to estimate the number of State Forest visits for each strata: the number of sites visited within the forest during the current visit (column 6).

To convert daily recreation use measures to total forest use for the entire calendar year, the average daily use estimates were extrapolated to the population of site days (or total number of days at all sites for each site type and use level) in the year. The results shown in column 7 of Table 3 represent the total yearly recreation site visits for all sites in each site type-level category. Finally, the number of site recreation visits was adjusted by the number of sites visited by each respondent, resulting in the estimated number of forest visits (column 8).

The Sproul State Forest received an estimated 173,173 recreational visits during the study year (October 1, 2011 – September 30, 2012). These forest visits included a total of 255,601 individual site visits, or about 1.5 site visits for each State Forest visit. The Susquehannock State Forest received an estimated 64,744 recreational visits and 101,637 individual forest site visits during the same period (about 1.6 site visits per forest visit). The lower estimates of recreation use on the Susquehannock are based mainly on the smaller number of sites located on that forest. For example, there were no “Special Areas” (designated Wild or Natural Areas) included in the Susquehannock State Forest sampling (eliminating one category of recreation use) and there are fewer day use developed sites in the Susquehannock State Forest compared to the areas available in the Sproul State Forest.

In addition to these recreation visits to the State Forests, the number of scenic driving visits was also estimated via the sampling procedure described above for the “View Corridor” locations. From the observational counts conducted, the number of vehicles per day ranged from 392 to 879 total vehicles, and the proportion of non-commercial traffic ranged from 81% to 84% for the different highways in these Forests. From these traffic counts and data from the visitor surveys on activity participation and number of people per vehicle, the total number of “viewing” or “sightseeing” visits was estimated to be 654,951 visits for the Sproul State Forest and 653,711 visits for the Susquehannock State Forest.

Table 3. Recreation Use Estimates for the Sproul and Susquehannock State Forests

Sproul State Forest								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Site Type and Use Strata	**1-way Traffic Count**	**% Recreation Visits**	**% Leaving for Last Time**	**People per Vehicle**	**Recreation Visits per day**	**Number of Sites Visited**	**Total Site Visits**	**Total Forest Visits**
GFA–High	19.98	0.60	0.59	2.48	17.57	1.43	33,015	23,010
GFA-Medium	16.91	0.30	0.69	2.30	8.03	1.76	17,094	9,726
GFA–Low	25.60	0.17	0.60	2.00	5.30	1.45	83,497	57,489
DUDS–High	23.50	0.43	0.81	2.85	23.63	1.73	6,050	3,502
DUDS-Medium	37.09	0.40	0.84	2.45	30.34	1.36	18,995	13,930
DUDS–Low	11.79	0.56	0.61	2.15	8.64	1.29	30,330	23,590
OUDS–High	28.25	0.45	0.54	2.46	16.87	1.27	726	572
OUDS-Medium	20.78	0.26	0.85	2.00	9.14	1.23	1,106	898
OUDS–Low	19.70	0.44	0.58	2.22	11.22	1.47	6,372	4,328
Special–Low*	31.74	0.48	0.89	1.96	26.60	1.62	58,418	36,127
Forest Total							255,601	173,173
Susquehannock State Forest								
GFA–High	31.98	0.49	0.43	2.33	15.84	1.65	9,297	5,630
GFA-Medium	15.80	0.39	0.42	2.06	5.42	1.59	3,683	2,311
GFA–Low	13.62	0.45	0.70	2.00	8.61	1.61	64,733	40,280
DUDS–High	5.50	0.68	0.67	2.29	5.69	1.36	938	691
DUDS-Medium	24.75	0.55	0.80	2.32	25.26	1.23	10,940	8,888
DUDS–Low	12.47	0.40	0.41	2.13	4.31	1.62	3,733	2,308
OUDS–High	13.47	0.60	0.93	2.84	21.55	1.20	1,034	862
OUDS-Medium	11.05	0.63	0.71	3.41	16.75	1.50	1,809	1,206
OUDS–Low	15.44	0.50	0.60	2.05	9.50	2.11	5,469	2,598
Forest Total							101,637	64,774

*All special areas in the Sproul were considered low use areas; thus there are no measures for medium and high use special areas. No special areas were included in the Susquehannock State Forest as this forest contains only one informal area (Hammersley Wild Area).

Survey Results

Overall, the survey sampled a total of 1,595 State Forest visitors. Among these, 1,395 people were willing to participate in the interview, resulting in a response rate of 85%. Of the unwilling visitors, 61 (3.8%) were people who had already completed the survey and were thus screened out. Thus the overall response rate reflecting those willing to complete the survey was 89%.

One of the initial screening questions in the survey asked the visitors, "What is the primary purpose of your visit to this site?" Responses included: recreation, working or commuting to work, just stopping to use the bathroom, just passing through/going somewhere else, and some other reason. Among these forest visitors, about half (48.9%) stated they were visiting the forest for recreation. Only these respondents who were visiting the forest for recreation were included in the descriptions of visitors in this report. Most of the remaining individuals in the sample were working or commuting to work (37.9%), just passing through (6.0%), stopping to use the bathroom (2.3%) or there for some other reason (< 2%). Other reasons mentioned by respondents included cabin maintenance, cutting or purchasing wood, just turning around or making a wrong turn, scouting for hunting, and working with special events such as a road rally.

Trip Visitation Patterns on the State Forests

- Most of the visitors contacted (85% in the Sproul and 93% in the Susquehannock) were repeat visitors to the State Forest.
- Among those who were repeat visitors, about half had made their first visits to the Forests prior to 1980. Another one-quarter made their first visit during the 1980s or 1990s. The remaining one-quarter were relatively new visitors, reporting their first visit between 2000 and 2012.
- About half of the visitors contacted in each Forest indicated that they typically make between 0 and 5 visits to the State Forest per year. The average number of reported trips to the forest per year was about 31 for the Sproul and 15 for the Susquehannock.
- Likewise, nearly half of the visitors contacted indicated that they typically make between 0 and 5 visits to other forest areas each year (these could include other state forests or any other public or private forests the respondent visited). The average number of trips to other forests areas per year was about 21 and 23, respectively for the Sproul and Susquehannock State Forests.
- The majority of Sproul visitors (60%) were day users, while the majority of Susquehannock visitors (63%) were overnight users who had spent the previous night in the State Forest.
- Of those respondents who were overnight visitors, the average length of stay was 3.4 nights in the Sproul and 4.5 nights in the Susquehannock.
- About two-thirds of visitors in both forests indicated that they used no day use facilities during their visit, while the remaining visitors used one or more day use facilities on this trip.
- About three-fourths of the respondents (72% in the Sproul and 74% in the Susquehannock) had just one or two people in their vehicle on this trip. The average number of persons per vehicle in both forests was 2.3.
- Less than one-fourth (21-24%) of the respondents in both forests reported that they had at least one child under the age of 16 with them.
- About one-third of the visitors contacted came to the Forest in family groups, with smaller proportions coming in groups of friends (22-24%) and groups containing family and friends (21-25%).
- Less than one-fifth (16-18%) of the visitors came to the Forest alone.

Table 4. Trip Visitation Patterns in the State Forests

	Valid Percent*	
	Sproul	**Susquehannock**
Previous Visitation History		
First Time Visitor	15.0	6.7
Repeat Visitor	85.0	93.3
Total	100.0	100.0
Year of First Visit		
Prior to 1980	50.6	52.6
1980-1989	15.3	9.3
1990-1999	12.9	12.3
2000-2012	21.2	25.8
Total	100.0	100.0
Number of Visits to This State Forest in Typical Year		
0-5	50.9	51.6
6-10	11.7	19.3
11-20	12.5	13.2
21-50	12.5	12.5
More than 50	13.5	3.4
Total	100.1	100.0
Mean	30.8	15.1
Number of Visits to Other Forests in Typical Year		
0-5	45.2	43.8
6-10	20.3	23.6
11-20	13.1	11.3
21-50	14.3	12.3
More than 50	7.1	9.0
Total	100.0	100.0
Mean	21.1	23.1
Length of Stay		
Overnight Visitor	39.8	62.8
Day User	60.2	37.2
Total	100.0	100.0
Number of Nights Spent (Overnight Visitors)		
1	19.6	11.5
2	33.0	26.4
3-5	39.1	41.2
6 or more	8.3	20.9
Total	100.0	100.0
Mean	3.4	4.5
Number of Day Use Facilities Used During This Trip		
0	65.5	69.4
1	22.8	21.6
2	11.7	9.0
Total	100.0	100.0

Number of People in Vehicle		
1-2	72.1	74.4
3-4	19.9	18.2
5 or more	7.9	7.4
Total	100.0	100.0
Mean	2.3	2.3
Number of People Less than 16 Years Old in Vehicle		
0	82.4	82.2
1	8.8	10.3
2	3.5	5.0
3 or more	5.3	2.5
Total	100.0	100.0
Type of Group		
alone	17.8	16.2
family	38.6	32.4
friends	21.8	23.8
family and friends	20.8	24.8
other	1.0	2.9
Total	100.0	100.1

*Percentages may not equal 100 because of rounding.

Demographic Characteristics of State Forest Visitors

- Over four-fifths (86-87%) of the respondents in both State Forests were males.
- Almost one-third of the visitors surveyed in the State Forests were between the ages of 36-50, while another one-third were between 51 and 64.
- The average age of visitors was 50 in the Sproul and 52 in the Susquehannock State Forest.
- Almost all of the State Forest visitors surveyed reported their race/ethnicity as White/Caucasian.
- Other ethnicities reported by visitors included Asian, African-American, and American Indian/Alaskan Native.
- More than one-tenth of the visiting groups (14% in each Forest) included a person with a disability in their household.

Table 5. Demographic Characteristics of State Forest Visitors

	Valid Percent	
	Sproul	**Susquehannock**
Gender		
Male	87.0	86.3
Female	13.0	13.7
Total	100.0	100.0
Age		
18 to 35	17.0	14.0
36 to 50	31.1	29.8
51 to 64	32.8	37.2
65 or older	19.1	19.0
Total	100.0	100.0
Mean	50.3	52.2
Ethnicity		
Caucasian	98.0	99.1
Other	2.0	0.9
Total	100.0	100.0
Income		
Under $25,000	13.7	9.1
$25,000-$49,999	25.9	23.6
$50,000-$74,999	29.5	30.4
$75,000-$99,999	16.9	16.7
$100,000-$149,999	7.6	14.1
$150,000 or over	6.5	6.2
Total	100.1	100.1
Does anyone in your household have a disability?		
Yes	13.7	14.4
No	86.3	85.6
Total	100.0	100.0

Activity Participation

The basic survey administered to all visitors included a detailed list of recreational activities. Respondents were asked to identify each activity that they had participated in (or planned to participate in) during their visit, as well as their primary activity on this trip (Table 6). The first column for each forest (activity participation) shows the range in numbers of visitors participating in the various activities, while the primary activity column reflects what the visitors considered their most important purpose for visiting the forest on this trip.

Table 6. Activity Participation of State Forest Visitors (during this recreation visit)

	Sproul		Susquehannock	
Consumptive Activities	**Activity Participation***	**Primary Activity+**	**Activity Participation***	**Primary Activity+**
Fishing—all types	18.6	15.9	15.6	4.5
Hunting—all types	22.7	17.7	35.6	29.9
Viewing, Learning about Nature & Culture				
Viewing natural features such as scenery, wildlife, birds, flowers, fish, etc.	60.5	11.6	54.7	7.1
Visiting historic and prehistoric sites/areas	9.0	0.6	8.1	0
Nature study	7.8	0	6.3	0.3
Visiting a nature center, nature trail, or visitor center	5.2	0.3	6.9	0
Nonmotorized Activities				
Hiking or walking	38.4	4.6	42.8	3.6
Horseback riding	0.6	0.3	3.8	2.9
Bicycling, including mountain bikes	2.3	0.3	3.8	1.0
Nonmotorized water travel (canoeing, sailing, kayaking, rafting, etc.)	2.0	0.6	1.9	0
Downhill skiing or snowboarding	0.3	0	0	0
Cross-country skiing, snowshoeing	0.3	0	2.2	1.3
Other nonmotorized activities (e.g. swimming, games & sports)	2.9	0.9	1.3	0
Motorized Activities				
Driving for pleasure on roads	48.1	16.8	40.0	9.4
Riding in designated off-road vehicle areas (non-snow)	11.3	8.3	20.3	17.5
Snowmobile travel	0.3	0.3	1.6	0.6
Motorized water travel (boats, etc.)	0	0	0	0
Other motorized activities (endure events, games, etc.)	1.2	0.3	1.9	1.3
Camping or Other Overnight				
Camping in developed sites (family or group sites)	10.4	2.8	9.7	2.3
Primitive camping (motorized)	1.4	0.3	0.6	0
Backpacking or camping in unroaded areas	2.9	1.5	1.9	1.6
Resorts, cabins, or other accommodations on State managed lands	9.3	2.4	15.6	4.5
Other Activities				
Gathering mushrooms, berries, firewood, or other natural products	5.8	0.9	9.1	1.0
Relaxing, hanging out, escaping heat, noise, etc.	37.4	4.6	38.8	4.9
Picnicking and family gatherings in developed sites (family or group sites)	7.8	2.1	11.3	1.6
Other	9.3	6.7	7.8	4.5

*Percentages do not equal 100% because respondents could report more than one activity.
+Percentages may not equal 100% because of rounding.

- Many forest visits included various viewing and sightseeing activities, but relatively few people reported such activities as their primary recreation activity on the State Forests.
    - About 12% of Sproul State Forest visitors reported viewing natural features, such as scenery, as their primary activity, while about 17% chose driving for pleasure as their primary activity.
    - These activities were a little less common on the Susquehannock State Forest, with about 7% of those visitors reporting viewing natural features, such as scenery, as their primary activity and about 9% choosing driving for pleasure as their primary activity.
- About one-third of the State Forest visitors sampled reported consumptive activities (fishing and hunting) as their primary activity at the Forest.
    - Fishing was more common as a primary activity on the Sproul (16%) than on the Susquehannock State Forest (5%).
    - Hunting was more common as a primary activity on the Susquehannock (30%) than on the Sproul (18%).
- Many of the sampled visitors did some hiking or walking during their visit (38-43%), but relatively few reported hiking or walking as their primary activity.
- Less than one-tenth of forest visitors surveyed reported some type of camping as their primary activity.
- About one-quarter of the respondents in both forests reported motorized pursuits as their primary activity.
    - Driving for pleasure was a more common primary activity on the Sproul (17%) than on the Susquehannock State Forest (9%).
    - ATV riding in designated areas was more common as a primary activity on the Susquehannock (18%) than on the Sproul (8%).

Satisfaction Addition

This section of the survey asked forest users about the importance they attached to, and their satisfaction with, thirteen customer service attributes in the State Forest they visited. Respondents were provided with the opportunity to choose "not applicable" for any attributes that they did not experience during their visit. Additional satisfaction-related questions were also asked in the basic survey administered to all visitors and in the experience addition. Responses to those questions are also included in this section.

Satisfaction Ratings

- The State Forests were generally rated highly on each of the thirteen satisfaction attributes, with over 50% of the scores in the "very good" or "good" categories.
- State Forest visitors were most satisfied with the feeling of safety and the scenery and attractiveness of the forest landscape (>90% good/very good).
- The only attributes receiving "poor" or "fair" ratings by more than 10% of visitors were the availability of information on recreation (11% poor or fair in the Sproul) and the adequacy of signage (10% poor/fair in the Sproul and 13% in the Susquehannock).
- The items that received the most not applicable (N/A) responses included helpfulness of employees and cleanliness of restrooms (over 50% N/A). Generally these responses reflect the fact that the visitors did not encounter staff or latrines during their visits.

Table 7. Satisfaction Ratings for Customer Service Attributes in the State Forests (Percent)

Sproul State Forest	Poor	Fair	Average	Good	Very Good	Not Applicable	Mean[a]
Feeling of safety	.9	3.4	1.7	30.8	63.2	.9	4.55
Scenery	0	0	6.8	34.2	59.0	0	4.52
Attractiveness of the forest landscape	.9	1.7	7.7	24.8	65.0	0	4.51
Helpfulness of employees	1.7	0	2.6	13.7	24.5	57.3	4.40
Condition of the natural environment	2.6	2.6	6.0	32.5	53.8	2.6	4.36
Condition of developed recreation facilities	0	1.7	8.5	23.9	29.9	35.9	4.28
Availability of parking	1.7	1.7	13.7	29.1	48.7	5.1	4.28
Parking lot condition	1.7	.9	8.5	35.9	34.2	18.8	4.23
Adequacy of signage	4.3	6.0	15.4	29.1	41.9	3.4	4.02
Condition of Forest trails	1.7	2.6	12.8	31.6	14.5	36.8	3.86
Condition of Forest roads	2.6	6.8	21.4	35.9	27.4	6.0	3.84
Cleanliness of restrooms	2.6	3.4	4.3	12.0	12.8	65.0	3.83
Availability of information on recreation	6.0	5.1	12.8	23.9	28.2	23.9	3.83

Susquehannock State Forest	Poor	Fair	Average	Good	Very Good	Not Applicable	Mean[a]
Scenery	0.9	0	5.7	17.0	75.0	0.9	4.68
Attractiveness of the forest landscape	0	0	6.6	21.7	69.8	1.9	4.64
Feeling of safety	0.9	0.9	6.6	20.8	68.9	1.9	4.59
Condition of developed recreation facilities	0	0.9	2.8	18.9	34.0	43.4	4.52
Helpfulness of employees	0.9	0.9	3.8	9.4	31.1	53.8	4.49
Cleanliness of restrooms	1.0	0	2.9	11.4	22.9	61.9	4.45
Condition of the natural environment	0.9	1.9	6.6	31.1	55.7	3.8	4.44
Availability of parking	0	1.9	12.3	22.6	50.9	12.3	4.40
Parking lot condition	0	1.9	13.2	21.7	34.9	28.3	4.25
Availability of information on recreation	1.9	2.8	11.3	27.4	34.0	22.6	4.15
Condition of Forest roads	2.8	1.9	17.9	33.0	40.6	3.8	4.11
Condition of Forest trails	2.8	2.8	14.2	29.2	26.4	24.5	3.98
Adequacy of signage	4.7	8.5	17.0	24.5	40.6	4.7	3.92

[a]Response Code: 1 = "Poor" through 5 = "Very good"

Importance Ratings

- Importance ratings for the customer service attributes generally followed the same pattern as the satisfaction ratings across the attributes.
- The condition of the natural environment (mean = 4.7 in both Forests), attractiveness of the forest landscape (mean = 4.7 in both Forests) and scenery (mean = 4.5 in both Forests) were the most important attributes to the State Forest visitors.
- The least important items included parking lot condition and availability (mean = 3.6-3.7 in both Forests).

Table 8. Importance Ratings for Customer Service Attributes in the State Forests (Percent)

Sproul State Forest	**1**	**2**	**3**	**4**	**5**	**Mean[a]**
Attractiveness of the forest landscape	1.0	0	3.9	22.3	72.8	4.66
Condition of the natural environment	1.0	0	2.0	26.0	71.0	4.66
Scenery	1.0	0	13.3	21.9	63.8	4.48
Feeling of safety	5.0	0	14.9	26.7	53.5	4.24
Condition of Forest roads	1.0	4.0	14.0	37.0	44.0	4.19
Adequacy of signage	4.1	1.0	18.6	24.7	51.1	4.19
Condition of Forest trails	3.8	2.6	17.9	26.9	48.7	4.14
Helpfulness of employees	7.1	1.4	12.9	30.0	48.6	4.11
Availability of information on recreation	6.7	2.2	14.6	29.2	47.2	4.08
Cleanliness of restrooms	10.6	1.5	12.1	33.3	42.4	3.95
Condition of developed recreation facilities	6.4	5.1	20.5	29.5	38.5	3.88
Availability of parking	8.9	2.0	29.7	25.7	33.7	3.73
Parking lot condition	8.8	4.4	29.7	31.9	25.3	3.60

Susquehannock State Forest	**1**	**2**	**3**	**4**	**5**	**Mean[a]**
Condition of the natural environment	0	1.0	3.0	17.0	79.0	4.74
Attractiveness of the forest landscape	0	3.0	4.0	11.9	81.2	4.71
Scenery	1.0	2.9	5.9	20.6	69.6	4.55
Feeling of safety	4.0	2.0	8.9	14.9	70.3	4.46
Condition of Forest roads	1.0	3.1	11.5	29.2	55.2	4.34
Adequacy of signage	5.2	1.0	11.3	24.7	57.7	4.29
Condition of developed recreation facilities	7.8	1.3	10.4	20.8	59.7	4.23
Condition of Forest trails	5.4	3.3	8.7	32.6	50.0	4.18
Helpfulness of employees	8.0	5.3	8.0	24.0	54.7	4.12
Availability of information on recreation	8.6	5.4	15.1	18.3	52.7	4.01
Cleanliness of restrooms	16.7	1.5	9.1	21.2	51.5	3.89
Availability of parking	12.8	5.3	19.1	22.3	40.4	3.72
Parking lot condition	13.8	7.5	17.5	20.0	41.3	3.68

[a]Response Code: 1 = Least Important through 5 = Most Important

Other Visitor Satisfaction Ratings

- Respondents for the Experience Addition were asked some additional questions about how they would rate the quality of various aspects of the State Forest.
- Most respondents indicated very favorable ratings (mean of 4.0 or above) for all of the items rated.

Table 9. Visitor Satisfaction Ratings for Various Forest Attributes (Percent)

	Awful	Fair	Good	Very Good	Excellent	N/A	Mean[a]
Sproul State Forest							
Safety and security	0	5.0	10.9	23.8	55.4	5.0	4.4
Natural environment	3.0	5.0	10.9	22.8	57.4	1.0	4.3
Condition of latrines, picnic pavilions & other facilities	2.0	5.9	5.0	17.8	24.8	44.6	4.0
Responsiveness of staff	4.0	2.0	5.1	10.1	21.2	57.6	4.0
Sanitation and cleanliness	2.0	11.0	12.0	27.0	43.0	5.0	4.0
Susquehannock State Forest							
Natural environment	1.0	1.9	3.8	21.9	69.5	1.9	4.6
Sanitation and cleanliness	0	2.9	14.3	23.8	52.4	6.7	4.4
Safety and security	0	3.8	10.5	25.7	55.2	4.8	4.4
Responsiveness of staff	1.0	1.0	6.7	16.2	36.2	39.0	4.4
Condition of latrines, picnic pavilions & other facilities	0	3.8	9.5	25.7	26.7	34.3	4.1

[a] Response scale = 1 (awful) to 5 (excellent)

Overall Satisfaction

- Overall satisfaction scores tended to be high, with over two-thirds of the respondents in both Forests reporting that they were “very satisfied” with their visit to the State Forest.

Table 10. Overall Satisfaction of State Forest Visitors

	Valid Percent	
	Sproul	**Susquehannock**
Very Dissatisfied	3.8	2.5
Somewhat Dissatisfied	4.4	2.2
Neither Dissatisfied nor Satisfied	6.1	4.7
Somewhat Satisfied	19.3	17.5
Very Satisfied	66.4	73.1
Total	100.0	100.0
Mean[a]	4.4	4.6

[a] Response code: 1 = “very dissatisfied” to 5 = “very satisfied”

Crowding Ratings

- Crowding scores tended to be relatively low, with over 60% of the respondents choosing 1 or 2, reflecting that they encountered "hardly anyone" during their visit.
- About one-fifth of the respondents in each Forest chose a 3 or 4, indicating that they felt slightly crowded during this trip.
- Very few respondents indicated conditions near the "overcrowded" end of the scale.
- The average crowding score on the 10-point crowding scale was 2.7 among both Sproul and Susquehannock Forest visitors.

Table 11. Summary of Perceived Crowding Ratings (Valid Percent).

Perception of Crowding[a]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Sproul	40.4	21.1	14.9	3.5	10.5	3.5	0.9	2.6	1.8	0.9
Susquehannock	32.7	28.8	11.5	10.6	8.7	2.9	1.9	1.9	0	1.0

[a] Response code: 1 = "hardly anyone" to 10 = "overcrowded"

Economics Addition

About one-third of the survey respondents were asked about their monetary expenditures during their trip to the State Forest. Additional questions in the "economics addition" focused on the respondents' trip itinerary (Table 12). These questions were asked to establish a context for evaluation of the reported trip expenditures.

- When asked what they would have done if, for some reason, they had been unable to go to the State Forest on this visit, the most common response (40% in the Sproul and 46% in the Susquehannock) was that they would have gone somewhere else to pursue the same activity.
- About one-third of the visitors in each forest said they would have stayed home.
- About one-tenth of the visitors reported they would have come back another time.
- Very few of the visitors would have gone elsewhere for a different activity.
- Overnight visitors were mostly on trips of 3-5 days (53% in both forests).
- Day visitors were more evenly divided in being away from their home for 1-2 hours (9-19%), 3-5 hours (36-41%), and more than 5 hours (40-55%).
- About four-fifths of the respondents surveyed (78% in the Sproul and 86% in the Susquehannock) were visiting only the State Forest on this particular trip.
- Nearly all of the visitors who reported multiple destinations for their trip indicated that the State Forest was their primary destination.
- When queried about how many people their reported expenditures were covering, the most typical response (42% for Sproul and 33% for Susquehannock) was just one person (themself).
- Almost one-third of the visitors (29% in the Sproul and 31% in the Susquehannock) reported expenditures covering 2 group members. The remaining visitors (30% in the Sproul and 36% in the Susquehannock) were paying expenses for 3 or more people.
- Besides the detailed spending questions about various spending categories, visitors were asked to estimate how much money everyone in their vehicle spent on the entire trip, from the time they left home until they return home. Sproul State Forest visitors reported spending considerably less on average ($81.09 per group) than Susquehannock State Forest visitors ($209.31). These total trip spending estimates are close to the sum of the individual category spending reported in the following section.

Table 12. State Forest Recreation Trip Profile (for economics section)

	Valid Percent	
	Sproul	**Susquehannock**
What Visitor Would have done if Unable to Visit SF		
Gone elsewhere for same activity	46.3	40.4
Gone elsewhere for different activity	6.5	5.5
Come back another time	8.9	10.1
Stayed home	32.5	32.1
Gone to work at your regular job	3.3	10.1
None of these	2.4	1.8
Total	99.9	100.0
Time Away from Home (Days)		
1-2	30.3	21.2
3-5	53.1	53.0
6 or more	16.7	25.9
Total	100.1	99.0
Time Away from Home (Hours)		
1-2	19.0	9.1
3-5	41.2	36.3
6 or more	39.7	54.5
Total	99.9	99.9
Single or Multiple Destination Trip		
Visited State Forest only	77.7	86.1
Visited other places	22.3	13.9
Total	100.0	100.0
Was State Forest Primary Destination for Trip		
Yes	79.0	90.7
No	21.0	9.3
Total	100.0	100.0
Number of People Covered by Expenses		
1	41.7	33.3
2	28.6	31.2
3	15.5	11.8
4 or more	14.3	23.7
Total	100.1	100.0
Estimated Total Trip Expenses for Group		
$25 or less	23.8	7.5
$26-$50	22.6	7.6
$51-$100	21.5	22.5
$101-$200	17.8	31.2
More than $200	14.3	31.2
Total	100.0	100.0
Mean	$81.09	$209.31

Visitor Expenditures

In the economics addition, visitors were asked how much they spent on this trip for ten categories of expenditures within 50 miles of the site visited (Table 13). The results shown below provide the proportion of visitors reporting spending any money on their trip within 50 miles of the forest, the percentage reporting expenditures in each category, and the average amount spent in each category.

- Most of the respondents (70% in the Sproul and 85% in the Susquehannock) indicated that they did spend some money within 50 miles of the forest on their current trip.
- Many respondents, however, indicated that they spent no money on many of the specific expenditure categories listed on the survey.
- Few visitors in either Forest reported any spending for "local transportation" and outdoor recreation and outfitter-related expenses (including guide fees and equipment rental).

Table 13. Summary of Trip Spending Patterns of State Forest Visitors

	Sproul	**Susquehannock**
Proportion of visitors spending any money within 50 miles of this state forest	70.0%	85.1%
Economic Expenditure Items	**Proportion of Visitors Spending Something in Each Category (percent)**	
Motel, Lodge, Cabin, B&B, etc.	8.3	15.6
Camping Fees	1.7	1.8
Restaurants & Bars	35.0	53.2
Groceries	26.7	49.5
Gasoline and oil	52.5	64.2
Local Transportation (bus, shuttles, etc.)	0	0
Outfitter Related Expenses (guide fees & equipment rentals)	6.8	0
Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.)	0	0.9
Sporting Goods	5.8	10.1
Souvenirs, Clothing, Other Misc.	4.2	11.9

- Susquehannock Forest visitors were more likely than their counterparts in the Sproul to report expenses in several categories, including restaurants and bars, groceries, and accommodations.
- The majority of visitors in both Forests (53% in the Sproul and 64% in the Susquehannock) reported buying gas or oil during their trip.

Table 14. Amount Spent by State Forest Visitors for Various Categories of Trip Expenditures

Economic Expenditure Items	Sproul		Susquehannock	
	Average Amount Spent - Among Visitors Spending Something in Each Category	**Average Amount Spent – All Visitors**	**Average Amount Spent - Among Visitors Spending Something in Each Category**	**Average Amount Spent – All Visitors**
Motel, Lodge, Cabin, B&B, etc.	$106.50	$8.88	$272.35	$42.48
Camping Fees	$71.50	$1.19	$49.50	$0.91
Restaurants & Bars	$54.38	$19.03	$80.91	$41.86
Groceries	$47.13	$12.57	$84.28	$41.06
Gasoline and oil	$49.94	$26.22	$106.27	$67.46
Local Transportation (bus, shuttles, etc.)	0	0	0	0
Outfitter Related Expenses (guide fees & equipment rentals)	$250.00	$2.08	0	0
Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.)	0	0	$20.00	0.18
Sporting Goods	$154.29	$9.00	$98.55	$8.75
Souvenirs, Clothing, Other Misc.	$37.00	$1.54	$46.69	$4.10
Total	NA	$80.51	NA	$206.81

- The first column for each Forest in Table 14 shows the average amount spent among only those visitors reporting spending something in each category. These numbers cannot be totaled because they are based on a vary number of individuals making the various types of purchases.
- The second column for each Forest in Table 14 shows the average amount spent among all visitors in the survey. These averages include those spending nothing in various categories, and therefore can be totaled to indicate the average total amount spent for all categories.

- For example, camping fees were paid by only about 2% of the visitors in each Forest, but the average amounts spent for these fees were $71.50 and $49.50 for Sproul and Susquehannock Forest visitors, respectively.
- In general Susquehannock State Forest visitors spent considerably more across all spending categories than Sproul State Forest visitors.

Experience Addition

This section of the survey asked a series of additional questions of interest to managers of the Pennsylvania State Forests. As was the case for the "satisfaction" and "economics" additions, about one-third of the respondents were asked these questions. Some of the questions enhanced other sections of the basic survey and have been reported earlier (e.g. previous visitation to the forest and group composition were reported with other visitor trip characteristics in Table 4). The results presented below focus on visitor motivations, feelings towards the Forest, and opinions about various topics in the Pennsylvania State Forests.

Forest Access

- Most respondents in both Forests indicated favorable ratings for access to the State Forests by both roads and trails (mean of 4.0 – 4.2).
- There were no significant differences in the accessibility ratings between the two State Forests.

Table 15. Visitor Ratings of Access to the State Forests (Percent)

	1	2	3	4	5	Mean[a]
Sproul State Forest						
By roads	1.0	6.9	10.9	32.7	48.5	4.2
By trails	2.5	1.2	22.2	38.3	35.8	4.0
Susquehannock State Forest						
By roads	3.8	0	6.7	30.5	59.0	4.4
By trails	1.0	6.3	18.8	28.1	45.8	4.1

[a] Response scale = 1 (poor) to 5 (very good)

Recreation Experience

- Most respondents also indicated favorable ratings (mean of 4.1 or above) for all of the recreation experience items rated.

Table 16. Visitor Ratings for Various Recreation Experience Attributes (Percent)

	Awful	Fair	Good	Very Good	Excellent	N/A	Mean [a]
Sproul State Forest							
Opportunity to recreate without feeling crowded	0	6.1	14.1	19.2	59.6	1.0	4.3
Places to recreate without conflict from other visitors	1.0	9.1	12.1	15.2	62.6	0	4.3
Compatibility of recreation activities at the area	0	6.1	18.2	16.2	40.4	19.2	4.1
Helpfulness/courteousness of Forest employees	2.0	5.1	8.2	9.2	27.6	48.0	4.1
Helpfulness/courteousness of people in surrounding communities	3.1	5.1	11.2	21.4	34.7	24.5	4.1
Susquehannock State Forest							
Opportunity to recreate without feeling crowded	0	2.9	5.7	24.8	66.7	0	4.6
Places to recreate without conflict from other visitors	0	1.9	9.5	27.6	61.0	0	4.5
Compatibility of recreation activities at the area	1.0	0	4.8	19.0	40.0	7.6	4.3
Helpfulness/courteousness of Forest employees	1.0	0	9.5	28.6	54.3	35.2	4.5
Helpfulness/courteousness of people in surrounding communities	0	1.9	12.4	33.3	44.8	6.7	4.5

[a] Response scale = 1 (awful) to 5 (excellent)

Place Attachment

Visitors were asked to choose their most important reason for visiting the State Forest from a list of alternative choices.

- Sproul State Forest visitors were more likely to report "enjoy being in the forest" as their primary reason for visiting the forest, while Susquehannock State Forest visitors were more likely to focus on their chosen activities, (especially hunting, ATV riding, and horseback riding).
- About one-fifth of the visitors (18% in both forests) went there primarily because it's "a good place to spend time with friends/family."
- Those who selected an "other reason" were also asked to describe that reason. Typical responses included other activities or combinations of activities such as observing nature, photography, skiing, and swimming.

Table 17. Which of the following was the most important reason for this visit to the State Forest?

	Valid Percent	
	Sproul	**Susquehannock**
I went there because I enjoy being in the forest	37.6	22.9
I went there because I wanted to spend time with friends/family	17.8	18.1
I went there because it's a good place to:		
Hunt	22.8	29.5
Hike	3.0	1.0
Bike	0	1.0
Fish	7.9	2.9
Horseback ride	0	3.8
ATV ride	1.0	7.6
Other Reason	9.9	13.3

Visitors also responded to a set of statements designed to measure the extent of place attachment to the State Forest.

- The vast majority of respondents (87-94%) agreed that the State Forest they visited "means a lot to them," with over half strongly agreeing.
- Most visitors also reported that they enjoy recreating in the State Forest more than at other places, and get more satisfaction out of visiting the State Forest than from visiting other places.

Table 18. Summary of Place Attachment Scale Items (Percent)

Place Attachment Items	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree	Mean[a]
Sproul State Forest						
This place means a lot to me	0	1.0	12.0	28.0	59.0	4.5
I enjoy recreating at this place more than other places I could visit	1.0	4.0	24.2	31.3	39.4	4.0
I am very attached to this place	6.0	8.0	23.0	23.0	40.0	3.8
I get more satisfaction out of visiting this place than from visiting most places	5.0	7.0	28.0	28.0	32.0	3.8
Susquehannock State Forest						
This place means a lot to me	0	0	5.7	22.9	71.4	4.7
I enjoy recreating at this place more than other places I could visit	0	2.9	15.2	28.6	53.3	4.3
I am very attached to this place	2.9	1.9	12.5	21.2	61.5	4.4
I get more satisfaction out of visiting this place than from visiting most places	1.9	1.9	19.0	25.7	51.4	4.2

[a] Response Code: 1="Strongly Disagree" and 5="Strongly Agree"

Motivations/Reasons for Visiting the State Forest

- Visitors' most important motivations (reasons for visiting) the State Forest were to be outdoors and to experience natural surroundings.
- Visitors also attached great importance to the opportunity to relax and get away from their regular routine.
- Moderately important motives for visiting the forest included the social motives of family recreation (mean = 4.0 - 4.1) and being with friends (mean = 4.1 for both Forests).
- Visitors were more evenly divided on the importance of getting physical exercise (mean = 3.6 - 3.7), seeking challenge or sport (mean = 3.7) and developing their skills (mean = 3.2 - 3.5).

Table 19. Summary of Motivations/Reasons for Recreating in the State Forests (Percent)

Reasons for Visiting	Not at all important	Somewhat important	Moderately important	Very important	Extremely important	Mean[a]
Sproul State Forest						
To be outdoors	0	0	3.0	33.3	63.6	4.6
To experience natural surroundings	0	1.0	7.0	27.0	65.0	4.6
For relaxation	0	1.0	7.1	30.3	61.6	4.5
To get away from the regular routine	0	3.0	9.0	23.0	65.0	4.5
To be with my friends	2.0	7.1	17.2	24.2	49.5	4.1
For family recreation	10.3	5.2	9.3	29.9	45.4	4.0
For the challenge or sport	8.1	9.1	21.2	26.3	35.4	3.7
For physical exercise	8.1	15.2	24.2	19.2	33.3	3.6
To develop my skills	18.2	10.1	28.3	22.2	21.2	3.2
Susquehannock State Forest						
To be outdoors	0	1.9	4.9	35.9	57.3	4.5
To experience natural surroundings	0	2.9	4.9	31.1	61.2	4.5
For relaxation	0	1.0	5.8	35.9	57.3	4.5
To get away from the regular routine	1.0	4.9	3.9	32.0	58.3	4.4
For family recreation	6.8	3.9	5.8	38.8	44.7	4.1
To be with my friends	8.7	1.9	8.7	35.0	45.6	4.1
For the challenge or sport	8.7	8.7	17.3	32.7	32.7	3.7
For physical exercise	6.8	6.8	23.3	36.9	26.2	3.7
To develop my skills	10.7	13.6	21.4	25.2	29.1	3.5

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Visitor Response to Potential Facilities and Services

Visitors surveyed were asked what facilities/services in the State Forest are most important to them.

- The respondents in both Forests attached the most importance to wildlife viewing areas or opportunities (mean = 3.9).
- Visitors also attached relatively high importance to signs directing them to recreation facilities (mean = 3.4 – 3.6) and printed interpretive information (mean = 3.4 – 3.6).
- Visitors' interest in various types of trails tended to reflect their activity interests. For example, although many visitors showed little or no interest in ATV or snowmobile trails, those types of trails were very important to motorized visitors.

Table 20. Visitor Importance Ratings for Various Types of Facilities and Services

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important	Mean[a]
Sproul State Forest						
Wildlife viewing areas or opportunities	3.0	10.1	17.2	29.3	40.4	3.9
Parking	12.2	13.3	21.4	27.6	25.5	3.4
Signs directing me to recreation facilities	19.4	7.1	20.4	25.5	27.6	3.4
Hike, bike & horse (non-motorized) Trails	18.9	9.5	18.9	22.1	30.5	3.4
Printed Interpretive Information	14.3	17.3	16.3	17.3	34.7	3.4
Picnic areas	19.6	10.3	27.8	25.8	16.5	3.1
ATV Trails	47.4	14.7	10.5	8.4	18.9	2.4
Snowmobile Trails	52.1	11.7	8.5	9.6	18.1	2.3
Susquehannock State Forest						
Wildlife viewing areas or opportunities	5.8	5.8	19.2	36.5	32.7	3.9
Printed Interpretive Information	11.7	6.8	26.2	23.2	32.0	3.6
Signs directing me to recreation facilities	8.8	12.7	18.6	27.5	32.4	3.6
Parking	14.7	9.8	19.6	29.4	26.5	3.4
Hike, bike & horse (non-motorized) Trails	22.3	5.8	12.6	29.1	30.1	3.4

Picnic areas	18.3	19.2	23.1	26.0	13.5	3.0
ATV Trails	41.3	3.8	12.5	11.5	30.8	2.9
Snowmobile Trails	48.0	6.9	7.8	16.7	20.6	2.6

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Information Services

State Forest visitors were asked a series of questions about their use of various types of forest information.

- About one-fifth of the visitors surveyed reported that they had obtained information about the area they visited during or in preparation for their trip.
- Nearly equal proportions of visitors sought the different types of information listed in the survey (maps, visitor guides, other information).
- The majority of Sproul visitors (61%) obtained information before leaving home, while the majority in the Susquehannock (52%) obtained information after arriving at the Forest.
- "Other" types of information sought by visitors included information from the web, information on trail availability or conditions, and information on geocaching.
- Most of the visitors who sought information reported that the information obtained was helpful in planning their trips.

Table 21. Visitor Responses to Questions about Information Services

	Valid Percent	
	Sproul	**Susquehannock**
Did you obtain any information about this area during this trip or in preparation for it?		
No	81.8	80.0
Yes	18.2	20.0
What type of information did you obtain?		
State Forest map	16.7	38.1
Trail map	27.8	61.9
PA visitors guide	16.7	14.3
Other	55.6	28.6
When did you receive information?		
Before leaving home	61.1	47.6
After arriving here	38.9	52.4
Was the information you received helpful to plan your trip?		
Yes	72.2	95.2
No	27.8	4.8

Desired Services in Nearby Communities

State Forest visitors were asked what services in nearby communities (off of the forest) they wished were available. A small minority of respondents (34 in the Sproul and 37 in the Susquehannock) offered suggestions, which are summarized in Table 22.

Table 22. Visitor responses to other services they wish were available in nearby communities (off of the forest).

	Number of Responses	
	Sproul	**Susquehannock**
Services		
Cell phone service/tower	8	7
Gas stations	6	5
Bathrooms	2	
Fresh water	1	
Forestry building	1	
Shopping opportunities		
More stores/General shopping	1	2
Convenience store	2	1
Grocery stores/Better food shopping	2	5
Hardware/building supply store	1	1
Sporting goods/ camping supplies store	1	3
Beer distributor	1	
Liquor store	1	
Wal-Mart	1	1
Restaurants		
General restaurants	3	6
Better restaurants	1	2
More restaurants		2
Bars		3
Family restaurant, not a bar	1	
Taco Bell	1	
Lodging		
More options for lodging		1
Hotels		1
Lodge with hot tub		1
Recreation		
General recreation opportunities	1	
Horseback riding	1	
Recreational boating	1	1
Ski resort	1	
Service chopper rides	1	
Trail maps and information on recreation	1	
Guide services		1
ATV and snowmobile rentals		1

Visitor Responses to Questions about Marcellus Shale-Related Activity

Forest visitors were asked several questions about how Marcellus shale-related activity had affected their use of the State Forest and their enjoyment of their recreation experience at the State Forest.

- The majority of visitors in both forests (72% in the Sproul and 81% in the Susquehannock) reported that Marcellus shale-related activity had not affected their use of the State Forest.
- Visitors were slightly more likely to report that gas-related activity affected their recreation experience at the forest. However, again, the majority of visitors in both forests (65% in the Sproul and 77% in the Susquehannock) reported that Marcellus shale-related activity had not affected their recreation experience at the State Forest.
- Sproul State Forest visitors were slightly more likely than their counterparts in the Susquehannock State Forest to indicate that Marcellus shale-related activity had affected both their use and recreation experience at the State Forest.

Table 23. Visitor Responses to Questions about Marcellus Shale-Related Activity

	Valid Percent	
	Sproul	**Susquehannock**
Has Marcellus shale-related activity changed your recreational use of this state forest?		
Yes	27.7	19.1
No	72.3	80.9
Total	100.0	100.0
Has Marcellus shale-related activity changed your recreation experience at this state forest?		
Yes	34.7	22.9
No	65.3	77.1
Total	100.0	100.0

Follow-up questions probing the reasons for the visitors' responses to the initial yes/no questions revealed the following major themes (Table 24):

- Among those reporting that their use of the State Forest had been impacted by shale-related operations, one of the most common themes among the responses reflected traffic-related issues.
  - The most frequently mentioned traffic concerns included increased road traffic, poor driving behavior, roads being blocked or areas made inaccessible to the public.

Table 24. Responses to How Marcellus Shale-related Activity has Changed your Use of the Forest.

Type of Comment	Number of Comments	
	Sproul	Susquehannock
Traffic-related Issues	30	19
Effects on Wildlife/Hunting	32	10
Changing Use patterns (Displacement)	24	13
General Environmental Concerns	13	10
Noise and Visual Impacts	6	6
Positive Impacts/Statements	6	5

- Many respondents in both Forests also mentioned various wildlife and hunting-related concerns.
    - The most common hunting-related issues were that the drilling activity scares game away or reduces their places to hunt, although some offered general statements indicating that drilling affects hunting and/or wildlife negatively.
- A third major theme of shale-related impacts on recreation use included several general environmental concerns.
    - These concerns included pollution, habitat destruction, and water quality as well as changes in landscape, noise pollution, and crowdedness and loss of a relaxing and serene environment.
- Some respondents in both Forests reported that shale-related activity had directly affected their use of the Forest, mainly by preventing access to areas or causing visitors to avoid drilling locations or use the Forest less often.
- A few respondents specifically mentioned noise and visual pollution associated with the gas drilling activity.
- A few respondents also expressed positive impacts of the shale-related activity.
    - These comments focused on the creation of new access roads providing better access to the Forest and road improvements.

Those visitors who stated that their recreational use of the Forest had not been affected by Marcellus shale-related activity were also asked to explain why not. Their responses also reflected several dominant themes, which were grouped into awareness-related issues and general acceptance of the drilling activity (Table 25).

- Many visitors reported that the drilling activity doesn't bother them, hasn't changed their use or doesn't affect their activities.

- Many visitors in both Forests indicated that they had not noticed the activity or had not noticed it in the areas they visit.
- The next most common acceptance-related comment was that it had not changed their use yet, reflecting a concern for possible future impacts to develop.
- Some visitors stated that they were not aware of (of had not even heard) of the Marcellus Shale phenomenon.
- A few visitors expressed support for the drilling activity, based on the opinion that it does not have a negative effect, is controlled, or is good for the economy.

Table 25. Responses to Why Marcellus Shale-related Activity has not Changed your Use of the Forest.

Type of Comment	**Number of Comments**	
	Sproul	**Susquehannock**
No effect on use	45	47
Don't notice/Haven't seen any activity	23	38
Not drilling here (or in areas I care about)	27	31
Not yet (implies concern for future)	23	30
Don't know about it	8	7
Pro-drilling	5	12

Forest visitors were also asked to explain the reason why Marcellus shale-related activity had or had not affected *their recreation experience* at the State Forest (Table 26). As in the case of the previous question, many of their responses did not refer specifically to experiential impacts, but rather expressed a variety of types of opinions about the drilling operations.

- Responses to the experiential impacts tended to reflect the same themes as the answers to the questions about the impacts of shale-related activity on visitors' use of the Forests.
- Noise pollution was mentioned more frequently as a factor affecting visitors' recreation experience than a factor affecting their recreation use.
- Changes in landscape and crowdedness/changes in atmosphere were also mentioned more frequently as factors affecting visitors' recreation experience than as factors affecting their recreation use.
- Some specific experiential impacts of shale-related activity included loss of satisfaction, light pollution, and bad smells.

Table 26. Responses to How Marcellus Shale-related Activity has Changed your Recreational Experience at the Forest?

Type of Comment	Number of Comments	
	Sproul	Susquehannock
Traffic-related Issues	38	14
Effects on Wildlife/Hunting	24	10
Changing Use patterns (Displacement)	12	9
General Environmental Concerns	13	12
Noise and Visual Impacts	24	11
Crowding/Loss of Solitude or Relaxation	9	7
Positive impacts	3	5

Responses by those visitors who stated that their recreation experience at the Forest had not been affected by Marcellus shale-related activity also reflected the same awareness-related and general acceptance of drilling activity themes as their previous explanations for why the shale-related activity had not affected their recreational use of the Forests (Table 27).

- Again, many visitors in both Forests indicated that they had not noticed the activity or had not noticed it in the areas they visit.
- Some visitors stated that they had not heard of the Marcellus Shale phenomenon.
- Many visitors in both Forests reported that the drilling activity doesn't bother them, hasn't changed their experience or doesn't affect their activities
- The next most common acceptance-related comment was that it had not changed their experience yet.
- A few visitors expressed support for the drilling activity, based on the opinion that it does not have a negative effect, is controlled, or is good for the economy.

Table 27. Responses to Why Marcellus Shale-related Activity has not Changed your Recreational Experience at the Forest.

Type of Comment	Number of Comments	
	Sproul	Susquehannock
No effect on experience	43	40
Don't notice/Haven't seen any activity	25	35
Not drilling here (or in areas I care about)	18	19
Not yet (implies concern for future)	14	29
Changed Location/Adapted	6	8
Don't know about it	6	4
Pro-drilling	6	7

Summary and Conclusions

The results published in this report are a compilation of the data collected at numerous State Forest recreation sites during the period of October 1, 2011 through September 30, 2012 (n = 1,395 interviews with Forest visitors). Besides the basic visitor use survey, three supplemental surveys were used to query visitors about their satisfaction levels, economic expenditures, and recreation experiences.

This report provides a summary of the characteristics, behaviors, and attitudes of visitors to the Sproul and Susquehannock State Forests in north central Pennsylvania. The results indicate that most State Forest visitors are repeat and frequent users, and have many years of experience in the forests. About three-fourths of the respondents in each Forest reported making their first visit to the Forest before the year 2000. Several notable differences existed in the use patterns and characteristics of recreation visitors in the two Forests. First, the Sproul State Forest has more "frequent visitors," showing an average of about 31 visits to the Forest per year versus 15 visits in the Susquehannock. Secondly, visitors in the Sproul were more likely (60%) than those in the Susquehannock State Forest (37%) to be day users. The majority of Susquehannock visitors were overnight visitors who stayed an average of 4.5 nights in the Forest. Activities that were popular in the Sproul included fishing and driving for pleasure, while those reported more frequently by Susquehannock visitors included hunting and ATV riding.

Regarding satisfaction levels, most respondents in both Forests were clearly satisfied with their recreation experience and with the satisfaction attributes listed in the survey. State Forest visitors were most satisfied with the scenery and attractiveness of the forest. They also reported very high feelings of safety while in the Forest. The data suggest that there is room for some improvement in the provision of information for recreation, adequacy of signage and condition of forest roads and trails.

The economics section of the study asked visitors about their monetary expenditures in and near the State Forests. Nearly half of the forest visitors indicated that they would have gone somewhere else to do the same activity if they had not been able to visit the State Forest, indicating that they were serious about pursuing their recreation activities on that trip. Most of the respondents (70% in the Sproul and 85% in the Susquehannock) indicated that they spent

some money within 50 miles of the forest on their current trip. The largest expenditures reported were for gasoline and oil, food/drink at restaurants and bars, and groceries. In general Susquehannock State Forest visitors spent considerably more across all spending categories for their trip (average = $206.81) than Sproul State Forest visitors ($80.51).

The experience section of the study was given to about one-third of the visitors, providing rich data about visitor attitudes, motivations, perceptions, and management preferences. The data clearly show that State Forest visitors are interested in experiencing the outdoor natural surroundings available in the forest areas. Relaxing out of doors, getting away from the routine, and other nature-based social activities are very important to these recreationists.

Visitor responses to potential management options were examined to ascertain support or opposition to various management alternatives. The highest degree of support was seen for additional wildlife viewing areas or opportunities. Visitors' interest in various types of trails tended to reflect their activity interests. For example, although many visitors showed little or no interest in specific types of trails, such as ATV or snowmobile trails, those kinds of trails were very important to notable segments of visitors pursuing these motorized activities. Respondents also attached relatively high importance to signs directing them to recreation facilities and printed interpretive information. Only about one-fifth of visitors in each Forest obtained information about the area they visited during their trip or in preparation for it. These visitors were almost equally divided between those who sought information before leaving home and those who obtained information after arriving at the Forest. In both Forests, though, most of those who sought information found it helpful in planning their trip.

The majority of visitors in both forests reported that Marcellus shale-related activity had not affected their use of or recreation experience at the State Forest. Among those reporting that their use of the State Forest had been impacted by shale-related operations, the most common responses reflected traffic-related issues, concerns with hunting, and general environmental concerns including pollution, habitat destruction, and water quality, as well as changes in landscape, noise pollution, and crowdedness and loss of a relaxing and serene environment. Among those reporting that gas drilling activity had not affected their use of the State forest, many indicated that they had not noticed the activity or had not noticed it in the areas they visit, or that the drilling activity doesn't bother them, hasn't changed their use or doesn't affect their activities. Responses to the experiential impacts of Marcellus shale-related activity tended to

reflect the same themes as the answers to the questions about the impacts of shale-related activity on visitors' use of the Forests. Sproul State Forest visitors were slightly more likely than those in the Susquehannock State Forest to indicate that Marcellus shale-related activity had affected either their recreation use or their recreation experience at the State Forest.

This report provides a representative snapshot of recreational use in two Pennsylvania State Forests. It thus provides a start when building a profile of Pennsylvania State Forest visitors. Surveys are currently continuing in other forests and the overall database will include a total of ten forest districts by the completion of the five-year project. Future reports will provide yearly summaries of the individual forests studied, as well as comparative and targeted data analyses aimed at assisting Bureau of Forestry managers in their efforts to meet the needs of their recreation constituency.

Appendix A

Visitor Responses to Open-Ended Questions

If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do? (Experience Addition, question # 8, Satisfaction Addition, question #2)

Note – Some responses addressed multiple topics and are coded in multiple categories

Sproul State Forest, 220 responses

No Suggestions (56)

Keep Up the Good Work (7)

Improve Recreation Facilities (61)

Improve road maintenance (20)
- Road maintenance (5)
- Fix roads (3)
- Keep improving the roads for car travel (2)
- Fix the bridges on the roads (2)
- Fix up some roads to make them more drivable
- Wider roads
- Grade roads more often
- Clear roads
- Road conditions
- Camp roads need to be improved
- Roads need brushed out
- Plow roads in winter, hard to get trailer into sites

ATVs (8)
- More ATV trails (2)
- Develop more recreation ATV riding trails. Improve hill heading to site
- A lot of blown down trees on the ATV trails
- Mark the ATV trails better
- Sign out front of road should say “Bloody Skillet” ATV parking
- Would like to see ATVs allowed in the forest
- ATV access on roads, pay for permits $100

General trails (8)
- Trails need to be marked better (4)
- Trail maintenance for hiking – would like to see it better maintained
- Ensure trail maintenance is done properly and completed end to end. Campbell Hollow Tr, #2,3,4, Hollow Tr, Stone quality Hollow on in Lycoming Co. on Big Trail Rd. Sam Corson Tr. from top of Lebo to Millers Run
- Open more snowmobile trails

Scenic views/overlooks (6)
- Clear vegetation from views (3)
- Make more scenic views

Add trash can at overlook
Improve access to overlook, smoother trail use the ADA approved road for path

Restrooms (4)
Cleaner Restrooms (2)
More restrooms at Bloody Skillet (2)

Campsites (4)
More camping sites (2)
More remote campsites
Increase space between sites

Add parking (4)
Add parking (3)
More parking, when it is busy people have to park on dangerous roads

Trash (4)
Improve trash pickup at this site (Karthaus Canoe Access)
Add trash can at overlook (Bucktail State Park Natural Area)
Put trash can here (Karthaus Canoe Access)
Site could be cleaner (Chuck Keiper Trail)

Improve facilities (2)
Better facilities
More developed sites

Misc. (1)
Offer more showers at the different state parks, have seen portable showers for seasonal use at other locations

Forest Management (42)

Anti-fence (9)
Remove fences (6)
Stop wasting money fencing areas
Provide information as to why there are chicken wire fences around trails and drilling areas
Remove fences and unnatural features

Restrict development (7)
Restrict development (2)
Remove fences and unnatural features
Keep it primitive/underdeveloped, no more exploitation
Too many activities too much expansion
More natural areas preserved
Keep area remote

Reduce logging (5)
Less clearcutting (4)
Stop clearcutting

Increase law enforcement (4)
Enforce the speed limit
Would like to see more patrol of these areas
Stop ATV riders from drinking and driving ATV's

Get rid of partiers

Remove dead trees (3)

Remove dead trees
Dead trees need to be taken out/utilized
Better forest management, take care of dead wood and gypsy moths

Other timber management (3)

Need more timber management in the eastern side of Rt. 144
Cut old timber to promote growth
A lot of trimmed trees, would like to see that better managed

Misc. (11)

Add cell towers for emergencies (2)
Controlled burning needed (2)
Improve Beech Creek
Sell more timber and fix road
50 years of free use of spring water and now they ask us to pay
Round off camping fees, just have straight dollar amounts and don't include change.
Running water in camps
Should be more people here at this time of year, a lot of beautiful country here, get more to visit here
Open all gates

Game Management (32)

Not Enough Game (15)

More game, deer herds are depleted
More deer in the area for hunters
Too little deer population in surrounding areas
Not enough deer for hunting, bear management to reduce their numbers
Manage the deer herds better, hunting is awful, not a lot of deer
Management of the coyote population, there are hardly any deer
Is there any way to increase the deer population? Not a lot of deer in the area
More game
Manage the game population better, not enough game
Deer herd
Increase deer numbers
Deer are being harvested faster than they can reproduce
Not enough deer for hunting
Stock more deer
Stock more pheasants

Increase Food Plots (4)

More fruit trees
More clearing for food plots
Additional feed plots for the deer would be beneficial
More grouse feeding

Limit/eliminate doe hunting (5)

No doe hunting (4)
Limit doe hunting

Misc. (8)

Have deer mapping
No deer hunting for one year
Cut back hunting season to improve deer population
Give deer a chance, lessen hunting season
Wildlife habitat reconstruction
Improve wildlife habitat, keep the habitant diverse
More animals, change in management practices
DCNR needs to take control of wildlife- too many permits issued for this area, deer are being harvested faster than they can reproduce

Signs/Maps (17)

Improve/maintain signs (12)

Improve signage (7)
Post more speed limit signs
Approximate distances on signs directing to areas
Adequate signage in advance of pull-offs or attractions to give the driver time to stop
Increase trail signage, I got lost
Better signage for roads/trails, had trouble finding the trailhead

Improve maps/information (5)

Provide maps
Fill information holders, keep them stocked
Update trail map
More trail information
Update website

Anti-Fracking/Gas Drilling (16)

Stop drilling for gas/fracking (6)

Stop drilling (2)
Get gas companies out, no more fracking
Get the drillers out of here
Get rid of gas drillers
Stop the fracking

Gas trucks/road damage issues (3)

Fix roads, too many gas trucks
Maintain roads or have gas trucks out of here
Limit the drilling because of all the trucks

Misc. (7)

Tax the gas companies (2)

Drilling is causing problems with hunters
Fracking is polluting the environment, I blame that on the current Republican administration, not charging gas companies enough
Would like to see the gas wells stay out of the forest, it takes away from the natural beauty
Don't continue to allow gas development

Fish/Stream Management (8)

Trout stocking (4)

Stock more trout (2)
Stock the streams for memorial weekend
Trout stocking program needs improvement, spread them out further

Misc. (4)

Need better stream manager
Close small tributaries to fishing for a few years
More stream access
Clean up stream

If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do? (Experience Addition, question # 8, Satisfaction Addition, question #2)

Susquehannock State Forest, 206 responses

Note – Some responses addressed multiple topics and are coded in multiple categories

No Suggestions (51)

Keep Up the Good Work (6)

Improve Recreation Facilities (94)

ATVs (27)
- More ATV trails (11)
- Improve signs/maps (4)
  - Better signage for ATV trails, open more trails for recreation
  - Partner with nearby townships to hand out maps of the ATV trails connecting the 4 townships to private roads/trails
  - Better maps
  - Better maps and township maps in Potter County.
- Open forest roads for ATVs (3)
  - Open forest roads to ATVS (2)
  - Selected forest roads should be open to ATV traffic, open road for ATV use to access restaurant – Rock Run Road
- Improve ATV facilities (3)
  - Need outhouses on the ATV trails, at each parking area
  - Improve parking lot condition at the ATV lot
  - Add concession stand on ATV trail for snacks, etc., bathroom could have been cleaner
- Misc. (6)
  - Make more difficult ATV trails
  - Dangerous corner on ATV trail should be widened
  - More trails, specifically ATV throughout state, too many snowmobiles trails, open them up to 4-wheelers
  - Connect ATV trail system, or use existing snowmobile trail to make it less crowded
  - Extend ATV season
  - ATVs are noisy near Lyman Run Park

General trails (16)
- More trails (6)
- Maintain trails better (6)
  - Billy Lewis trail needs maintenance (2)

Areas of the Susquehannock Trail System are overgrown to the point of the trail completely disappearing
Donut Hole trail needs major maintenance
Clean trails – Mudlick
Cut the brush back on the trails

Trail marking/blazing (3)
Mark trails better
Mark trails better, signs are missing
Trails need to be re-blazed

Make roads more passable for hikers and skiers

Improve/maintain roads (13)

Improve forest roads (4)
Maintain forest roads (3)
Widen road
Road grading and pull over spots
Keep the roads well managed
Roads – better maintenance in Potter County
Dyer Road and several others could use a grading/surface improvement
Cut back the brush on the side of the forest roads

Horses (8)

Reconsider number of horses per site versus number of rigs; go by number of horses (3)
Place to dump horse manure instead of packing out or spreading it, have access to good potable water in or near campground, but like the site to remain uncrowded
Dyer camp picnic tables need repaired, should offers water availability at the camp, add a compost pile there too
More horse/trail friendly/ in tune with needs and goals
Continue to improve horse camp areas
Get rid of horses at horse campsite

Improve/maintain signs (7)

Signage on roads needs improvement (3)
Some roads not on the map
Need better signs
Improve visibility of signs entering/exiting roads
Better road intersection signs

Improve maps/information (7)

Provide more comprehensive maps for horse riding & hiking
Regional trail map with signage, availability of maps
Maps at trailhead
Update trail map
More trail information
Improve maps for the STS, needs to indicate distances better
Better snowmobiling maps

Restrooms (7)

Add more restrooms (5)
Cleaner restrooms (2)

Better parking near trailheads (2)

Misc. (7)

Picnic tables need to be repaired
Add overlook near reservoir
Re-do vistas, they are overgrown
Install public treehouses
Have a lean-to for backpackers
Why not recommission the CCC camp, they should be reactivated, some trails are in complete disarray
Improve mountain biking trails, add a loop trail in this area like Allagrippis trail, specifically built for mountain biking

Wildlife management (33)

Limit/eliminate doe hunting (10)

No doe hunting (7)
Less doe hunting (2)
Deer management needs improvement, make doe season shorter

Increase deer population (9)

Increase deer population (7)
There are not many deer in these woods
Where are all the deer at?

Increase food for game (8)

More food plots (5)
Plant better trees for wildlife, there is no vegetation
Put more oak trees in to provide more food for wildlife
Feed turkeys more

Misc. (6)

Have hunters give more input in deer management
Game management could be improved, want to see more game
More cutting to attract more wildlife
Problems with deer management, no DCNR here anymore
Do more to better hunting
Leave the deer alone

Forest Management (19)

Timber management (4)

Take more pole stage timber out
Thin some of the forest out selectively
Better firewood
Clear timber

Reduce logging (3)

Timber sales too close to trails, logging trucks drive on ski trails
Leave the trees, no clear cuttings
Slow down clear cutting

Restrict development (2)

Don't allow any more development – keep it remote
Keep it natural as much as possible

Increase law enforcement patrols (2)

Misc. (8)

Fix right of way access at 3912 Twelve Mile Road
Remove fence
Clever marketing
Gate the camp area so only campers can use it
Don't release black flies
Get rid of invasive species
Do something about snakes near Lyman Lake
If leased cabins, leave a grandfather clause to let things be as they have been, less nit picking

Anti-Fracking/Gas Drilling (5)

Stop drilling
Reduce gas well traffic
Regulate drilling
No Marcellus drilling in this State Forest
Only use fracking on private land

Fish/Stream Management (4)

Stock more fish (2)
Stream restoration
Maintain streams

Marcellus Shale Open-Ended Responses by Forest

Sproul SF

Has Marcellus shale-related activity changed your recreational use of this State Forest? *n* = 317, Yes = 87, No = 230

218 total open-ended responses

If yes, why?

Road/Traffic Issues (30)

Traffic (2)
More traffic (3)
A lot of traffic (2)
Some traffic
On the roads more
Limited access on roads, truck traffic is heavy
Way too many vehicles on roads to driveway
Too much traffic and water trucks
Way too much traffic & road delays, gas trucks
Trucks on roads
Truck traffic
Heavy road traffic
A lot of truck traffic & road damage
Traffic is more dangerous
Truck traffic is dangerous
Heavy truck traffic makes roads less safe feeling – speed limits not obeyed
A lot more traffic, was in an accident
Been run off road, hurts relaxation aspect of experience
Every time I come up here, I am almost killed by a pickup truck
Extremely dangerous to drive on back roads, oil companies are idiots
More caution on roads
Roads
Roads are bad
Ruin roads
More roadwork
Roads terrible, need fixed

Effects on Wildlife/Hunting (32)

Kill[s] wildlife
Concerned about wildlife habitat
Scaring deer away (4)
Too many extra people in the woods scaring deer
Hunting is affected

Hunting has been impeded
Hunting
Screwing up hunting
Disrupted ecosystems associated with snake hunting
Hunting and trapping areas impacted
Can't hunt at usual sites
Hunting area disrupted
Changes hunting locations
Took away hunting spot
No hunting at well sites
Rigs are where I used to hunt
Can't hardly hunt anywhere anymore
They are in our hunting area
Some hunting spots are taken away
Limited access to hunting areas
Cleared places that I used to hunt
Inability to access regular hunting areas
Threw hunting out of whack – not seeing the same amount of wildlife before they started drilling
Drilling activity has limited hunting area, has caused the wildlife to migrate out of the area, decrease in numbers
Hunting, changed way animals travel, don't see them period
Hunting, pushed animals
Changed hunting
Game has been chased out, woods used to be undisturbed
Had to change our hunting style, drillers seem to wait till hunting

Changing Use Patterns (Displaced/Closed Areas) (24)

Have to stay off certain roads
Traffic, avoiding areas with high traffic
Can't go to some places because of traffic
Changed the route to cabin
Off-roading, some areas closed to use
Prevented me from riding ATV because trails were torn up from pipeline construction
Can't go to some areas
Closed areas
Closed due to drilling
Some places can't get into
Avoiding areas with high traffic
Avoid certain locations where there is activity
Don't visit certain areas anymore to avoid drilling activity
Places I don't go any more because of gas drilling, they have a well pad in the Miller Run Natural Area
The roads are blocked
A lot of roads are now blocked off

Roads are closed that could be open to the public
I will not come back here again because of the development in gas
Many favorite areas have been disrupted/destroyed
Taken, don't use as much
Would have come more
Berry picking sites destroyed
Took two acres of this land
Certain areas were more accessible, others became inaccessible

General Environmental Concerns (13)

Concerned about pollution and water quality (2)
Becoming crowded, taking a lot of space for clear cuts
Pristine areas of peaceful forest gone
Destroy area
Destroy forest
It's a mess
Change in landscape, new road
Changed some areas, clear cutting messed the place up
Lots of activity and equipment and people
Don't like the clearing of the woods
Taking the mountain, ruining the forest, nothing is the same
Need more inspection and regulation

Noise and Visual Impacts (6)

Drilling is disruptive noise-wise
Noise
Noise pollution
Noise from helicopters last year
Helicopters flying over state game land
Keep hidden and neat, can see them

Positive Impacts/Statements (6)

Last year, not so much this year
The road is in much better shape
Made better roads
Increased access roads
My son worked for them, bought me this truck
Phone service

If no, why not?

No Effect on Use (45)

- No change (10)
- No effect (8)
- No negative effect (2)
- Not affected by it for fishing or hunting
- Not affected; works for gas company and knows that it isn't in this area
- Still will use it despite the change
- Still visit
- Still fish
- Still useable
- Still use forests
- Did not interfere with use
- Doesn't get in the way of our activities
- Hasn't changed anything they do
- Has not affected his use specifically of the forest area
- Doesn't prevent access to areas
- No impact from it
- No impact, forest is still gorgeous
- Doesn't impact at all, non-invasive
- Haven't been impacted
- Doesn't get in the way
- Not issue with his group
- Doesn't bother me
- Not a lot of impact
- Hasn't hurt anything
- Does not hurt anything
- Just has not
- Not really
- Just adapt to the changes

Don't Notice/Haven't Seen Any Activity (23)

- Haven't noticed anything (8)
- Haven't seen it (6)
- No visible activity (4)
- Only notice it on the roads sometime
- Don't visit enough to notice a change
- First time visiting the area
- Not in the area much
- Haven't been here

Not Drilling Here (or in areas I care about) (27)

- Not in this area (5)
- No drilling here (5)
- No impact here (3)

Areas visited are not affected (3)
Haven’t seen in this area (2)
Areas visited have not been altered, haven't seen anything directly ruined by drilling
Not much activity in the area
Right now they are not in this area
Haven't around property
Not in area of my cabin
No impact in areas traveled
Can't say it has here, but I saw lots of trucks traffic on way here
Not around so much
Not this state forest, other places it has, only here for limited time

Not Yet (implies concern for future) (23)

Not yet (9)
No impact at all yet
Not as of now
To date, no change
They haven't been drilling in this area yet (2)
Not impacted where I hunt yet
Not in this location yet
No, It has not changed yet, think it will though
Not yet, but coming
Not yet, but it may
Not yet, road messed up in other forest
Not yet - too early to tell, noticed the road is being widened
They haven't f***ed anything up yet, when they do I will be very upset, whatever economic benefit there is will not offset if they damage the forest
Don't have pipeline yet, site can't hook up well on our properly, hasn't changed anything yet

Don’t Know About It (8)

Didn't know what it was (4)
Wasn't sure if it was here
Didn't know there was any activity going on in this location
Haven't drilled in the state forest that I know of
Because didn't know until recently, saw a map in a restaurant

Pro-Drilling (5)

Marcellus shale doesn't bother me here, already drilled on my property
Every well site I've seen is well kept, have people who work for gas and confident they are doing their job
I have no problem with them drilling, they can drill all they want
Good for the economy
Need gas; doesn't affect their everyday life

Sproul SF

Has Marcellus shale-related activity changed your recreation experience at this State Forest? *n* = 317, Yes = 107, No = 210

227 total open-ended responses

If yes, why?

Road/Traffic Issues (38)

Traffic (6)
Too much traffic
Extra traffic, extra people
Extra traffic on roads (2)
Extra traffic, messing with spring
Traffic, no visible benefits seen for the parks and forests
Changed some areas, traffic
Before it would have been way less traffic
Yes. More traffic on the small roads leading into the parks and throughout the surrounding community
Have to put up with forest truck traffic
Truck traffic is very unpleasant
Seeing a lot of trucks and extra traffic
Truck traffic is a concern
Roads too busy
Lots of truck traffic and noise
Trucks on roads
Saw way too many semi-trucks on the roads. Interrupted the trip multiple times (had to pull off roads)
Following tanks/Lots of extra traffic
Roads have been rough
Just roads
Not friendly people, have torn up roads and forest
Much more traffic, heavy traffic destroying roads
Limited access, dusty roads
Coming up on the mountain, roads are bad
Unsafe driving
Yes, been run off road
Driving is a challenge
Traffic is more dangerous
Dangerous, areas are crowded, roads are dangerous
Mountain Rd 144 dangerous
Truck traffic annoying, potentially dangerous
More careful

Recreation Use on the State Forests Appendix

Effects on Wildlife/Hunting (23)

Less wildlife in forest
Less wildlife, further in the woods due to drilling
Wildlife is now very limited
Less wildlife
Can't see any wildlife
Scaring nature and animals away so they are not seen
Less fish
Ruined hunting, too many roads
Less deer, less enjoyable
Hunting has not been as enjoyable, the landscape has also been altered
Hunting is not as enjoyable due to the decline of the deer population
Hunting not as good
Hunting messed up
Messed up archery hunting
Worse hunting
Game deferred, crowding of land
There aren't any deer like there used to be
Surveys and seismic crews were very intrusive, caused a drop in deer populations as well sort of ruined hunting season
Scares deer (2)
Spooked deer
Drilling and blasting drives off the wildlife and makes hunting difficult
Occupy hunting land, blocking off roads for drivable trails
Now, he goes to different areas to hunt
Destroyed hunting areas

Noise/Visual Impacts (24)

Noise and traffic (8)
Noise and extra people
Traffic gets very noisy next to wells
Noise, traffic, pipe lines, extra unnatural features
Dramatically changed, wilderness no longer quiet, lots of truck traffic and noise
A lot of noise disturbance from the helicopter today
Helicopters, people all over the place
Come to the area to escape noise, drilling and pumping stations cause noise, State Forest should be left solely undeveloped
Last year it did, noise, all day long
In the winter, the heavy drilling noise, he likes to come out to SF for silence
Eyesore
Gas sites are incredibly ugly and noisy
Changes scenery (2)
Drilling sites are noticeable on side roads
Orange flagging all over the place
Too many markings
Don't think it looks the way it used to before the drilling

Changing Use Patterns (Displaced/Closed Areas) (10)

Places where the wells are, can't hunt there or get down to fishing area, I don't go camping there. I can't go other places
Can't use some area
Berry picking sites destroyed
Some areas are not accessible
More posted land
Don't drive normal routes, have to use more caution
Changed some of routine
Shuts roads down, loss of prior experience, can't hunt in forest areas
Restricted where they ride their motorcycles-potholes and road conditions, truck traffic
Areas around drill sites are not pleasurable to visit
Can't go on certain mountains because of gas people and related activity
Was going to buy a cabin but changed mind when found out about it

General Environmental Concerns (13)

Contaminate with smells
What used to be more pristine forest areas is now all torn up with gas activity; good for country that we have these resources but government has to make sure the companies are doing the right thing; should fine some out of business; the companies should be accountable for their damage
Not in agreement with the drilling, has changed their perspective of the forests with industrialization
Need more inspection and regulation
Destroying the forest
It has destroyed the pleasant feeling this forest once had
Locals should get perks from drilling
Negatively- they need to go
Not happy with the whole thing
Clearing of trees, pads
It's not as nice
Setting
Mixed blessing

Crowding/Loss of Solitude or Relaxation (9)

Limited access and extra people
Had to be more careful and alert, more people
In different areas - not bad at camp, but north is more crowded
Helicopters, people all over the place
More traffic/less serenity
Annoying
Hurts relaxation aspect of experience
Losing privacy that would have been here previously
Not as private as it used to be

Positive Impacts/Statements (3)

Lots of trees, better roads
Some trails are better
Roads all in great shape

If no, why not?

No Effect on Experience (43)

No change (7)
No direct effects (6)
Just doesn't affect me (4)
No effect on activities
Not affected by it for fishing or hunting
Do the same thing as always
Does not interfere with my activities
Doesn't prevent access to areas
No negative effect (2)
No impact, forest is still gorgeous
Doesn't impact it all, non-invasive
No impact from it
No visible impact (2)
No, hasn't hurt anything
No marked change
Not a lot of impact
Walked through and did recognize it but didn't bother me
Doesn't bother me
Not issue with his group
It is fine by him
Hasn't bothered
No conflict from it
Not much, more trucks from out of state on roads
Only notice it on the roads sometime
Other than traffic not really
Not that I know of
Not really

Don't Notice/Haven't Seen Any Activity (25)

No visible activity (5)
Haven't seen it (2)
Didn't see anything
Do not see it on this trip or any others
Didn't see any
No noticed change
Haven't noticed a change
Don't notice any difference

No noticeable drilling
Haven't noticed any effect
Haven't seen any eyesores, see some activity
Haven't noticed it so much
Not directly exposed to it right now
No, still hidden, very neat
Hasn't had much contact with it
We came up camping years ago before it started
No comparison, first time here (2)
Don't visit enough to notice a change
Only a once a year trip

Not Drilling Here (or in areas I care about) (17)

No activity here (6)
Haven't seen much of it here (2)
Hasn't changed here. They use this area or their camp
Right now they are not in this area
Not affected in the area
Haven't noticed it in this area
Has seen the activity elsewhere and its negative effects but hasn't seen them here
Didn't know there was any activity this far south
No impact in areas traveled
Areas visited are not affected at all
Not around so much

Changed Location/Adapted (6)

Just adapt to the changes (2)
Because we changed spot
Just hunt somewhere else
So far it hasn't affected it that much because I avoid other areas
Still going to recreate, lots of places to go to get away from, drillers are trying to be good neighbors

Not Yet (implies concern for future) (14)

Not yet (7)
They haven't been drilling in this area yet
Not affected this area yet
To date, no change
Not so far
Not seeing yet
Not yet, but it may
Concerned about dumping
No impact at all yet

Recreation Use on the State Forests Appendix

Don't Know About It (5)

Didn't know what it was (2)
Don't know about it
Not aware of Marcellus shale activity
Haven't drilled in the state forest that I know of
Because didn't know until recently, saw a map in a restaurant

Pro-Drilling (6)

Need gas, doesn't affect their everyday life
I like seeing the industry developing in our area
Every well site I've seen is well kept, have people who work for gas and confident they are doing their job
I have no problem with them drilling, they can drill all they want
Long term benefit, timber cutting beneficial
It's good for area

Susquehannock SF

Has Marcellus shale-related activity changed your recreational use of this state forest? *n* = 297, yes = 56, no = 242

223 total open-ended responses

If yes, why?

Road/Traffic Issues (19)

Heavy truck traffic
Traffic, road conditions
Lots of truck traffic, road conditions are worse
Traffic is heavy, dangerous
Too many trucks on the roads - Almost hit by one on my ATV
Water trucks make travel dangerous
Truck traffic has really increased here on this road
Gas trucks were all over the road
Road traffic and condition/deterioration, trucks ruin the road
Roads are bad, more traffic
Roads (2)
Road quality
They ruin the roads
Yes, Screw roads and woods up/ Heavy trucks destroy roads
Ruined a lot of things, ruined road. Dislike the gas well presence
Changed condition of roads
Tearing up roads, ruining trail traffic
Bad Roads

Changing Use Patterns (Displaced/Closed Areas) (13)

Avoids roads used by trucks
Changes in where you can go
Some of the best ATV trails are now closed
Some areas (near Haneyville) are restricted
Used to enjoy hiking in areas that are now used for drilling; now he goes elsewhere
Don't like the area disturbed by drilling
Block ski area, gravel on ski roads
If in snowmobile areas, access is more limited to trails because of drilling
So far some areas are not available because of drilling
Impact on the Chuck Keiper trail minimizes use and traffic limits visits, wiped out path of trail across from here
Concerns about whether to come here
Try to plan visit around well sites and reports of spills
Avoid where they are
Some areas, roads

Recreation Use on the State Forests Appendix

Effects on Wildlife/Hunting (10)

Use it less / less game
Change when I hunt
Can't hunt places where I used to
Changed hunting areas
Traffic diminished the hunting areas
Hunts deer - has to hunt harder
Scaring away game
Fire wells here, constant blowoff of something here, scares deer and turkey
Deer
Disturbs wildlife

Noise and Visual Impacts (6)

Too noisy, affects hiking
Ribbons and stakes and helicopter flying around is annoying
Visually unappealing
Wells are an eyesore
Ambient light is worse

General Environmental Concerns (10)

Risk of contamination; drillers are not local jobs
Environmental impact
Worried about water pollution
Important to test water, won't drink the water
Worried about water quality
Land takeover, chemicals
Lessen Wilderness
Trails a mess
Negatively
Very little impact, some trail damage

Positive Impacts/Statements (5)

Trucks are plowing roads not normally plowed for the winter
Allows more access to roads
More trails have been added
Helped pay for ATV with lease money
Works in industry - stays at camp 2 weeks

If no, why not?

No Effect on Use (47)

The area is beautiful as is
Love it still, come here the same
Come out here just as often (2)
Come here same amount as before they took over
Still recreate anyway
Do what we always do
I don't do anything differently (2)
Doesn't affect his activities
Doesn't affect him
Just doesn't affect it at all
No change at all (5)
Just come here anyways
No direct effects (4)
No effects at all from it (2)
Just doesn't bother them (3)
Doesn't bother him, used to the drilling, avoids problem areas
Hasn't bothered me, check every year so I'm not worried about them
ATVs are not obstructed by drilling activity
No interference to me
Not interfered with trail riding, camping
Doesn't interfere with trails
Drilling doesn't interfere with hunting (3)
We see it while hunting but hasn't really changed what we do
Hasn't changed where I hunt
Does not impact this recreational activity
Drill sites haven't impacted recreation
Not affected him so much
Not directly impacted (2)
No, did not impede anything
Because the area is state protected game lands
Wouldn't matter
Concerned but no change in use

Don't Notice/Haven't Seen Any Activity (38)

No visible activity (10)
Have not seen it (6)
Haven't encountered it (5)
Haven't experienced any
Didn't see any evidence
No noticeable activity, just some traffic
Not noticeable
Has not noticed a change
No visible impacts or interactions

Couldn't tell any difference
Didn't see any sign of any activity
No activity to be seen; only logging
Haven't seen much activity (2)
Not much activity
Doesn't visit often
Never been here before
Don't get in the woods as much as he used to, maybe would have affected him when he was younger
No reason (2)

Not Drilling Here (or in areas I care about) (31)

Not here (no drilling activity in this area) (18)
No change in this area directly
Areas used not in proximity to drilling (2)
Don't see them doing anything here; I don't have a problem; worried about habitat loss
Not affecting hunting here
Susquehannock trail system still open
Not on trails
Hasn't interfered with areas visited
Haven't run into any of it, not where I'm going
Haven't seen any in this area
Not really here, didn't notice them
Don't pay attention, haven't been where I am
Don't use these areas

Not Yet (implies concern for future) (30)

Not yet (16)
Not yet, but traffic
Not drilling here yet (3)
Not drilling in area yet (much)
Haven't seen any impact yet
Hasn't affected them yet
Hasn't affected us at all in the areas we are, so far
Stay at Ole Bull state park, no impact yet
Not here not yet, hope they don't mess the area up too bad, we have water well
Hasn't impacted yet where we ride, could impact water source
Hasn't changed it yet but I'm sure it will have an impact, worried about water/stream pollution, don't think there is enough enforcement of environmental regulations, as long as they clean up I don't have a problem, worried about habitat loss
No, as long as it doesn't ruin hunting
Been out of way, nothing seems too bad, worry about the creeks but Mother Nature will hopefully take the course

Don't Know About It (7)

Didn't know they were drilling

Not aware of any drilling activity here
Didn't know it was present
Didn't know where it was
Never heard of it
I don’t know
Not really, don't know much about it

Pro-Drilling (12)

Wish they'd do more of it, doesn't affect us at all
Waters unaffected, drillers cleaned-up areas drilled
As far as he knows, drilling has little to no impact on surface of land
More road access
State replaced old bridge - better roads
No, but very interested in seeing the drilling.
Hasn't bothered me, check every year so I'm not worried about them
Only thing I have against drilling is they are doing too much and flooding market, gone overboard with regulations on fracking (in NY), I work in oil business
It's a damn good idea to drill and get more, I like oil and gas
Making money from it
They are doing a good job, protecting water quality and environment
Good for everybody, creates jobs

Susquehannock SF

Has Marcellus shale-related activity changed your recreation experience at this state forest? *n* = 295 , Yes = 68, No = 228

204 total open-ended responses

If yes, why?

Road/Traffic Issues (14)

Traffic (3)
Truck traffic
Higher traffic, delays
Extra traffic
Traffic is heavy, dangerous
Road condition
Roads have been greatly used and damaged
They ruin the roads
Made roads a lot worse, they were bad to start with and are worse now
Roads are beat up making the drive in slow between the trails they haul
Trucks run me off the road
Trucks are scary drivers on main and back roads

Crowding/Loss of Solitude or Relaxation (7)

More people than previously, extra traffic on roads
Some areas are more crowded
More people on weekends
Slows me down
Limited space
Raised levels of anxiety concerning visits
Experience is less relaxing, more aggravating

Noise and Visual Impacts (11)

Visually
Some areas aren't as pretty and some areas are more crowded
Detracted from the natural setting
Wells are an eyesore
Visually unappealing environmental impact
Landscape stripped, changed beauty of landscape
Deforestation, loss of trails, light pollution equals a less enjoyable visit
Wilderness beauty
Inconvenience, big clearing up the roads on way in
Engine breaking noises
Noise, but has been better

Recreation Use on the State Forests Appendix

General Environmental Concerns (12)

Concern about water quality (3)
Saw film of oil on road; won't drink the water
Risk of contamination, drillers are not local jobs
Downstream from Lyman Run, concern that pollutants have already or have possibility of entering water table
Seen where they've bulldozed and cut well pads; state is going to be "caught holding the bag" in the future when clean-up is needed
Not as nice, messy and blocked trails, better signage for blocked trails
Feel vibration, really close
He has never seen the Susquehannock River so dry. Says the Marcellus drillers are taking water from the river to flush out oil
"Gasholes" men in the area are rude to locals
Pisses him off

Effects on Wildlife/Hunting (10)

Less game / more traffic/ gates
Less deer
There are less deer, more coyotes
Could have chased game out, didn't see much
More traffic on road disrupts wildlife
Truck traffic noise in deer season, fairly quiet here
Blow off scaring game, and noise
Too much noise - poor hunting now
Hard on hunting
Can't hunt in some areas

Changing Use Patterns (Displaced/Closed Areas) (9)

Some areas (near Haneyville) are restricted
Don't hunt some areas, if received royalty it would be better
Can't use some of the trails
Limits the range of rides causing inconvenience
Well pads on trail
Cuts into trails
Less trails = less for enjoyment
Has turned me off to going to areas for hiking where drilling is on-going, avoided these areas
Used to enjoy hiking in areas that are now used for drilling, now he goes elsewhere

Positive Impacts/Statements (5)

Roads are completed, the drive is nicer in some areas, bad in others
Made roads nicer in forest, made main roads worse, though
Makes more trails, better access to trails
More access = more areas to recreate
Has opened it up a bit, places where they have cleared wells, opening trails to see different area

If no, why not?

No Effect on Experience (40)

No effect (9)
Not directly impacted (6)
No change at all (4)
Just has not (3)
Not affected him so much
Just doesn't bother them
Not interfere with me
No effect on motorcycle riding today
Just come here anyways
Do everything I always did
Still able to enjoy the activities
Still recreate anyway
Still hunt
Hasn't changed where I hunt
Not really, more people [on] roads
Truck traffic, but no change in experience
Still hunting, clear cutting, roads in better shape
Not much
Because the area is state protected game lands
Commonly occurring subject here
As far as he knows, drilling has little to no impact on surface of land
Don't get in the woods as much as he used to, maybe would have affected him when he was younger

Don't Notice/Haven't Seen Any Activity (35)

No visible activity (12)
Haven't encountered any activity (6)
Not drilling
No activity
No activity to be seen, only logging
Have not seen it
Wouldn't know, haven't seen anything, doesn't affect us
No evidence of change (2)
Couldn't tell any difference
Not noticeable
No noticeable activity, just some traffic
Didn't see any sign of any activity
Haven't experienced any
Haven't seen much activity (2)
Never been here before
Doesn't visit often

Been out of way, nothing seems too bad, worry about the creeks but Mother Nature will hopefully take the course

Not Drilling Here (or in areas I care about) (19)

Not here (6)
Not drilling in this area (7)
Don't see them doing anything here, I don't have a problem, worried about habitat loss
Not in state forest, we live in Wellsboro and the roads are bad there
Susquehannock trail system still open
Areas used not in proximity to drilling
Haven't run into any of it, not where I'm going
Did not run into any activity

Not Yet (implies concern for future) (29)

Not yet (15)
Not drilling here yet (7)
Hasn't affected us at all in the areas we are, so far
As of right now, they aren't drilling where we hunt, haven't seen any activity here either
Stay at Ole Bull state park, no impact yet
Not drilling in area yet (much)
Not yet, but traffic
But we notice it more and more
Not yet but coming

Changed Location/Adapted (8)

Just adapts (2)
Go to other areas (2)
Don't go there
I stay away
Stay away / noisy
Doesn't bother him, used to the drilling, avoids problem areas

Don't Know About It (4)

Didn't know where it was
Didn't know they were drilling
Didn't know it was present
Never heard of it

Pro-Drilling (7)

Anything they do, they put it back to natural condition, my camp is right down there, haven't noticed anything. It's good for PA, lots of jobs
Still hunting, clear cutting, roads in better shape
Only thing I have against drilling is they are doing too much and flooding market, gone overboard with regulations on fracking (in NY), I work in oil business
All for it, drill it up, got to get the 'gas,' don't give money to the 'ragheads'
Making money from it

They are doing a good job, protecting water quality and environment

Haven't seen it except that improvements to the roads are nice/more accessible firewood from trimming trees

Appendix B

Zip Code Analysis of Sproul and Susquehannock State Forest Visitors

2011-12 Pennsylvania Visitor Use Monitoring
ZIP Code Data

Each of the three versions of the survey asked for the respondent's home ZIP code as part of the socio-demographic data. These ZIP codes were then uploaded into ArcMap GIS software (ESRI, 2012). A basic spatial analysis was conducted for each forest to determine the geographic distribution of the respondents. Straight-line distances were computed from the respondent's ZIP code to the forest headquarters. Additionally, a breakdown of respondents by state and Pennsylvania county was performed. The results are shown below, segmented by forest. Maps illustrating the geographic distribution of visitors are included at the end of this section.

Sproul State Forest Highlights

- The average straight-line distance from the respondents' home ZIP code to the Sproul State Forest Headquarters was 78 miles.
- About one-third (32.8%) of respondents' home ZIP codes were within 25 miles of the Sproul State Forest Headquarters, 68.4% were within 100 miles (Table 1).
- Respondents' home ZIP codes represent 12 states; 87.5% of the respondents reported a home ZIP code in Pennsylvania (Table 2).
- The Pennsylvania respondents' home ZIP codes represent 47 different counties (Table 3). The top three counties were Clinton (28.7%), Centre (17.7%), and Lycoming (6.5%).

Table 1. Straight-Line Distance from ZIP Code to Sproul State Forest Headquarters (n = 335)

Distance (miles)	Number of Responses	Percent*
Less than 25	110	32.8%
25-49	61	18.2%
50-99	58	17.3%
100-149	73	21.8%
150-199	18	5.4%
200+	15	4.5%

*may not add up to 100% due to rounding

Table 2. Sproul State Forest Responses by State (n = 335)

State	Number of Responses	Percent*
Pennsylvania	293	87.5%
New York	13	3.9%
New Jersey	12	3.6%
Ohio	5	1.5%
Maryland	4	1.2%
Wisconsin	2	.6%
Colorado	1	.3%
Delaware	1	.3%
Florida	1	.3%
Illinois	1	.3%
Michigan	1	.3%
West Virginia	1	.3%

*may not add up to 100% due to rounding

Table 3. Sproul State Forest Pennsylvania Responses by County (n = 293)

County	Number of Responses	Percent*
Clinton	84	28.7%
Centre	52	17.7%
Lycoming	19	6.5%
York	15	5.1%
Berks	10	3.4%
Clearfield	10	3.4%
Lancaster	10	3.4%
Cambria	6	2%
Dauphin	6	2%
Schuylkill	6	2%
Chester	5	1.7%
Cumberland	5	1.7%
Northumberland	5	1.7%
Allegheny	3	1%
Blair	3	1%
Lehigh	3	1%
Montgomery	3	1%
Perry	3	1%
Potter	3	1%
Snyder	3	1%
Union	3	1%
Bucks	2	.7%
Columbia	2	.7%
Crawford	2	.7%

Elk	2	.7%
Erie	2	.7%
Indiana	2	.7%
Jefferson	2	.7%
Lebanon	2	.7%
Philadelphia	2	.7%
Westmoreland	2	.7%
Adams	1	.3%
Bedford	1	.3%
Bradford	1	.3%
Butler	1	.3%
Cameron	1	.3%
Carbon	1	.3%
Franklin	1	.3%
Juniata	1	.3%
Luzerne	1	.3%
Mifflin	1	.3%
Montour	1	.3%
Northampton	1	.3%
Tioga	1	.3%
Washington	1	.3%
Wayne	1	.3%
Wyoming	1	.3%

*may not add up to 100% due to rounding

Susquehannock State Forest Highlights

- The average straight-line distance from the respondents' home ZIP code to the Susquehannock State Forest Headquarters was 109 miles.
- About one-tenth (11.5%) of respondents' home ZIP codes were within 25 miles of the Susquehannock State Forest Headquarters; 42.1% were within 100 miles (Table 4).
- Respondents' home ZIP codes represent 10 states; 86.5% of the respondents reported a home ZIP code in Pennsylvania (Table 5).
- The Pennsylvania respondents' home ZIP codes represent 52 different counties (Table 6). The top three counties were York (11.8%), Potter (11%), and Lancaster (9.5%).

Table 4. Straight-Line Distance from ZIP Code to Susquehannock State Forest Headquarters (n = 304)

Distance (miles)	Number of Responses	Percent*
Less than 25	35	11.5%
25-49	22	7.2%
5099	71	23.4%
100-149	117	38.5%
150-199	51	16.8%
200+	8	2.6%

*may not add up to 100% due to rounding

Table 5. Susquehannock State Forest Responses by State (n = 304)

State	Number of Responses	Percent*
Pennsylvania	263	86.5%
New York	25	8.2%
Ohio	4	1.3%
Virginia	3	1%
Maryland	2	.6%
Massachusetts	2	.6%
New Jersey	2	.6%
Delaware	1	.3%
New Hampshire	1	.3%
Vermont	1	.3%

*may not add up to 100% due to rounding

Table 6. Susquehannock State Forest Pennsylvania Responses by County (n = 263)

County	Number of Responses	Percent*
York	31	11.8%
Potter	29	11%
Lancaster	25	9.5%
Montgomery	12	4.6%
Snyder	11	4.2%
Chester	11	4.2%
Berks	9	3.4%
Dauphin	8	3%
Adams	7	2.7%
Northampton	7	2.7%
Clinton	6	2.3%
Blair	6	2.3%
McKean	6	2.3%
Perry	6	2.3%
Cambria	5	1.9%
Cumberland	5	1.9%
Tioga	5	1.9%
Schuylkill	4	1.5%
Centre	4	1.5%
Westmoreland	4	1.5%
Lebanon	4	1.5%
Northumberland	4	1.5%
Somerset	3	1.1%
Columbia	3	1.1%
Erie	3	1.1%
Franklin	3	1.1%
Bucks	3	1.1%
Washington	3	1.1%
Mifflin	3	1.1%
Butler	2	.7%
Cameron	2	.7%
Carbon	2	.7%
Clearfield	2	.7%
Philadelphia	2	.7%
Lehigh	2	.7%
Elk	2	.7%
Huntingdon	2	.7%
Allegheny	2	.7%
Bradford	2	.7%
Clarion	1	.4%
Indiana	1	.4%

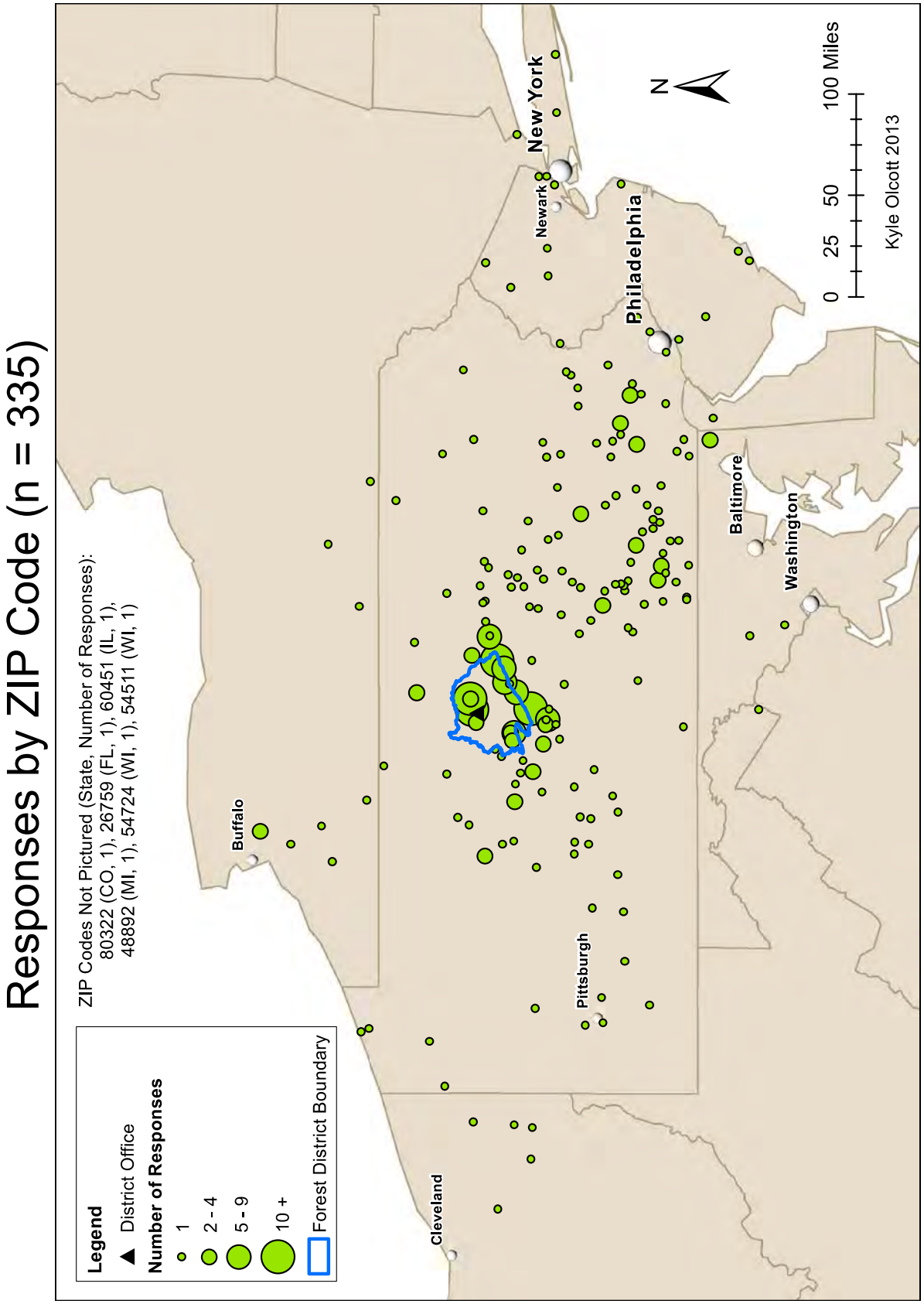
Juniata	1	.4%
Lycoming	1	.4%
Delaware	1	.4%
Fayette	1	.4%
Greene	1	.4%
Armstrong	1	.4%
Bedford	1	.4%
Union	1	.4%
Venango	1	.4%
Warren	1	.4%
Montour	1	.4%

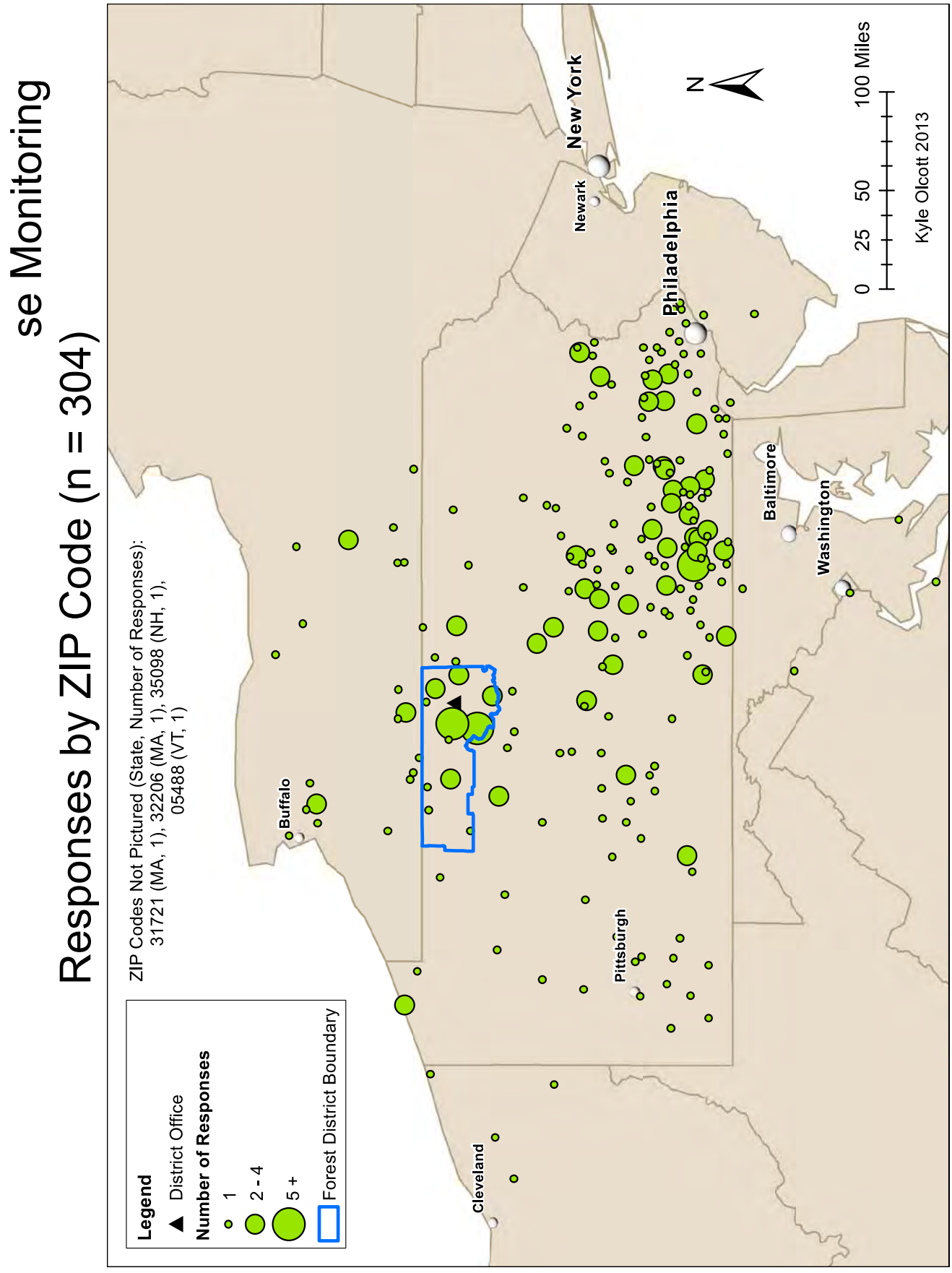
*may not add up to 100% due to rounding

Reference

ESRI 2012. ArcGIS Desktop. Release 10.1. Redlands, CA: Environmental Systems Research Institute.

g


Responses by ZIP Code (n = 335)
ZIP Codes Not Pictured (State, Number of Responses):
80322 (CO, 1), 26759 (FL, 1), 60451 (IL, 1),
48892 (MI, 1), 54724 (WI, 1), 54511 (WI, 1)
Legend
District Office
Number of Responses
1
2 - 4
5 - 9
10 +
Forest District Boundary
Buffalo
Cleveland
Pittsburgh
Philadelphia
Newark
New York
Baltimore
Washington
N
0 25 50 100 Miles
Kyle Olcott 2013


se Monitoring
Responses by ZIP Code (n = 304)
ZIP Codes Not Pictured (State, Number of Responses):
31721 (MA, 1), 32206 (MA, 1), 35098 (NH, 1),
05488 (VT, 1)
Legend
District Office
Number of Responses
1
2 - 4
5 +
Forest District Boundary
Buffalo
Cleveland
Pittsburgh
Newark
New York
Philadelphia
Baltimore
Washington
N
0 25 50 100 Miles
Kyle Olcott 2013

Appendix C

Survey Instrument

Sproul/Susquehannock State Forest:
2011 - 2012 Recreational Use Survey

Interviewer:_____ Site: _____ Date: _____

Time of Interview: _____ Vehicle Axle Count: _____ Clicker Count: _____

Hello, my name is _____, I'm from Penn State and we are doing a survey of State Forest visitors. The information collected will help the DCNR better serve their visitors. Your participation is voluntary and all information is confidential.
May I have a few minutes of your time to complete this survey?
___ Yes (If refusal, thank them for their time.)

Section 1 (Screening Questions)

1. What is the primary purpose of your visit to this site?

- ❑ Recreation—CONTINUE INTERVIEW
- ❑ Working or commuting to work (stop interview)
- ❑ Just stopped to use the bathroom (stop interview)
- ❑ Just passing through, going somewhere else (stop interview)
- ❑ Some other reason (specify)_____

Complete 2 and 2a for DUDS and OUDS ONLY

2. Are you leaving (site name) for the last time today or will you return later?

- ❑ Leaving for last time today
- ❑ Will return later

2a. When did you first arrive at (site name) on this visit?
Month_____ Day_____ Year_____ Time (military)_____

Complete for GFA ONLY

3. Are you leaving the Sproul/Susquehannock SF for the last time today or will you return later?

- ❑ Leaving for last time today
- ❑ Will return later

Section 2 (Basic Information)

Now I want to ask you some more questions about where you went on your whole visit to the **Sproul/Susquehannock** SF, which includes the use of this area and other portions of the **Sproul/Susquehannock** SF.

1. Did you spend last night in the Sproul/Susquehannock SF?
No Yes
❑ ❑ **If yes, how many nights in a row did you spend in the Sproul/Susquehannock SF?**
_____

2. When did you first arrive at the Sproul/Susquehannock on this recreation visit?
Month_____ Day_____ Year_____ Time (military)_____
❑ **Same as site arrival time**

3. When do you plan to finish your visit to the Sproul/Susquehannock SF on this recreation visit?
Month_____ Day_____ Year_____ Time (military)_____
❑ **Same as site arrival time**

4. What other areas did you visit, or do you plan to visit in the Sproul/Susquehannock SF for recreation on this trip? (List sites or areas visited)

_____

4a. Lodging facilities include campgrounds, cabins, hotels and lodges. How many different overnight lodging facilities will you use during this State Forest visit? Number_____

4b. How many developed day use sites (like picnic areas or visitor centers), not including trailheads, will you use on this trip to the Sproul/Susquehannock SF? Number_____

5. In what activities on this list did you participate during this recreation visit at the Sproul/Susquehannock SF? (Can choose more than one)		**6. Which of those is your primary activity for this recreation visit to the Sproul/Susquehannock? (Choose only one)**
Question 5 answers		**Question 6 answer**
	Fishing—all types	
	Hunting—all types	
	Viewing & Learning Nature & Culture	
	Viewing natural features such as scenery, wildlife, birds, flowers, fish, etc. (circle one)	
	Visiting historic and prehistoric sites/areas (circle one)	
	Nature study	
	Visiting a nature center, nature trail, or visitor center (circle one)	
	Nonmotorized Activities	
	Hiking or walking	
	Horseback riding	
	Bicycling, including mountain bikes (circle one)	
	Nonmotorized water travel (canoeing, sailing, kayaking, rafting, etc.)	
	Downhill skiing or snowboarding (circle one)	
	Cross-country skiing, snowshoeing (circle one)	
	Other nonmotorized activities (e.g. swimming, games & sports)	
	Motorized Activities	
	Driving for pleasure on roads	
	Riding in designated off-road vehicle areas (non-snow)	
	Snowmobile travel	
	Motorized water travel (boats, etc.)	
	Other motorized activities (endure events, games, etc.)	
	Camping or Other Overnight	
	Camping in developed sites (family or group sites)	
	Primitive camping (motorized)	
	Backpacking or camping in unroaded areas	
	Resorts, cabins, or other accommodations on State managed lands	
	Other Activities	
	Gathering mushrooms, berries, firewood, or other natural products	
	Relaxing, hanging out, escaping heat, noise, etc.	
	Picnicking and family gatherings in developed sites (family or group sites)	
	OTHER (fill in activity) _____	

7. Including this visit, about how many times have you come to the Sproul/Susquehannock SF for recreation in the past 12 months? Number_____

7a. How many of those visits were to participate in the main activity you identified a moment ago? Number_____

8. Overall, how satisfied or dissatisfied are you with this visit to the Sproul/Susquehannock State Forest? _____

- ❑ (1) Very dissatisfied
- ❑ (2) Somewhat dissatisfied
- ❑ (3) Neither dissatisfied nor satisfied
- ❑ (4) Somewhat satisfied
- ❑ (5) Very satisfied

9. What is your home ZIP code or Canadian postal code? _____

- ❑ **Visitor is from a country other than USA or Canada**

10. How many people (including you) traveled here in the same vehicle as you? Number_____

10a. How many of those people are less than 16 years old? Number_____

11. What is your age? Age_____

12. Gender? Male Female

13. Which of the following best describes you?

- ❑ Black/African American
- ❑ Asian
- ❑ White
- ❑ American Indian/Alaskan Native
- ❑ Native Hawaiian or other Pacific Islander
- ❑ Spanish, Hispanic or Latino
- ❑ Other _____

14. Information about income is important because people with different incomes come to the forest for different reasons. Into which income group would you say your household falls?

- ❑ Under $25,000
- ❑ $25,000-$49,999
- ❑ $50,000-$74,999
- ❑ $75,000-$99,999
- ❑ $100,000-$149,999
- ❑ $150,000 or over

___ Don't Know

___ Refused to Answer

Economics Addition

1. If for some reason you had been unable to go to the Sproul/Susquehannock SF for this visit, what would you have done instead:

- ❑ Gone elsewhere for the same activity
- ❑ Gone elsewhere for a different activity
- ❑ Come back another time
- ❑ Stayed home
- ❑ Gone to work at your regular job
- ❑ None of these: _____

2. About how much time, in total, will you be away from home on this recreation trip?

- ❑ Days _____ or
- ❑ Hours _____

3. On this trip, did you recreate at just the Sproul/Susquehannock SF, or did you go to other State Forests, parks, or recreation areas?

- ❑ Just the **Sproul/Susquehanna** SF (skip question 4, go to question 5)
- ❑ Other places (go to question 4)

4. Was the Sproul/Susquehannock SF your primary destination for this recreation trip?

❑ Yes ❑ No

5. Did you or other members of your party spend any money on this trip within 50 miles of this park?

___ Yes (Go to Question 6) ___ No (Skip to Question 7)

6. For the following categories, please estimate the amount you (and other members of your party) will spend within 50 miles of here on this trip.

Motel, Lodge, Cabin, B&B, etc. $ _____	Restaurants & Bars $ _____	Groceries $ _____	Outfitter Related Expenses (guide fees & equipment rentals) $ _____	Sporting Goods $ _____
Camping $ _____	Local Transportation (bus, shuttles, etc.) $ _____	Gasoline & Oil $ _____	Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.) $ _____	Souvenirs, Clothing, Other Misc. $ _____

6a. How many people do these trip expenditures cover? _____ group members

6b. In total, about how much did you and other people in your vehicle spend on this entire trip, from the time you left home until you return home? Dollar Amount_____

7. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

____ No (If no, why not?_____

8. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

____ No (If no, why not?_____

Satisfaction Addition

1. **This section asks you about your satisfaction with the recreation services and quality of the recreation facilities in the Sproul/Susquehannock SF. Please rate the following attributes of <u>this recreation site or area of the forest</u>. Also rate the importance of this attribute toward the overall quality of your recreation experience here.** Rate importance from 1 (=not important) to 5 (=very important) in terms of how this attribute contributes to your overall recreation experience.

	Poor	Fair	Average	Good	Very Good	N/A	**Importance**				
Scenery	1	2	3	4	5		1	2	3	4	5
Availability of parking	1	2	3	4	5		1	2	3	4	5
Parking lot condition	1	2	3	4	5		1	2	3	4	5
Cleanliness of restrooms	1	2	3	4	5		1	2	3	4	5
Condition of the natural environment	1	2	3	4	5		1	2	3	4	5
Condition of developed recreation facilities	1	2	3	4	5		1	2	3	4	5
Condition of Forest roads	1	2	3	4	5		1	2	3	4	5
Condition of Forest trails	1	2	3	4	5		1	2	3	4	5
Availability of information on recreation	1	2	3	4	5		1	2	3	4	5
Feeling of safety	1	2	3	4	5		1	2	3	4	5
Adequacy of signage	1	2	3	4	5		1	2	3	4	5
Helpfulness of employees	1	2	3	4	5		1	2	3	4	5
Attractiveness of the forest landscape	1	2	3	4	5		1	2	3	4	5

2. If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

_____

3. Please rate your perception about the number of people at this area today. Use a scale of 1 to 10, where 1 means there was hardly anyone else there, and 10 means that you thought the area was very overcrowded?

HARDLY ANYONE								VERY OVERCROWDED	
1	2	3	4	5	6	7	8	9	10

4. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

5. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

State Forest Experience Addition

1. Is this your first visit to the state forest?

❑ Yes ❑ No

[If no] In what year did you make your first visit to the state forest _____ year

In a typical year, how many days do you spend recreating in the state forest? _____ days

In a typical year, how many days do you spend recreating at other forest recreation sites outside of the state forest? _____ days

2. Which of the following best describes the composition of your group? [check only one]

❑ Alone ❑ Family

❑ Friends ❑ Family & friends

❑ Commercial group (group of people who paid a fee to participate in this trip) ❑ Organized group (club or other organization)

❑ Other [please specify]_____

3. Overall, how would you rate the quality of each of the following at the state forest:

	Awful	Fair	Good	Very Good	Excellent	Not applicable
Sanitation and cleanliness	1	2	3	4	5	NA
Safety and security	1	2	3	4	5	NA
Condition of latrines, picnic pavilions & other facilities	1	2	3	4	5	NA
Responsiveness of staff	1	2	3	4	5	NA
Natural environment	1	2	3	4	5	NA

4. Which of the following was the most important reason for this visit to the state forest? [Please check only one]

_____ I came here because I enjoy being in the forest

_____ I came here because it is a good place to spend time with friends/family

_____ I came here because it's a good place to :

_____ Hunt _____ Hike

_____ Bike _____ Horseback ride

_____ Fish

_____ Other reasons for visit (e.g., cabin owner, private inholding):

5. On a scale of 1 to 5, how do you feel about access to the forest: [1 poor, 5 very good]

By roads	1	2	3	4	5
By trails	1	2	3	4	5

6. Does anyone in your household have a disability?

❑ Yes ❑ No

6a. [If yes] Please tell us if you believe our facilities are adequate

7. Here is a list of possible reasons why people recreate at outdoor recreation sites. Please tell me how important each of the following benefits is to you as a reason for visiting a state forest in Pennsylvania. [one is not at all important and five is extremely important] [N/A does not apply to this question. Should be able to answer for each]

REASON	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important
To be outdoors	1	2	3	4	5
For relaxation	1	2	3	4	5
To get away from the regular routine	1	2	3	4	5
For the challenge or sport	1	2	3	4	5
For family recreation	1	2	3	4	5
For physical exercise	1	2	3	4	5
To be with my friends	1	2	3	4	5
To experience natural surroundings	1	2	3	4	5
To develop my skills	1	2	3	4	5

8. If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

_____

9. We are interested in knowing what facilities/services in the state forest are most important to you. Please tell me how important each of the below listed items is to you.

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important	No Opinion
Wildlife viewing areas or opportunities	1	2	3	4	5	x
Picnic areas	1	2	3	4	5	x
Parking	1	2	3	4	5	x
Signs directing me to recreation facilities	1	2	3	4	5	x
ATV Trails	1	2	3	4	5	x
Snowmobile Trails	1	2	3	4	5	x
Hike, bike, & horse (non-motorized)Trails	1	2	3	4	5	x
Printed Interpretive information	1	2	3	4	5	x

10. Please look at this list of statements that address your feelings about the recreation <u>area</u> that you visited on this trip in the state forest. Please indicate your level of agreement with each of the statements listed below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
This place means a lot to me	1	2	3	4	5
I enjoy recreating at this place more than other places I could visit	1	2	3	4	5
I am very attached to this place	1	2	3	4	5
I get more satisfaction out of visiting this place than from visiting most places	1	2	3	4	5

11. Have you obtained any information about this area during this trip or in preparation for it?

❑ Yes ❑ No

[If yes] Please continue with follow-up questions

11a. What type of information did you obtain?

❑ State forest map ❑ Trail map

❑ PA visitors guide ❑ Other:

11b. When did you receive information?

❑ Before leaving home ❑ After arriving here

11c. Where or from whom did you receive information?

11d. Was the information you received helpful to plan your trip?

❑ Yes ❑ No

[If no] what would have made the information more useful?

12. What services in nearby communities (OFF of the forest) do you wish were available? Please list:

_____

13. This section asks about your satisfaction with your recreation experience at <u>this recreation site</u> or <u>area of the forest.</u> Please rate the following attributes of this recreation site or area of the forest.

	Awful	Fair	Good	Very Good	Excellent	Not applicable
Opportunity to recreate without feeling crowded	1	2	3	4	5	NA
Places to recreate without conflict from other visitors	1	2	3	4	5	NA
Compatibility of recreation activities at the area	1	2	3	4	5	NA
Helpfulness/courteousness of Forest employees	1	2	3	4	5	NA
Helpfulness/courteousness of people in surrounding communities	1	2	3	4	5	NA

14. Was the state forest your primary destination for this recreation trip?

❑ Yes ❑ No

[If no] Please list your primary destination for this recreation trip:_____

15. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

16. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

Visitor Use Monitoring of Pennsylvania's State Forests: Year 3 Report – Tioga and Tiadaghton State Forests

by

Alan Graefe

Andrew Mowen

D. Kyle Olcott

Maxwell Olsen

Joel Mueller

Department of Recreation, Park and Tourism Management
The Pennsylvania State University

and

Donald English
USDA Forest Service

Final Report Submitted to the Pennsylvania Bureau of Forestry
Department of Conservation and Natural Resources
Harrisburg, Pennsylvania

September 30, 2015

Table of Contents

Introduction....1
Purpose....2
Objectives....2
Methodology....3
Organization of this Report....4
Recreation Use Estimates....5
Survey Results....11
- Trip Visitation Patterns....12
- Demographic Characteristics....15
- Activity Participation....16

Satisfaction Addition....18
- Satisfaction Ratings....18
- Importance Ratings....19
- Other Visitor Satisfaction Ratings....21
- Overall Satisfaction....21
- Crowding Ratings....22

Economics Addition....23
- Visitor Expenditures....25

Experience Addition....28
- Forest Access....28
- Recreation Experience....29
- Place Attachment....30
- Motivations/Reasons for Visiting the State Forest....32
- Visitor Response to Potential Facilities and Services....33
- Information Services....34
- Desired Services in Nearby Communities....35
- Visitor Response to Questions about Marcellus-Shale Related Activity....36

Summary and Conclusions....40
Appendices....43
- Appendix A – Visitor Responses to Open-ended Questions....43
- Appendix B – Zip Code Analysis of Tiadaghton and Tioga State Forest Visitors....89
- Appendix C – Survey Instrument....97

List of Tables

1 Description of the Sampling Sites....6
2 Summary of Mechanical and Observational Counts at Sampling Sites....8
3 Recreation Use Estimates for the Tiadaghton and Tioga State Forests....10
4 Trip Visitation Patterns in the State Forests....13
5 Demographic Characteristics of State Forest Visitors....15
6 Activity Participation of State Forest Visitors....16
7 Satisfaction Ratings for Customer Service Attributes in the State Forests....18
8 Importance Ratings for Customer Service Attributes in the State Forests....20
9 Visitor Satisfaction Ratings for Various Forest Attributes....21
10 Overall Satisfaction of State Forest Visitors....21
11 Summary of Perceived Crowding Ratings....22
12 State Forest Recreation Trip Profile (for economics section)....24
13 Summary of Trip Spending Patterns of State Forest Visitors....26
14 Amount Spent for Various Categories of Trip Expenditures....27
15 Visitor Ratings of Access to the State Forests....28
16 Visitor Ratings for Various Recreation Experience Attributes....29
17 Most Important Reason for this Visit to the State Forest....30
18 Summary of Place Attachment Scale Items....31
19 Summary of Motivations/Reasons for Recreating in the State Forests....32
20 Visitor Importance Ratings for Various Types of Facilities and Services....33
21 Visitor Responses to Questions about Information Services....34
22 Visitor Responses to Services Visitors Wish Were Available in Nearby Communities....35
23 Visitor Responses to Questions about Marcellus Shale-Related Activity....36
24 Responses to How Marcellus Shale-related Activity has Changed your Use of the Forest....37
25 Responses to Why Marcellus Shale-related Activity has not Changed your Use of the Forest....38
26 Responses to How Marcellus Shale-related Activity has Changed your Recreation Experience at the Forest....38
27 Responses to Why Marcellus Shale-related Activity has not Changed your Recreation Experience at the Forest....39

Introduction

Resource managers in the Pennsylvania Department of Conservation and Natural Resources have identified a need to better understand the recreational visitors who use the State Forests and State Parks. This need includes understanding visitors' use patterns, as well as their expectations, spending patterns, desires and satisfaction levels. Relevant questions asked by managers might include:

i) Who are our customers?
   - What are the primary customer segments and sub segments?
   - What is the profile of each segment and sub segment?
   - What are the patterns of use, trip characteristics, purpose of visit, and demographic characteristics of our visitors?
   - What is our market niche?
   - What is the average number of vehicles entering/exiting State Forest/Park sites?
   - What is the average number of people per vehicle?

ii) What are our customers looking for?
   - What are their expectations and satisfaction levels?
   - What gaps exist between expectations and satisfaction levels?
   - What do they want in terms of information/interpretation, services, and amenities?
   - What kind of experience do they desire?
   - What are their preferences for facilities?
   - How well are we performing in key areas (service, facilities, law enforcement, information/interpretation, resource protection, and visitor experience)?
   - What is an acceptable level of services/maintenance given existing and projected budget constraints?
   - What are the barriers to participation?

iii) What is the economic impact of State Forest/Park visitors?
   - How are State Forest/Park visitors impacted by oil and gas drilling operations on and surrounding State Forests and State Parks?

Purpose

The purpose of this study is to develop a long-term, systematic approach for answering such questions about Pennsylvania State Forest and State Park visitors. The study will survey visitors at selected State Forests and Parks over a five year period to measure recreational use and gather data to provide a profile of recreational visitors. Sampling will be designed to measure and describe recreation use on two State Forests and six State Parks per year over a five-year study period. In total, 10 forests and 30 parks will be surveyed during the five-year duration of the project. After the initial study period, additional surveying may be conducted.

This report provides results from the third year of the project. Specifically, surveys were conducted in the Tioga State Forest (District #16) and the Tiadaghton State Forest (District #12) to measure recreation use and develop a profile of State Forest visitors and their use patterns. Concurrently, surveys were conducted in six State Parks located adjacent to or near these two State Forests (Little Pine, R. B. Winter, Worlds End, Hills Creek, Leonard Harrison, Colton Point). Results from the State Park surveys are presented in a separate report.

This project builds on earlier surveys and will incrementally create a database that can be used to better understand State Forest and State Park visitors and provide a longitudinal database for tracking trends in State Forest and State Park use. For example, results can be used to compare participation patterns and visitor characteristics for different individual forests and parks. As the database grows, findings can be extrapolated to the entire state systems and will ultimately represent all State Forests and State Parks within the Commonwealth by the end of the five-year study.

Objectives

1. To conduct surveys of visitors to selected Pennsylvania State Forest and State Park areas and develop a visitor profile, including information on the origin of visitors (e.g. local, non-local resident, out of state), trip context and purpose (e.g. day versus overnight visitor, primary purpose versus casual visitor), length of stay in the area, spending patterns, size and type of visiting groups, previous visitation history, activities pursued, and different patterns of visitation across seasons.

2. To measure overall recreation use and specific visitation patterns within the selected State Forests and State Parks, including the number of visitors per vehicle and the distribution of use across different types of sites within the given State Forest/Park.

3. To develop a demographic profile of visitors at the designated State Forests/Parks.

4. To identify visitor expectations and levels of satisfaction with various aspects of their visit.

5. To examine visitor opinions about possible future management practices occurring in State Forests/Parks and facility development decisions.

6. To examine visitor reactions to oil and gas activities and the impacts these activities have on recreational visitation patterns and visitor experiences.

7. To measure visitor expenditures and extrapolate these to determine their level of economic impact on surrounding communities.

Methodology

Data were collected through the use of on-site interviews and use measurements at a stratified random sample of the forests' developed sites and dispersed areas open for recreation. The overall survey methodology and sampling design is directly comparable to and consistent with the procedures established for the U.S. Forest Service's National Visitor Use Monitoring (NVUM) program. Details for the sampling and analysis approach for that program can be found in a report by English et al. (2001), available on the USDA Forest Service website for the National Visitor Use Monitoring Program.[1] A detailed sampling schedule, which identified the site, day, and time of day for on-site interviewing, was established for each forest in consultation with Bureau of Forestry personnel. Prior to the survey, meetings were held with the district forester and key staff in each forest to identify the range of sampling locations for each forest. The potential survey sites were visited by project personnel to confirm their suitability for the study and identify an optimal protocol and design of the sampling station for each site. A sample site inventory was created, with input from each forest's staff, to categorize the use levels for all designated sites and days of the year. From this matrix, a detailed random sampling calendar was developed by Dr. Donald English, manager of the NVUM program for the USDA Forest Service. The sampling schedule provided for a total of 200 sampling days per forest, allocated over various sampling strata per forest, and distributed throughout the calendar year.

Sampling for the survey was designed to obtain a database that accurately describes overall use of the forests, as well as use of selected types of sites and individual areas of particular interest within the State Forests. All on-site interviewing, data entry, and analysis were conducted by trained project staff. Concurrent with the visitor survey, area use patterns

[1] English, D. B. K., Kocis, S. M., Zarnoch, S. J., & Arnold,. J. R. 2001. Forest Service National Visitor Use Monitoring Process: Research Method Documentation. http://www.fs.fed.us/recreation/programs/nvum

were measured through traffic and trail counters and observations of vehicles using the area. Both the visitor count data and visitor survey data will later be used to validate and calibrate visitor use monitoring methods for future application in the State Forests.

On-site face-to-face interviews were used to obtain data from a sample of recreationists visiting the Tiadaghton and Tioga State Forests. The on-site survey took approximately 5-15 minutes to complete, depending on which survey was used in the interview. Approximately one-third of the visitors were interviewed with the basic version/experience addition, another third received the basic/satisfaction addition and the remaining third completed the basic/economics addition.

All of the sampling for this study followed a detailed sampling schedule and took place between 8:00 am and 8:00 pm, during a morning shift or an afternoon shift. The morning sampling period ran from 8:00 am to 2:00 pm, while the afternoon sampling period ran from 2:00 pm to 8:00 pm.

Organization of this Report

This report summarizes the results of visitor surveys conducted on the State Forests during the period October 1, 2013 through September 30, 2014. The results are organized by topic area, with different sections corresponding to different versions of the survey. Each section follows a consistent format, with the results reported separately for each forest. Appendices to the report include responses to open-ended questions in the survey and a copy of the survey instrument used.

Recreation Use Estimates

Following the National Visitor Use Monitoring (NVUM) protocols, recreation use of the State Forests was estimated through a process of obtaining mechanical traffic counts, calibrated by observation and on-site interviewing, at the sample of recreation sites and days scheduled throughout the study year. Mechanical traffic counts were obtained for a 24-hour period on the targeted sample days. Interviewers were on site for a 6-hour period. During that time, they both visually calibrated the mechanical counter by observing and counting exiting traffic, and interviewed a random sample of exiting visitors. State Forest sampling sites included all potential places that recreation users could exit the forests, and were classified by types and use levels (Table 1). Most of the sampling days were conducted at general forest area (GFA) sites. Such sites provide access to the forest without concentrating use at the site itself, and include trailheads, river put-in and take-out points, forest roads, etc. Other sampling categories include day use developed sites (DUDS) such as picnic areas, scenic overlooks and the like, overnight use developed sites (OUDS) including camping areas, cabins, resorts, etc., and "special areas." The latter category includes designated "natural" and "wild" areas of the state forests, and is analogous to the designated Wilderness areas within the national forests.

In addition to these categories, field personnel spent several days in each Forest at "View Corridor" sites. The view corridor sites were located on two higher volume paved roads in each Forest (Routes 44 and 414 in the Tiadaghton and Routes 6 and 414 in the Tioga). The intent of sampling at those sites was to estimate the volume of scenic driving through the respective State Forests, above and beyond that occurring on the forest roads already included in the sampling of GFA sites. Since traffic on these state routes includes all types of vehicles (work and commuting vehicles, etc.) and cannot all be considered scenic driving in the State Forest, the total traffic counts were adjusted to estimate the number of vehicles that could be considered participating in sightseeing or scenic driving to any degree. As for the other types of sites, mechanical traffic counts were obtained after 6 hours and 24 hours. Simultaneously, traffic was observed and counted in hourly intervals and categorized as regular vehicles and commercial vehicles during the 6-hour field visit. The visual counts were used to validate the 6-hour mechanical traffic counts. No interviews were conducted at these sites due to safety concerns related to the higher speed and volume of traffic. The proportion of scenic driving was estimated using data from the National Visitor Use Monitoring study conducted in the Allegheny National Forest, and validated with the activity participation data collected in the current State Forest study.

Since most recreation use of the State Forests is dispersed rather than focused at developed day use or overnight use areas, GFA sites accounted for the greatest number of sampling days and completed interviews across both forests. Sampling of State Forest sites was also stratified by level of recreational use, including three use levels as estimated by Bureau of Forestry personnel (Table 1). More specifically, the sampling strata were defined by best available estimates of the daily volume of exiting recreation traffic at each site, and classified as Low, Medium, and High. These estimated levels were based on relative criteria for each type of site and based on the collective knowledge and experience of Bureau of Forestry personnel.

Table 1. Description of the Sampling Sites.

	Tiadaghton		**Tioga**	
	Percent of Sampling Days	**Percent of Interviews**	**Percent of Sampling Days**	**Percent of Interviews**
Site Type				
General Forest Area (GFA)	51.3	42.9	43.9	50.2
Day Use Developed Site (DUDS)	16.6	35.7	16.8	22.2
Overnight Use Developed Site (OUDS)	16.6	4.9	16.3	12.6
Special Area	13.6	16.5	19.9	15.0
View Corridor	2.0	0	3.1	0
Total	100.0	100.0	100.0	100.0
Use Level Stratum				
High	23.6	42.5	25.0	43.0
Medium	34.2	32.5	32.1	36.2
Low	42.2	25.0	42.9	20.8
Total	100.0	100.0	100.0	100.0

Stratification was designed to reduce the overall variance of the visitation estimate, and to ensure an adequate representation of varying levels of recreation throughout the study year. About one-third of the sampling days and corresponding interviews were completed during high, medium, and low use periods. Survey results were weighted to the population of days in each stratum to correctly represent the use distribution across the various types of sites within the State Forests.

Pneumatic traffic counters were used to measure vehicular use at suitable locations such as forest roads and parking lots. Field personnel recorded counts at the end of each 6-hour sampling period and again after 24 hours had elapsed. Comparing the mechanical and observational counts at the end of the 6-hour period provides a calibration that can be used with the 24-hour mechanical counts to obtain an estimate of total daily exiting traffic. Survey screening questions were used to determine the proportion of exiting traffic that was completing

a recreation visit, as well as the proportion of recreational visitors compared to other users of forest sites. Non-recreational forest users included those who were working or commuting to work, just passing through, or there for some other reason. Additional survey questions were used to convert vehicle counts to visitor estimates, based on the number of people per vehicle.

The 6-hour mechanical traffic counts ranged from 0 to 683, with a mean of 20.4 vehicles counted on the Tiadaghton and 28.7 vehicles on the Tioga (Table 2). A significant number (12-22%) of these counts were zero, reflecting no traffic during the 6-hour sampling period. The 24-hour counts ranged from 0 to 2,118, with a mean of 70.9 on the Tiadaghton and 77.2 on the Tioga. The hand tally counts for the 6-hour sampling periods averaged 9.1 and 12.7 on the Tiadaghton and Tioga State Forests, respectively. These counts were naturally lower than (about half of) the corresponding 6-hour mechanical counts because the observational counts included only one-way (exiting) traffic while the mechanical counters recorded traffic moving in both directions. The 6-hour counts obtained via the hand tally clickers and mechanical traffic counters showed a very high degree of correlation (.97 on both Forests), lending additional validity to the estimates of visitor use levels.

Results from the traffic counts and completed surveys were used to estimate total recreational use of the State Forests. Data were extrapolated from the sampled site-day combinations to all site-days within each stratum and totaled for the entire forest. The results include two measures of recreational use per forest: 1) the total number of individual site visits, and 2) the total number of recreational forest visits. Since many visits to the State Forests tend to include visits to more than one different site during each visit, the total site visits are considerably higher than the number of forest visits.

Table 2. Summary of Mechanical and Observational Counts at Sampling Sites

	Tiadaghton	Tioga
Pneumatic Traffic Counter		
6-hour Traffic Counts (Percent)		
0	21.9	11.8
1 - 2	10.8	9.1
3 - 5	11.7	14.9
6 - 9	11.7	12.9
10 - 30	30.6	32.6
31 or more	13.3	18.7
Total	100.0	100.0
Mean	20.4	28.7
24-hour Traffic Counts (Percent)		
0	7.1	3.8
1 - 5	14.7	10.7
6 - 10	8.3	6.3
11 - 25	17.3	25.1
26 - 40	12.9	9.4
41 - 60	12.8	16.4
61 or more	26.9	28.3
Total	100.0	100.0
Mean	70.9	77.2
6-hour Hand Clicker Counts (Percent)		
0	23.4	14.9
1 – 2	21.3	22.0
3 – 5	18.8	14.4
6 – 10	15.7	21.0
11 or more	20.8	27.7
Total	100.0	100.0
Mean	9.1	12.7

A State Forest recreation visit is defined as “one person entering and exiting a State Forest for the purpose of recreation” (English et al., 2001). A single visitor may participate in any number of activities and visit any number of sites within a single visit. Also, a single visit can last multiple days or might be one person or group visiting a single site on a day trip for any amount of time. Site and forest recreation visits were estimated using the following process and data shown in Table 3. First, 24-hour traffic counts were used to measure the number of vehicles leaving the forest on any given day (Table 3, column 1). The vehicle counts within each stratum were multiplied by the percentage of exiting traffic whose purpose for visiting the forest was for recreation (column 2). To avoid double counting visitors who may be traveling to and from a site within the day, the next step was to multiply the number of vehicles on recreation trips by

the percentage of visitors reporting they were leaving the site for the last time that day (column 3). To convert the units from vehicles to people, the next step was to multiply by the average number of people per vehicle for each site-use stratum (column 4), resulting in an estimate of total daily recreation visits for each site-use category (column 5).

To convert daily recreation use measures to total forest use for the entire calendar year, the average daily use estimates were extrapolated to the population of site days (or total number of days at all sites for each site type and use level) in the year, shown in column 6. The results of this calculation represent the total yearly recreation site visits for all sites in each site type-level category (column 7). Finally, one additional variable was used to estimate the number of State Forest visits for each strata: the number of sites visited within the forest during the current visit. Visitors reported visiting an average of 1.76 sites in the Tiadaghton and 1.65 sites in the Tioga during their current visit. The number of site recreation visits was adjusted by the number of sites visited by each respondent, resulting in the estimated number of forest visits (column 8).

The Tiadaghton State Forest received an estimated 221,687 recreational visits during the study year (October 1, 2013 – September 30, 2014). These forest visits included a total of 390,169 individual site visits, or about 1.76 site visits for each State Forest visit. The Tioga State Forest received an estimated 252,723 recreational visits and 416,993 individual forest site visits during the same period (about 1.65 site visits per forest visit).

In addition to these recreation visits to the State Forests, the number of scenic driving visits was also estimated via the sampling procedure described above for the "View Corridor" locations. From the observational counts conducted, the number of vehicles per day ranged from 124 to 2,118 total vehicles in the Tioga (average = 1,020 vehicles) and from 691 to 1,242 in the Tiadaghton (average = 925 vehicles), and the proportion of non-commercial traffic averaged 79% to 87% for the different highways in these Forests. From these traffic counts and data from the visitor surveys on activity participation and number of people per vehicle, the total number of "viewing" or "sightseeing" visits was estimated to be 726,510 visits for the Tioga State Forest and 626,340 visits for the Tiadaghton State Forest. These annual visitation estimates might be considered another form of more passive or secondary use of the State Forests, above and beyond the primary recreation use measured in the visitor surveys conducted at the various sites throughout the Forests. While we have no data on how much sightseeing or other recreation activities these people may be doing, they are traveling through the Forests and may be partaking of their scenic or other values.

Table 3. Recreation Use Estimates for the Tiadaghton and Tioga State Forests

Tiadaghton State Forest								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Site Type and Use Strata	**1-way Traffic Count**	**% Recreation Visits**	**% Leaving for Last Time**	**People per Vehicle**	**Recreation Visits per day**	**Site days in year**	**Total Site Visits**	**Total Forest Visits**
GFA–High	38.531	0.512	0.878	2.52	43.65	2234	97,513	55,405
GFA-Medium	32.540	0.557	0.692	1.86	23.33	6075	141,722	80,524
GFA–Low	8.617	0.407	0.677	2.06	4.89	9211	45,050	25,597
DUDS–High	35.500	0.405	0.950	2.72	37.15	74	2,749	1,562
DUDS-Medium	28.850	0.619	0.947	2.15	36.36	334	12,144	6,900
DUDS–Low	26.167	0.366	1.000	1.60	15.32	687	10,527	5,981
OUDS-High	21.905	0.868	0.560	3.26	34.71	148	5,137	2,919
OUDS-Medium	21.905	0.868	0.560	2.88	30.67	520	15,946	9,060
OUDS-Low	21.905	0.868	0.560	3.00	31.94	792	25,299	14,374
Special-High	0.000					0		
Special-Medium	19.775	0.406	0.826	2.19	14.52	370	5,374	3,053
Special–Low	18.775	0.469	0.679	3.30	19.73	1455	28,708	16,311
Forest Total							390,169	221,687
Tioga State Forest								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Site Type and Use Strata	**1-way Traffic Count**	**% Recreation Visits**	**% Leaving for Last Time**	**People per Vehicle**	**Recreation Visits per day**	**Site days in year**	**Total Site Visits**	**Total Forest Visits**
GFA–High	49.615	0.725	0.724	2.82	73.44	976	71,678	43,441
GFA-Medium	35.260	0.522	0.732	2.39	32.20	3807	122,587	74,295
GFA–Low	13.870	0.500	0.875	2.02	12.26	9452	115,859	70,218
DUDS–High	51.090	0.743	0.904	2.90	99.52	76	7,563	4,584
DUDS-Medium	33.545	0.738	0.613	2.35	35.66	253	9,023	5,468
DUDS–Low	38.930	0.448	0.833	2.22	32.25	1496	48,249	29,242
OUDS-High	22.250	0.895	0.320	2.88	18.35	189	3,469	2,102
OUDS-Medium	17.110	0.684	0.524	2.81	17.23	507	8,737	5,295
OUDS-Low	22.250	0.778	0.346	3.04	18.21	764	13,911	8,431
Special–High	28.460	0.800	0.682	2.61	40.53	144	5,836	3,537
Special-Medium	11.575	0.756	0.839	1.74	12.77	302	3,858	2,338
Special–Low	6.700	0.857	1.000	1.67	9.59	649	6,223	3,772
Forest Total							416,993	252,723

Survey Results

Overall, the survey sampled a total of 1,881State Forest visitors. Among these, 1,539 people were willing to participate in the interview, representing a response rate of 82%. Of the unwilling visitors, 30 were people who had already completed the survey and were screened out. Thus the overall response rate, reflecting the proportion of selected visitors who were willing to complete the survey, was 83%.

One of the initial screening questions in the survey asked the visitors, "What is the primary purpose of your visit to this site?" Responses included: recreation, working or commuting to work, just stopping to use the bathroom, just passing through/going somewhere else, and some other reason. Among these forest visitors, over half (58%) stated they were visiting the forest for recreation. Only those respondents who were visiting the forest for recreation were included in the estimates of recreation use and descriptions of visitors in this report. Most of the remaining individuals in the sample were working or commuting to work (27%), just passing through (8%), stopping to use the bathroom (1%) or there for some other reason (5%). Other reasons mentioned by respondents included travel to residences or private cabins, scouting for upcoming events, dropping off canoes or cars for a shuttle, cutting or purchasing wood, and just turning around or making a wrong turn.

Trip Visitation Patterns on the State Forests

- Most of the visitors contacted (89% in the Tiadaghton and 88% in the Tioga) were repeat visitors to the State Forest.
- Among those who were repeat visitors, about one-third (35% in the Tiadaghton and 28% in the Tioga) had made their first visit to the Forests prior to 1980. About 40% in both Forests made their first visit during the 1980s or 1990s. The remaining 11% were relatively new visitors, reporting their first visit between 2000 and 2014.
- Tioga State Forest visitors reported visiting the forest more often than Tiadaghton State Forest visitors.
  - About half of the Tiadaghton visitors (54%) and one-third (36%) of the Tioga visitors indicated that they typically make between 0 and 5 visits to the State Forest per year.
  - The average number of reported trips to the forest per year was about 26 for the Tioga and 22 for the Tiadaghton.
- About one-third (34%) of the Tiadaghton visitors and one-half (54%) of the Tioga visitors contacted indicated that they typically make between 0 and 5 visits to other forest areas each year (these could include other State Forests or any other public or private forests the respondent visited), and the average number of trips to other forests per year was about 21 and 15, respectively for the Tiadaghton and Tioga State Forests.
- The majority of visitors sampled in both forests were overnight users.
  - Tiadaghton visitors were much more likely (83%) than Tioga visitors (55%) to be on overnight trips to the state forest.
  - Of those respondents who were overnight visitors, the average length of stay was nearly the same in both Forests (2.7 nights in the Tiadaghton and 2.6 nights in the Tioga).
- Over one-half of the visitors in both forests indicated that they used no day use facilities during their visit, while the remaining visitors used one or more day use facilities on this trip. Day use facilities included several picnic and parking areas, visitor centers, and trail systems.
- About two-thirds (67-68%) of the respondents in both Forests had just one or two people in their vehicle on this trip. The average number of persons per vehicle was 2.5 in the Tiadaghton and 2.6 in the Tioga State Forest.
- About one-fifth (18-20%) of the respondents in both Forests reported that they had at least one child under the age of 16 with them.
- The most common group type in both Forests was family groups (38% in the Tiadaghton and 48% in the Tioga), with smaller proportions coming in groups of friends and groups containing family and friends.
- Less than one-fifth (13-19%) of the visitors in both Forests came to the Forest alone.

Table 4. Trip Visitation Patterns in the State Forests

	Valid Percent*	
	Tiadaghton	**Tioga**
Previous Visitation History		
First Time Visitor	10.9	12.3
Repeat Visitor	89.1	87.7
Total	100.0	100.0
Year of First Visit		
Prior to 1980	35.2	28.1
1980-1989	20.0	19.0
1990-1999	17.2	19.0
2000-2009	16.2	22.6
2010-2014	11.4	11.3
Total	100.0	100.0
Number of Visits to This State Forest in Typical Year		
0-5	53.5	35.9
6-10	14.5	21.1
11-20	14.0	14.1
21-50	9.6	16.2
More than 50	8.3	12.7
Total	100.0	100.0
Mean	21.7	25.6
Number of Visits to Other Forests in Typical Year		
0-5	34.3	53.6
6-10	23.5	17.8
11-20	19.6	12.9
21-50	14.7	9.3
More than 50	7.8	6.4
Total	100.0	100.0
Mean	20.8	14.6
Length of Stay		
Overnight Visitor	82.8	54.9
Day User	17.2	45.1
Total	100.0	100.0
Number of Nights Spent (Overnight Visitors)		
1	15.8	16.8
2	39.0	46.2
3-5	40.4	33.2
6 or more	4.9	3.8
Total	100.1	100.0
Mean	2.7	2.6
Number of Day Use Facilities Used During This Trip		
0	55.9	52.3
1	31.4	30.1
2 or more	12.8	17.6
Total	100.1	100.0

	Valid Percent*	
	Tiadaghton	**Tioga**
Number of People in Vehicle		
1-2	68.2	66.9
3-4	22.7	22.2
5 or more	9.0	10.9
Total	99.9	100.0
Mean	2.4	2.6
Number of People Less than 16 Years Old in Vehicle		
0	81.9	79.5
1	7.6	8.8
2	6.8	7.0
3 or more	3.7	4.7
Total	100.0	100.0
Type of Group		
alone	18.5	13.0
family	37.8	48.4
friends	28.6	21.7
family and friends	14.3	16.1
other	0.8	.6
Total	100.0	99.8

*Percentages may not equal 100% because of rounding.

Demographic Characteristics of State Forest Visitors

- About three-fourths (73-75%) of the respondents in both State Forests were males.
- About one-fourth of the visitors surveyed in the State Forests (27-28%) were between the ages of 36-50, while another one-third (32-33%) were between 51 and 64.
- The average age of visitors was 51 in the Tiadaghton and 49 in the Tioga State Forest.
- Almost all of the State Forest visitors surveyed reported their race/ethnicity as White/Caucasian.
- Other ethnicities reported by visitors included Asian, African-American, and American Indian/Alaskan Native.
- Less than one-tenth of the visiting groups included a person with a disability in their household.

Table 5. Demographic Characteristics of State Forest Visitors

	Valid Percent*	
	Tiadaghton	**Tioga**
Gender		
Male	75.2	72.9
Female	24.8	27.1
Total	100.0	100.0
Age		
18 to 35	17.7	23.5
36 to 50	27.9	26.8
51 to 64	33.3	32.2
65 or older	21.1	17.5
Total	100.0	100.0
Mean	51.1	48.5
Ethnicity		
Caucasian	98.2	99.0
Other	1.9	1.0
Total	100.1	100.0
Income		
Under $25,000	7.6	8.7
$25,000-$49,999	26.2	27.4
$50,000-$74,999	27.1	25.4
$75,000-$99,999	21.0	19.8
$100,000-$149,999	11.4	12.7
$150,000 or over	6.7	6.0
Total	100.0	100.0
Does anyone in your household have a disability?		
Yes	4.3	7.4
No	95.7	92.6
Total	100.0	100.0

*Percentages may not equal 100% because of rounding.

Activity Participation

The basic survey administered to all visitors included a detailed list of recreational activities. Respondents were asked to identify each activity that they had participated in (or planned to participate in) during their visit, as well as their primary activity on this trip (Table 6). The first column for each forest (activity participation) shows the range in numbers of visitors participating in the various activities, while the primary activity column reflects what the visitors considered their most important purpose for visiting the forest on this trip.

Table 6. Activity Participation of State Forest Visitors (during this recreation visit)

	Tiadaghton		Tioga	
Consumptive Activities	**Activity Participation***	**Primary Activity+**	**Activity Participation***	**Primary Activity+**
Fishing—all types	29.7	16.4	25.5	12.6
Hunting—all types	12.7	8.2	14.5	8.3
Viewing, Learning about Nature & Culture				
Viewing natural features such as scenery, wildlife, birds, flowers, fish, etc.	53.0	6.9	55.6	6.4
Visiting historic and prehistoric sites/areas	5.5	0	4.4	0
Nature study	10.4	1.1	12.6	0.6
Visiting a nature center, nature trail, or visitor center	23.4	2.4	11.4	0
Nonmotorized Activities				
Hiking or walking	38.7	10.8	53.2	18.6
Horseback riding	0.5	0	0.2	0.4
Bicycling, including mountain bikes	23.4	12.7	21.3	11.2
Nonmotorized water travel (canoeing, sailing, kayaking, rafting, etc.)	10.9	0.5	8.9	2.9
Downhill skiing or snowboarding	0	0	0	0
Cross-country skiing, snowshoeing	0.8	0.5	0.6	0.4
Other nonmotorized activities (e.g. swimming, games & sports)	3.6	0.3	3.3	0.2
Motorized Activities				
Driving for pleasure on roads	30.1	4.8	28.4	3.1
Riding in designated off-road vehicle areas (non-snow)	1.6	0	2.9	0.6
Snowmobile travel	8.7	8.7	6.2	5.4
Motorized water travel (boats, etc.)	0.5	0	0.6	0
Other motorized activities (enduroevents, games, etc.)	0.3	0	0.2	0
Camping or Other Overnight Activities				
Camping in developed sites (family or group sites)	10.4	5.3	12.2	5.6
Primitive camping (motorized)	1.6	0.8	6.6	2.5
Backpacking or camping in unroaded areas	2.1	0.8	2.7	0.2
Resorts, cabins, or other accommodations on State managed lands	7.3	1.3	6	1.2
Other Activities				
Gathering mushrooms, berries, firewood, or other natural products	7.0	0.8	5.2	0.4
Relaxing, hanging out, escaping heat, noise, etc.	43.9	11.9	48.7	12.0
Picnicking and family gatherings in developed sites (family or group sites)	10.4	1.3	16.1	1.7
Other	6.8	4.5	7.7	4.8

*Percentages do not equal 100% because respondents could report more than one activity.
+Percentages may not equal 100% because of rounding.

- Many forest visits included various viewing and sightseeing activities, but relatively few people reported such activities as their primary recreation activity on the State Forests.
    - Tiadaghton State Forest visitors were slightly more likely (10%) than Tioga State Forest visitors (7%) to report viewing and learning activities as their primary activity, while less than 5% of visitors in both Forests chose driving for pleasure as their primary activity.
- About one-fourth (25%) of the Tiadaghton State Forest visitors sampled reported consumptive activities (fishing and hunting) as their primary activity at the Forest, compared to 21% of Tioga State Forest visitors.
    - Fishing was slightly more common as a primary activity on the Tiadaghton (16%) than on the Tioga State Forest (13%).
    - Hunting was equally popular on both forests, with about 8% of visitors reporting hunting as their primary activity.
- Many of the sampled visitors in both Forests did some hiking or walking during their visit. Hiking/walking was the most common primary activity among all activities on the Tioga State Forest (19%).
- Bicycling was a popular activity on both forests, with over 10% of visitors reporting it as their primary activity and over 20% reporting some participation in bicycling during their visit.
- Relatively few of the Forest visitors surveyed reported any type of camping as their primary activity.
- Aside from driving for pleasure on roads, few of the respondents in either Forest reported motorized pursuits as their primary activity.
    - Snowmobiling was the most popular motorized activity on both Forests, with 9% reporting it as their primary activity on the Tiadaghton and 5% reporting it as their primary activity on the Tioga.

Satisfaction Addition

This section of the survey asked forest users about the importance they attached to, and their satisfaction with, thirteen customer service attributes in the State Forest they visited. Respondents were provided with the opportunity to choose "not applicable" for any attributes that they did not experience during their visit. Additional satisfaction-related questions were also asked in the basic survey that was administered to all visitors and in the experience addition. Responses to those questions are also included in this section.

Satisfaction Ratings

- The State Forests were generally rated highly on each of the thirteen satisfaction attributes, with over 50% of the scores in the "very good" or "good" categories.
- State Forest visitors were most satisfied with the scenery and attractiveness of the forest landscape (>90% good/very good).
- The items that received the most not applicable (N/A) responses included helpfulness of employees and cleanliness of restrooms (over 30% N/A). Generally these responses reflect the fact that the visitors did not encounter staff during their visits, and that restrooms are usually only present in developed areas in State Forests.

Table 7. Satisfaction Ratings for Customer Service Attributes in the State Forests (Percent)

Tiadaghton State Forest	Poor	Fair	Average	Good	Very Good	Not Applicable	Mean[a]
Scenery	1.4	0	2.9	16.5	79.1	0	4.7
Attractiveness of the forest landscape	0.7	0.7	2.2	15.8	79.1	1.4	4.7
Feeling of safety	0	0	7.2	23.2	69.6	0	4.6
Helpfulness of employees	0	0	4.3	13.0	45.7	37.0	4.6
Condition of the natural environment	0.7	0.7	4.3	29.5	64.0	0.7	4.6
Availability of parking	0	2.9	7.2	21.6	65.5	2.9	4.5
Parking lot condition	0	2.2	10.1	21.7	60.1	5.8	4.5
Condition of Forest trails	0	0.7	6.5	29.5	41.7	21.6	4.4
Condition of developed recreation facilities	0	0	9.4	19.6	44.2	26.8	4.4
Cleanliness of restrooms	2.2	0.7	7.2	9.4	27.3	53.2	4.3
Adequacy of signage	0.7	4.3	12.2	33.1	43.9	5.8	4.2
Availability of information on recreation	1.4	3.6	12.3	26.1	44.2	12.3	4.2
Condition of Forest roads	0.7	2.2	18.7	33.1	36.7	8.6	4.1

Tioga State Forest	Poor	Fair	Average	Good	Very Good	Not Applicable	Mean[a]
Scenery	0	0.6	2.9	26.4	70.1	0	4.7
Attractiveness of the forest landscape	0	2.3	3.5	22.1	72.1	0	4.6
Condition of the natural environment	0	.6	4.6	29.3	65.5	0	4.6
Feeling of safety	0	0	7.6	27.3	65.1	0	4.6
Helpfulness of employees	.6	1.7	4.0	12.1	28.2	53.4	4.4
Parking lot condition	0	.6	11.6	31.4	47.7	8.7	4.4
Condition of Forest trails	1.1	0	5.7	34.5	40.2	18.4	4.4
Availability of parking	1.1	2.3	13.8	31.0	46.0	5.7	4.3
Condition of developed recreation facilities	0	.6	12.9	30.4	41.5	14.6	4.3
Adequacy of signage	2.3	1.1	13.8	36.8	44.3	1.7	4.2
Condition of Forest roads	1.2	7.5	19.7	30.6	37.0	4.0	4.0
Availability of information on recreation	1.7	4.0	24.3	26.0	27.2	16.8	3.9
Cleanliness of restrooms	1.7	11.6	14.5	19.7	18.5	34.1	3.6

[a]Response Code: 1 = "Poor" through 5 = "Very good"

Importance Ratings

Visitors were also asked how important they found each of the listed attributes or services.

- Importance ratings for the customer service attributes generally followed the same pattern as the satisfaction ratings across the attributes.
- The condition of the natural environment (mean = 4.8 in both Forests), attractiveness of the forest landscape (mean = 4.8 – 4.9 in both Forests) and scenery (mean = 4.7 – 4.8 in both Forests) were the most important attributes to the State Forest visitors.
- The least important items included parking lot condition and availability (mean = 3.8 – 4.2 in both Forests) and availability of information on recreation (mean = 4.0 - 4.1 in both Forests).

Table 8. Importance Ratings for Customer Service Attributes in the State Forests (Percent)

Tiadaghton State Forest	**1**	**2**	**3**	**4**	**5**	**Mean[a]**
Attractiveness of the forest landscape	0	0	2.2	9.6	88.2	4.9
Condition of the natural environment	0	0	3.6	13.7	82.7	4.8
Scenery	0	0.7	4.3	15.1	79.9	4.7
Feeling of safety	1.5	0.7	14.6	18.2	65.0	4.5
Condition of Forest trails	1.5	1.5	6.9	26.9	63.1	4.5
Condition of Forest roads	0	0.7	12.7	34.3	52.2	4.4
Helpfulness of employees	3.3	1.7	10.7	21.5	62.8	4.4
Adequacy of signage	1.5	3.8	14.4	23.5	56.8	4.3
Cleanliness of restrooms	0.9	2.6	19.7	28.2	48.7	4.2
Condition of developed recreation facilities	0	4.0	18.5	33.1	44.4	4.2
Availability of parking	2.2	2.2	15.3	34.3	46.0	4.2
Availability of information on recreation	6.1	1.5	17.4	22.0	53.0	4.1
Parking lot condition	1.5	6.6	25.5	29.2	37.2	3.9

Tioga State Forest	**1**	**2**	**3**	**4**	**5**	**Mean[a]**
Attractiveness of the forest landscape	0	0.6	1.8	15.3	82.4	4.8
Condition of the natural environment	0	0	2.9	15.9	84.1	4.8
Scenery	0	0	3.5	11.7	84.8	4.8
Feeling of safety	0.6	0.6	12.0	18.0	68.9	4.5
Condition of Forest trails	3.7	0.6	7.5	24.8	63.4	4.4
Adequacy of signage	0.6	2.4	10.1	30.4	56.5	4.4
Cleanliness of restrooms	2.6	2.0	15.0	27.5	52.9	4.2
Condition of Forest roads	1.8	3.0	16.7	29.8	48.8	4.2
Helpfulness of employees	3.6	2.9	16.5	26.6	50.4	4.1
Condition of developed recreation facilities	3.0	2.4	16.5	32.9	45.1	4.1
Availability of parking	1.8	7.4	14.1	32.5	44.2	4.1
Availability of information on recreation	6.3	1.3	22.2	28.5	41.8	4.0
Parking lot condition	4.3	8.1	23.6	33.5	30.4	3.8

[a]Response Code: 1 = Least Important through 5 = Most Important

Other Visitor Satisfaction Ratings

Respondents for the experience addition were asked some additional questions about how they would rate the quality of various aspects of the State Forest.

- Most respondents indicated very favorable ratings (mean of 4.3 or above) for all of the items rated.

Table 9. Visitor Satisfaction Ratings for Various Forest Attributes (Percent)

	Awful	Fair	Good	Very Good	Excellent	N/A	Mean[a]
Tiadaghton State Forest							
Natural environment	0	1.7	3.4	20.5	70.9	3.4	4.7
Safety and security	0	0.9	6.8	22.2	68.4	1.7	4.6
Responsiveness of staff	0.8	0.8	5.1	14.4	39.0	39.8	4.5
Sanitation and cleanliness	0.8	0.8	5.1	32.2	59.3	1.7	4.5
Condition of latrines, picnic pavilions & other facilities	0.8	3.4	10.2	24.6	39.8	21.2	4.3
Tioga State Forest							
Natural environment	0	1.9	3.7	12.3	80.9	1.2	4.7
Safety and security	0	0.6	4.3	29.0	64.2	1.9	4.6
Responsiveness of staff	0.6	.6	6.8	9.3	32.7	50.0	4.5
Sanitation and cleanliness	0	0.6	9.3	32.1	53.7	4.3	4.5
Condition of latrines, picnic pavilions & other facilities	0	4.3	10.5	20.4	37.0	27.8	4.3

[a] Response scale = 1 (awful) to 5 (excellent)

Overall Satisfaction

- Overall satisfaction scores tended to be high, with around three-fourths of the respondents in both Forests reporting that they were "very satisfied" with their visit to the State Forest.

Table 10. Overall Satisfaction of State Forest Visitors

	Valid Percent	
	Tiadaghton	**Tioga**
Very Dissatisfied	0.8	0.2
Somewhat Dissatisfied	1.8	0.8
Neither Dissatisfied nor Satisfied	1.3	1.7
Somewhat Satisfied	20.1	16.5
Very Satisfied	76.0	80.8
Total	100.0	100.0
Mean[a]	4.7	4.8

[a] Response code: 1 = "very dissatisfied" to 5 = "very satisfied"

Crowding Ratings

- Crowding scores tended to be relatively low, with nearly half of the respondents in the Tiadaghton and over one-third in the Tioga choosing 1 or 2, reflecting that they encountered "hardly anyone" during their visit.
- Very few respondents indicated conditions near the "overcrowded" end of the scale.
- Conditions appear to be slightly more crowded in the Tioga State Forest. The average crowding score on the 10-point crowding scale was 3.5 among the Tioga visitors and 3.0 among Tiadaghton State Forest visitors.

Table 11. Summary of Perceived Crowding Ratings (Valid Percent).

Perception of Crowding[a]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Tiadaghton	27.2	18.4	17.6	14.7	12.5	4.4	5.1	0	0	0
Tioga	26.3	11.4	13.2	14.4	18.6	6.0	7.2	1.2	0	1.8

[a] Response code: 1 = "hardly anyone" to 10 = "overcrowded"

Economics Addition

About one-third of the survey respondents were asked about their monetary expenditures during their trip to the State Forest. Additional questions in the "economics addition" focused on the respondents' trip itinerary (Table 12). These questions were asked to establish a context for evaluation of the reported trip expenditures.

- When asked what they would have done if, for some reason, they had been unable to go to the State Forest on this visit, the most common response (53% in the Tiadaghton and 60% in the Tioga) was that they would have gone somewhere else to pursue the same activity.
- About one-fifth of the visitors in both Forests (20% in the Tiadaghton and 17% in the Tioga) said they would have stayed home.
- About 18% of the visitors in the Tiadaghton and 15% in the Tioga reported they would have come back another time.
- Few visitors in either Forest (6% in the Tiadaghton and 3% in the Tioga) would have gone elsewhere for a different activity.
- Overnight visitors were mostly on trips of 3-4 days (49% in the Tiadaghton and 59% in the Tioga).
- Day visitors were most likely to be away from their home for 6 hours or more (42%) in the Tiadaghton State Forest**.** They were more likely on shorter trips of 3-5 hours (42%) in the Tioga State Forest.
- The vast majority of visitors (77% in the Tiadaghton and 87% in the Tioga) were visiting only that State Forest on this particular trip.
- Most (71-79%) of the visitors who reported multiple destinations for their trip indicated that the State Forest was their primary destination.
- When queried about how many people their reported expenditures were covering, the most typical response for both Forests was two people (38% in the Tiadaghton and 44% in the Tioga).
- Besides the detailed economic questions about various spending categories, visitors were asked to estimate how much money everyone in their vehicle spent on the entire trip, from the time they left home until they return home. The total amounts spent in both State Forests were similar, averaging $192.39 in the Tiadaghton and $193.58 in the Tioga.

Table 12. State Forest Recreation Trip Profile (for economics section)

	Valid Percent	
	Tiadaghton	**Tioga**
What Visitor Would have done if Unable to Visit SF		
Gone elsewhere for same activity	52.8	59.9
Gone elsewhere for different activity	5.6	2.7
Come back another time	17.6	15.4
Stayed home	20.0	17.0
Gone to work at your regular job	3.2	2.7
None of these	0.8	2.2
Total	100.0	100.0
Time Away from Home (Days)		
1-2	34.2	26.4
3-5	49.4	59.1
6 or more	16.4	14.5
Total	100.0	100.0
Time Away from Home (Hours)		
1-2	23.1	26.4
3-5	34.6	41.7
6 or more	42.3	31.9
Total	100.0	100
Single or Multiple Destination Trip		
Visited State Forest only	76.8	86.9
Visited other places	23.2	13.1
Total	100.0	100.0
Was State Forest Primary Destination for Trip		
Yes	70.6	79.4
No	29.4	20.6
Total	100.0	100.0
Number of People Covered by Expenses		
1	16.3	17.8
2	38.4	44.2
3	17.4	14.0
4 or more	27.9	24.0
Total	100.0	100.0
Estimated Total Trip Expenses for Group		
$25 or less	3.5	12.2
$26-$50	10.5	12.2
$51-$100	22.0	16.1
$101-$200	21.0	17.5
More than $200	43.0	42.0
Total	100.0	100.0
Mean	$192.39	$193.58

Visitor Expenditures

In the economics addition, visitors were asked how much they spent on this trip for ten categories of expenditures within 50 miles of the site visited (Tables 13 and 14). The results shown below provide the proportion of visitors reporting spending any money on their trip within 50 miles of the forest, the percentage reporting expenditures in each category, and the average amount spent in each category.

- Nearly three-fourths of the respondents (72% in the Tiadaghton and 73% in the Tioga) indicated that they did spend some money within 50 miles of the forest on their current trip.
- Many respondents, however, indicated that they spent no money on many of the specific expenditure categories listed on the survey instrument.
- Few visitors in either Forest reported any spending for local transportation, camping fees, outdoor recreation and outfitter-related expenses (including guide fees and equipment rentals).
- Significant proportions (over 40%) of visitors in both forests reported trip expenses in the categories of restaurants and bars and groceries.
- The majority of the Tiadaghton State Forest visitors (51%) and Tioga State Forest visitors (56%) reported buying gas or oil during their trip. This is not surprising since about half of the visitors in both forests live within 50 miles of the site visited (52% in the Tiadaghton and 47% in the Tioga).

Table 13. Summary of Trip Spending Patterns of State Forest Visitors

	Tiadaghton	**Tioga**
Proportion of visitors spending any money within 50 miles of this state forest	72.0%	73.2%
Economic Expenditure Items	**Proportion of Visitors Spending Something in Each Category (percent)**	
Motel, Lodge, Cabin, B&B, etc.	19.8	15.8
Camping Fees	5.6	15.3
Restaurants & Bars	42.4	43.2
Groceries	42.4	43.2
Gasoline and oil	51.4	56.3
Local Transportation (bus, shuttles, etc.)	0	0
Outfitter Related Expenses (guide fees & equipment rentals)	3.2	4.9
Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.)	1.6	0.5
Sporting Goods	10.4	9.3
Souvenirs, Clothing, Other Misc.	11.6	10.9

The first column for each Forest in Table 14 shows the average amount spent among only those visitors reporting spending something in each category. These numbers cannot be totaled because they are based on a different number of individuals making the various types of purchases. The second column for each Forest in Table 14 shows the average amount spent among all visitors in the survey. These averages include those spending nothing in various categories, and therefore can be totaled to indicate the average total amount spent for all categories.

- For example, camping fees were paid by only about 6% of the visitors in the Tiadaghton State Forest, but the average amount spent for these fees was $92.14. More visitors in the Tioga paid camping fees (15%), but they spent on average about half as much, or $46.14. for their camping fees.

Table 14. Amount Spent by State Forest Visitors for Various Categories of Trip Expenditures

Economic Expenditure Items	Tiadaghton		Tioga	
	Average Amount Spent - Among Visitors Spending Something in Each Category	**Average Amount Spent – All Visitors**	**Average Amount Spent - Among Visitors Spending Something in Each Category**	**Average Amount Spent – All Visitors**
Motel, Lodge, Cabin, B&B, etc.	$177.96	$37.02	$280.86	$45.51
Camping Fees	$92.14	$5.16	$46.14	$7.06
Restaurants & Bars	$83.45	$35.38	$81.37	$35.13
Groceries	$85.06	$36.06	$55.99	$24.17
Gasoline and oil	$59.27	$29.87	$63.78	$35.90
Local Transportation (bus, shuttles, etc.)	0	0	0	0
Outfitter Related Expenses (guide fees & equipment rentals)	$45.00	$1.45	$75.00	$3.69
Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.)	$15.00	$.24	$20.00	$0.11
Sporting Goods	$48.08	$5.00	$59.65	$5.54
Souvenirs, Clothing, Other Misc.	$67.69	$7.15	$76.75	$8.39
Total	NA	$157.33	NA	$165.39

- In general, the categories showing the highest expenditures included gasoline and oil, groceries, and restaurants and bars.
- In total, the visitors in both forests reported spending over $150.00 on average for all the expenditure categories included in the survey. These averages are slightly lower than the overall trip spending reported in Table 13 because the frame of reference for these individual expense categories focused on spending within 50 miles of the State Forest, while the overall trip expense estimate included spending by all party members during the entire trip regardless of where the money was spent.

Experience Addition

This section of the survey asked a series of additional questions of interest to managers of the Pennsylvania State Forests. As was the case for the "satisfaction" and "economics" additions, about one-third of the respondents were asked these questions. Some of the questions enhanced other sections of the basic survey and have been reported earlier (e.g. previous visitation to the forest and group composition were reported with other visitor trip characteristics in Table 4). The results presented below focus on visitor motivations, feelings towards the Forest, and opinions about various topics in the Pennsylvania State Forests.

Forest Access

- Most respondents in both Forests indicated favorable ratings for access to the State Forests by both roads and trails (mean of 4.3 – 4.5).
- There were no significant differences in the accessibility ratings between the two State Forests.

Table 15. Visitor Ratings of Access to the State Forests (Percent)

	1	2	3	4	5	Mean[a]
Tiadaghton State Forest						
By roads	1.8	1.8	7.9	39.5	49.1	4.3
By trails	1.1	3.3	13.2	33.0	49.5	4.3
Tioga State Forest						
By roads	0	2.6	10.4	37.0	50.0	4.3
By trails	0	0.7	5.5	34.5	59.3	4.5

[a] Response scale = 1 (poor) to 5 (very good)

Recreation Experience

- Most respondents also indicated favorable ratings (mean of 4.5 or above) for all of the recreation experience items rated.
    - Most visitors in both Forests felt the opportunity to recreate without feeling crowded and without conflict from other visitors.
    - Most visitors who encountered Forest employees or people in surrounding communities reported positive interactions.

Table 16. Visitor Ratings for Various Recreation Experience Attributes (Percent)

	Awful	Fair	Good	Very Good	Excellent	N/A	Mean [a]
Tiadaghton State Forest							
Opportunity to recreate without feeling crowded	0	0	3.4	23.9	71.8	0.9	4.7
Helpfulness/courteousness of people in surrounding communities	0	0	5.2	22.4	58.6	13.8	4.6
Places to recreate without conflict from other visitors	0	0.9	6.8	21.4	70.1	0.9	4.6
Helpfulness/courteousness of Forest employees	0.9	0.9	6.0	12.0	50.4	29.9	4.6
Compatibility of recreation activities at the area	0	0	10.3	24.8	59.0	6.0	4.5
Tioga State Forest							
Opportunity to recreate without feeling crowded	0	0.6	5.6	17.9	75.9	0	4.7
Places to recreate without conflict from other visitors	0.6	1.2	3.1	22.8	72.2	0	4.7
Compatibility of recreation activities at the area	0.6	1.2	6.8	20.4	68.5	2.5	4.6
Helpfulness/courteousness of people in surrounding communities	1.2	0	6.2	19.1	58.6	14.8	4.6
Helpfulness/courteousness of Forest employees	0.6	1.2	4.9	13.6	42.0	37.7	4.5

[a] Response scale = 1 (awful) to 5 (excellent)

Place Attachment

Visitors were asked to choose their most important reason for visiting the State Forest from a list of alternative choices.

- Visitors in both Forests were almost equally divided between reporting their most important reason for visiting the State Forest was because they "enjoy being in the forest" and because "it's a good place to spend time friends/family."
- About one-quarter of the visitors in both State Forests (25% in the Tiadaghton and 29% in the Tioga) stated their most important reason for visiting was because they "enjoy being in the forest."
- Another quarter (28% in the Tiadaghton and 27% in the Tioga) went there primarily because it's "a good place to spend time with friends/family."
- Among the activities listed, visitors in both Forests were most likely to report that they came to the Forest because it's a good place to bike (12% in the Tiadaghton and 14% in the Tioga).
- The "other" responses included wanting to use their cabin, snowmobiling, and photography.

Table 17. Which of the following was the most important reason for this visit to the State Forest?

	Valid Percent	
	Tiadaghton	**Tioga**
I went there because I enjoy being in the forest	24.8	29.0
I went there because its a good place to spend time with friends/family	28.2	26.5
I went there because it's a good place to:		
Hunt	8.5	8.0
Hike	6.8	6.8
Bike	12.0	14.2
Fish	11.1	8.6
Horseback ride	0.9	0
Other Reason	7.7	6.8

Visitors also responded to a set of statements designed to measure the extent of place attachment to the State Forest.

- The vast majority of respondents (84-88%) agreed that the State Forest they visited "means a lot to them," with about half strongly agreeing.
- Most visitors also reported that they enjoy recreating in the State Forest more than at other places, and get more satisfaction out of visiting the State Forest than from visiting other places.

Table 18. Summary of Place Attachment Scale Items (Percent)

Place Attachment Items	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree	Mean[a]
Tiadaghton State Forest						
This place means a lot to me	0	0.8	11.0	35.6	52.5	4.4
I enjoy recreating at this place more than other places I could visit	0	0.8	20.3	29.7	49.2	4.3
I am very attached to this place	1.7	5.9	21.2	27.1	44.1	4.1
I get more satisfaction out of visiting this place than from visiting most places	1.7	3.4	22.9	25.4	46.6	4.1
Tioga State Forest						
This place means a lot to me	3.1	1.2	11.7	30.9	53.1	4.3
I enjoy recreating at this place more than other places I could visit	.6	2.5	18.5	29.6	48.8	4.2
I get more satisfaction out of visiting this place than from visiting most places	1.9	3.7	17.9	29.6	46.9	4.2
I am very attached to this place	5.6	4.3	21.0	21.6	47.5	4.0

[a] Response Code: 1="Strongly Disagree" and 5="Strongly Agree"

Motivations/Reasons for Visiting the State Forest

- Visitors' most important motivations (reasons for visiting) the State Forest were to be outdoors and to experience natural surroundings.
- Visitors also attached great importance to the opportunity to relax and get away from their regular routine.
- Moderately important motives for visiting the Forest included the social motives of family recreation (mean = 3.9 - 4.0) and being with friends (mean = 4.0 - 4.1) as well as physical exercise (mean = 3.9- 4.0).
- The least important motivations in both Forests were to develop my skills (mean = 3.5 in both Forests) and for the challenge or sport. Tiadaghton visitors attributed slightly more importance to challenge and sport (mean = 3.8) than Tioga Forest visitors (mean = 3.6).

Table 19. Summary of Motivations/Reasons for Recreating in the State Forests (Percent)

Reasons for Visiting	Not at all important	Somewhat important	Moderately important	Very important	Extremely important	Mean[a]
Tiadaghton State Forest						
To be outdoors	0	0.8	1.7	23.7	73.7	4.7
To experience natural surroundings	0.9	0.9	0.9	24.8	72.6	4.7
To get away from the regular routine	1.7	0.9	7.7	17.9	71.8	4.6
For relaxation	0.9	0.9	5.1	31.6	61.5	4.5
To be with my friends	10.3	5.1	8.5	24.8	51.3	4.0
For family recreation	11.0	5.9	8.5	31.4	43.2	3.9
For physical exercise	4.2	5.1	20.3	33.9	36.4	3.9
For the challenge or sport	7.6	8.5	21.2	25.4	37.3	3.8
To develop my skills	11.9	10.2	24.6	25.4	28.0	3.5
Tioga State Forest						
To be outdoors	0	0	1.2	28.6	70.2	4.7
To experience natural surroundings	0	0	5.0	26.3	68.8	4.6
To get away from the regular routine	0	0	8.8	32.5	58.8	4.5
For relaxation	2.5	0.6	6.8	30.4	59.6	4.4
To be with my friends	5.0	3.8	16.3	28.8	46.3	4.1
For family recreation	10.6	5.0	10.0	21.3	53.1	4.0
For physical exercise	2.5	8.1	20.5	29.8	39.1	4.0
For the challenge or sport	8.8	11.3	20.0	28.8	31.3	3.6
To develop my skills	9.4	9.4	31.9	23.8	25.6	3.5

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Visitor Response to Potential Facilities and Services

Visitors surveyed were asked what facilities/services in the State Forest are most important to them.

- The respondents in both Forests attached great importance to wildlife viewing areas or opportunities (mean = 4.3 – 4.5).
- Tioga State Forest visitors expressed more interest (mean = 4.3) in hiking, biking, and horse trails (these different types of non-motorized trails were not broken out in the survey) than Tiadaghton State Forest visitors (mean = 3.9).
- Visitors also attached relatively high importance to signs directing them to recreation facilities (mean = 3.9 – 4.1) and printed interpretive information (mean = 3.7 – 3.9).

Table 20. Visitor Importance Ratings for Various Types of Facilities and Services

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important	Mean[a]
Tiadaghton State Forest						
Wildlife viewing areas or opportunities	2.5	2.5	12.7	22.9	59.3	4.3
Signs directing me to recreation facilities	4.3	4.3	23.3	37.1	31.0	3.9
Hike, bike & horse (non-motorized) Trails	6.8	5.1	17.1	33.3	37.6	3.9
Parking	3.4	5.1	30.5	42.4	18.6	3.7
Printed Interpretive Information	6.8	5.1	28.2	34.2	25.6	3.7
Picnic areas	5.9	6.8	33.1	34.7	19.5	3.6
ATV Trails	33.3	16.2	18.8	14.5	17.1	2.7
Snowmobile Trails	36.8	14.5	14.5	12.8	21.4	2.7
Tioga State Forest						
Wildlife viewing areas or opportunities	1.2	3.1	9.9	19.8	66.0	4.5
Hike, bike & horse (non-motorized) Trails	3.1	3.1	13.0	27.8	53.1	4.3
Signs directing me to recreation facilities	1.9	2.5	14.8	42.0	38.9	4.1
Printed Interpretive Information	4.3	2.5	28.4	28.4	36.4	3.9

Parking	0.6	4.9	26.5	42.0	25.9	3.9
Picnic areas	2.5	9.3	24.2	34.8	29.2	3.8
ATV Trails	32.1	11.1	16.7	20.4	19.8	2.9
Snowmobile Trails	33.3	11.7	17.9	16.7	20.4	2.8

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Information Services

State Forest visitors were asked a series of questions about their use of various types of forest information.

- A minority of the visitors (24% in the Tiadaghton and 21% in the Tioga) reported that they had obtained information about the area they visited during or in preparation for their trip. In both Forests, first-time visitors were much more likely to report seeking information about the forest.
- Visitors in both Forests were most interested in obtaining State Forest or trail maps. Fewer visitors sought other types of information such as the Pennsylvania Visitors Guide.
- The vast majority of visitors in both Forests (80-84%) obtained information before leaving home rather than after arriving at the Forest.
- Nearly all of the visitors who sought information reported that the information obtained was helpful in planning their trips.

Table 21. Visitor Responses to Questions about Information Services

	Valid Percent	
	Tiadaghton	**Tioga**
Did you obtain any information about this area during this trip or in preparation for it?		
No	76.3	79.0
Yes	23.7	21.0
What type of information did you obtain?		
State Forest map	60.7	51.6
Trail map	70.4	51.5
PA visitors guide	11.1	31.3
Other	22.2	28.1
When did you receive information?		
Before leaving home	80.0	84.4
After arriving here	20.0	15.6
Was the information you received helpful to plan your trip?		
Yes	96.4	100.0
No	3.6	0

Desired Services in Nearby Communities

State Forest visitors were asked what services in nearby communities (off of the forest) they wished were available. Some of the respondents offered suggestions (sometimes offering multiple suggestions), which are summarized in Table 22.

Table 22. Visitor responses to other services they wish were available in nearby communities (off of the forest).

	Number of Responses	
	Tiadaghton	**Tioga**
Services		
Better cellphone service	2	1
More entertainment	1	
Gas stations	1	1
Bathrooms/restrooms		3
Fresh water		2
Community center		1
Hospital		1
Better law enforcement		1
More garbage cans		1
Better development planning		1
Fire wood cutting		1
Shopping opportunities		
Grocery stores/Better food shopping	1	1
Small camping stores (fishing bait)	1	
Convenience store		1
More stores		1
Sporting goods/ camping supplies store		1
Beer distributor		1
Restaurants		
More restaurants	2	2
Better/nice restaurants		1
Place to eat alone		1
Recreation		
Kayak rentals	1	
Places to pick up camping permits	1	
Recreation stands	1	
Bicycle rentals		2
Area for nature safety education (snakes)		1
Golf course		1
ATV trails		1
Nothing		
Less development is needed		1

Visitor Responses to Questions about Marcellus Shale-Related Activity

Forest visitors were asked several questions about how Marcellus shale-related activity had affected their use of the State Forest and their enjoyment of their recreation experience at the State Forest.

- The majority of visitors in both Forests (81% in the Tiadaghton and 71% in the Tioga) reported that Marcellus shale-related activity had not affected their use of the State Forest.
- Visitors were slightly more likely to report that gas-related activity affected their recreational experience at the Forest than their use of the Forest. However, again, most visitors in both forests (78% in the Tiadaghton and 65% in the Tioga) reported that Marcellus shale-related activity had not affected their recreation experience at the State Forest.

Table 23. Visitor Responses to Questions about Marcellus Shale-Related Activity

	Valid Percent	
	Tiadaghton	**Tioga**
Has Marcellus shale-related activity changed your recreational use of this state forest?		
Yes	28.6	19.1
No	71.4	80.9
Total	100.0	100.0
Has Marcellus shale-related activity changed your recreation experience at this state forest?		
Yes	35.4	21.6
No	64.6	78.4
Total	100.0	100.0

Follow-up questions probing the reasons for the visitors' responses to the initial yes/no questions revealed the following major themes. These responses are summarized in Tables 24-27 and listed in full detail in Appendix A.

- Based on the minority of visitors reporting that their use of the State Forest had been changed due to Marcellus Shale-related activity, there were fewer open-ended responses to the initial "yes" (use was affected) responses than to the "no" (use was not affected) responses.
- Among those reporting that their use of the State Forest had been impacted by shale-related operations, the most common responses reflected various major themes.
- The most prevalent theme in both Forests involved various forms of visitor displacement, or changes in visitors' destinations or activities due to area/road closures or fracking activity.

Table 24. Responses to, How has Marcellus Shale-related activity changed your use of the Forest?

Type of Comment	Number of Comments	
	Tiadaghton	Tioga
Displaced/closed areas	52	43
Traffic-related concerns	27	37
Wildlife/Hunting-related concerns	23	20
General environmental concerns	23	20
Noise and visual impacts	11	6
Positive impacts/statements	12	11

- Many respondents also mentioned various traffic-related, wildlife or hunting-related concerns.
  - The most frequently mentioned traffic concerns included increased road traffic, especially truck traffic and noise pollution.
  - The most common hunting-related issues were that the drilling activity scares game away or reduces their places to hunt.
- Visitors expressed several environmental concerns, including various types of pollution, natural habitat destruction, and impacts to water quality as well as changes in landscape and aesthetic quality.
- A few respondents also expressed positive impacts of the shale-related activity.
  - These comments focused on the creation of economic benefits or new access roads or trails providing better access to the Forest.

Those visitors who stated that their recreational use of the Forest had not been affected by Marcellus shale-related activity were also asked to explain why not. Their responses also reflected several dominant themes, which were grouped into topics reflecting awareness-related issues and general acceptance of the drilling activity (Table 25).

- The most common responses in both Forests were statements indicating that the drilling activity doesn't bother them, hasn't changed their use or doesn't affect their activities.
- Many visitors in both Forests indicated that they had not noticed the activity or had not noticed it in the areas they visit.
- Another common comment was that it had not changed their use yet.
- Some visitors stated that they had not heard of or did not know much about the Marcellus Shale phenomenon.
- A few visitors expressed support for the drilling activity, based on the opinion that it does not have a negative effect, is controlled, or is good for the economy.

Table 25. Responses to why Marcellus shale-related activity has not changed your use of the forest?

Type of Comment	Number of Comments	
	Tiadaghton	Tioga
No effect on use	89	175
Don't notice/Haven't seen any activity	22	75
Not drilling here (or in areas I care about)	36	62
Not yet (implies concern for future)	8	14
Don't know about it	14	14
Pro-drilling	8	5

Forest visitors were also asked to explain the reason why Marcellus shale-related activity had or had not affected *their recreation experience* at the State Forest. As in the case of the previous question, many of their responses did not refer specifically to experiential impacts, but rather expressed a variety of types of opinions about the drilling operations (Table 26).

- The experiential impacts tended to reflect the same themes as the answers to the questions about the impacts of shale-related activity on visitors' use of the Forests.
- Road/traffic related issues were the most common responses to the question about how drilling-related activity had affected visitors' experiences at the State Forest, while visitor displacement and closed areas were mentioned less frequently.
- The responses to how Marcellus shale-related activity had affected their recreation experience at the State Forest included more impacts to the quality of the recreation experience, such as a change in the character of the area or experience and noise or visual impacts.
- As in the case of the previous question about impacts of drilling on visitors' use of the forest, some respondents mentioned positive impacts such as better access when asked how their recreation experience had been affected.

Table 26. Responses to, How has Marcellus shale-related activity changed your recreation experience at the Forest?

Type of Comment	Number of Comments	
	Tiadaghton	Tioga
Road/Traffic issues	43	28
Wildlife/Hunting-related concerns	19	13
General environmental concerns	34	23
Crowding/Loss of solitude or relaxation	17	17
Displaced/Closed areas	16	10
Noise impacts	11	5
Visual impacts	9	12
Positive impacts/Better access	11	3

Responses by those visitors who stated that their recreation experience at the Forest had not been affected by Marcellus shale-related activity also reflected the same awareness-related and general acceptance of drilling activity themes as their previous explanations for why the shale-related activity had not affected their recreational use of the Forests (Table 27).

- Again, many visitors in both Forests reported that the drilling activity doesn't bother them, hasn't changed their experience, or doesn't affect their activities.
- Many visitors in both Forests reiterated that they had not noticed the activity or had not noticed it in the areas they visit.
- Some visitors stated that they were not aware of, or had not even heard of, the Marcellus Shale phenomenon.
- The next most common acceptance-related comment was that it had not changed their experience yet.
- Finally, a small number of respondents voiced pro-drilling sentiments or mentioned positive benefits of the gas drilling activity, such as improved roads or access to the Forest.

Table 27. Responses to why Marcellus shale-related activity has not changed your recreational experience at the forest?

Type of Comment	**Number of Comments**	
	Tiadaghton	**Tioga**
No effect on experience	63	73
Don't notice/Haven't seen any activity	17	44
Not drilling here (or in areas I care about)	19	25
Not yet (implies concern for future)	4	10
Don't know about it	7	8
Changed location/adapted	5	2
Pro-drilling/Positive impact	10	12

Summary and Conclusions

The results published in this report are a compilation of the data collected at numerous State Forest recreation sites during the period of October 1, 2013 through September 30, 2014 (n = 1,539 interviews with Forest visitors). Besides the basic visitor use survey, three supplemental surveys were used to query visitors about their satisfaction levels, economic expenditures, and recreation experiences.

This report provides a summary of the characteristics, behaviors, and attitudes of visitors to the Tiadaghton and Tioga State Forests, located in the north-central area of Pennsylvania. The results indicate that most of the State Forest visitors are repeat and frequent users, and have many years of experience in the forests. About two-thirds to three-fourths of the respondents in each Forest reported making their first visit to the Forest before the year 2000.

Several notable differences were noted in the use patterns and characteristics of recreation visitors in the two Forests. First, the Tioga State Forest has more "frequent visitors," showing an average of about 26 visits to the Forest per year versus 22 visits in the Tiadaghton. Conversely, the Tiadaghton visitors reported more trips to other forest areas (21 days on average compared to 15 for Tioga Forest users). Thus, the Tioga State Forest may have a slightly more loyal group of users who allocate more of their outdoor recreation trips to the Forest that their counterparts in the Tiadaghton State Forest.

Secondly, visitors in the Tiadaghton were far more likely (83%) than those in the Tioga State Forest (55%) to be overnight users. Overnight visitors in both Forests, however, stayed an average of 2.6 – 2.7 nights in the Forest. Activities that were more popular in the Tiadaghton included fishing and snowmobiling, while hiking was pursued more frequently by Tioga visitors.

Regarding satisfaction levels, most respondents in both Forests were clearly satisfied with their recreation experience and with the satisfaction attributes listed on the survey. State Forest visitors were most satisfied with the scenery and attractiveness of the forest landscape. They also reported very high feelings of safety while in the Forest. The data suggests that there is room for some improvement in the cleanliness of restrooms, provision of information for recreation, adequacy of signage and condition of forest roads and trails.

The economics section of the study asked visitors about their monetary expenditures in and near the State Forests. About half of the forest visitors indicated that they would have gone somewhere else to do the same activity if they had not been able to visit the State Forest,

indicating that they were serious about pursuing their recreation activities on that trip. Most of the respondents (72% in the Tiadaghton and 73% in the Tioga) indicated that they spent some money within 50 miles of the forest on their current trip. The largest expenditures reported were for gasoline and oil, food/drink at restaurants and bars, and groceries. In general visitors to these two State Forests spent about the same amount across all of the spending categories for their trip, averaging $157.33 in the Tiadaghton and $165.39 in the Tioga.

The experience section of the study was given to about one-third of the visitors, providing rich data about visitor attitudes, motivations, perceptions, and management preferences. The data clearly shows that State Forest visitors are interested in experiencing the outdoor natural surroundings available in the forest areas. Relaxing out of doors, getting away from the routine, and other nature-based social activities are very important to these recreationists. Only slight differences in motivations were observed across the two Forests. For example, Tiadaghton visitors attached slightly more importance to the motive of challenge and sport, perhaps reflecting their greater participation in fishing.

Visitor responses to potential management options were examined to ascertain support or opposition to various management alternatives. Tioga visitors expressed the greatest interest in various types of non-motorized trails (hiking, biking, and equestrian), while a high degree of support was seen in both Forests for additional wildlife viewing areas or opportunities. Visitors' interest in various types of trails tended to reflect their activity pursuits. For example, although many visitors showed little or no interest in specific types of trails, such as ATV or snowmobile trails, those kinds of trails were very important to certain segments of visitors interested in motorized activities. Respondents also attached relatively high importance to signs directing them to recreation facilities and printed interpretive information. Only a small minority of visitors in each Forest obtained information about the area they visited during their trip or in preparation for it. Information was more likely sought by first-time users, and visitors in both Forests were more likely to seek information before leaving home than after arriving at the Forest. In both Forests most of those who sought information found it helpful in planning their trips.

The vast majority of visitors in both forests reported that Marcellus shale-related activity had not affected their use or recreation experience at the State Forest. Among those reporting that their use of the State Forest had been impacted by shale-related operations, the most

common responses reflected various types of visitor displacement, or changes in visitors' destinations or activities due to area closures or fracking activity. Respondents also expressed some general environmental concerns including pollution, habitat destruction, and threats to water quality as well as changes in landscape, noise pollution, and loss of a relaxing and serene environment. Traffic-related issues and concerns with wildlife and hunting were also mentioned. Among those reporting that gas drilling activity had not affected their use of the State Forest, many indicated that they had not noticed the activity or had not noticed it in the areas they visit, or that the drilling activity doesn't bother them, hasn't changed their use or doesn't affect their activities.

Responses to the experiential impacts of Marcellus shale-related activity tended to reflect the same themes as the answers to the questions about the impacts of shale-related activity on visitors' use of the Forests. While the majority of the visitors surveyed in both Forests indicated that Marcellus Shale-related activity had not affected either their recreation use or their recreation experience at the State Forest, visitors in the Tiadaghton were more likely to indicate that their use of and experience at the Forest had been affected. A notable segment in each Forest was worried about future impacts or had seen or experienced impacts in other areas.

This report provides a representative snapshot of recreational use in two Pennsylvania State Forests. It thus provides a start on building a profile of Pennsylvania State Forest visitors. Surveys are currently continuing in other forests and the overall database will include a total of ten forest districts by the completion of the five-year project. Future reports will provide yearly summaries of the individual forests studied as well as comparative and targeted data analyses aimed at assisting Bureau of Forestry managers in their efforts to meet the needs of their recreation constituency.

Appendix A

Visitor Responses to Open-Ended Questions

If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do? (Experience Addition, question # 8, Satisfaction Addition, question #2)

Tiadaghton State Forest, 282 responses

Note – Some single responses addressed multiple topics and are coded in multiple categories

No Suggestions *(68)*

Keep Up the Good Work *(39)*

Doing good job (2)
Everything is good (3)
Fine as is
I don't have a problem with anything
I don't know, looks good
I guess not. We love it up here
I think it's good I don't have any problems
I think they are doing well
I think they do pretty well. Nothing that I can really think of
It all looks good to me
It's pretty good
Keep doing what they are doing
Keep up the good work
Nicely managed
No complaints. Love it
No it's nice out here
None. Everything is good. Keep the forest clean
None. I think they are doing well
Not really. I think they are doing very well
Nothing everything was perfect here
Nothing. Everything is fine
Nothing. It's beautiful
Bathroom excellent, bugs annoying. Nothing else to note. Seat liners in the bathhouses was thoughtful and great. Keep up the good work
Bathroom's great. The trail is nicer than the last time we were up, no erosion on the sides
It's been a nice ride
Continue keeping the trails groomed
Just keep grooming snowmobile trails
They did awesome this year with grooming. I've seen them out every time I've been out
I think they are doing great. They do a lot more than the Game Commission
I don't think so, it's hard to be better than this. Parking, creek access, two parking lots
Not really. I noticed the cemented fire rings. The thing I really like is that it's never overcrowded
Nothing, we love it here it is the perfect amount of people but you can still have time to yourself

Nothing much for this area, I love the campsite and the forest
Nothing, we come here every year and love it here

Improve Information and Maps *(27)*

Maps (4)
More detailed maps
More directions / maps
Mark more trails that are kid friendly
More maps and distance information along trail to see as you walk.

Internet Information (4)
Better online information, more readily available maps
More information on the camping situation on the DCNR website. There is some, but it's vague and confusing to me
Making hiking/camping permit available online
More recreational information available. Better website

Recreational Signage (10)
Better signage for state forest roads
Definitely add more signage to make people aware of the less used areas
Maybe better signs pointing towards the overlooks
Put in signs at this site to tell us that this is the starting point of the rail-trail
A sign at the top of the road, rail-to-trails this way
Bike trail maps available on the trail (e.g., board)
More signs and detailed info about trails (distance)
More signs for hiking trails
We can't think of anything it's really nice out here, maybe put a few signs on the road showing us how to get to the trail
State land border is vague. Should be signs on 44 for the rail-trail access. Better signage for parking areas. Detailed directions on websites. GPS coordinates for the parking lots

Educational Signage (5)
Communication of what they are doing. A lot of fences and markers that seem important but we do not know the purpose
More educational information like signage
More information about local trees and flowers
More scenery identification signs
More signage about catch and release fishing and the benefits of it

Promotion (3)
More marketing... So people know to use it more
No littering signs, promote this rail-trail more to get kids active
Promote the hiking trails

Other (1)
Information about local restaurants and bars

***Improve Road Conditions** (18)*

Road Maintenance (10)
Better forest road maintenance (4)
Better road management (2)
Improve the road condition
Pave forest roads. We found several serious holes
Pave the forest roads. It is not safe to drive on uneven roads
Plowing forest roads

Heavy Trucks (3)
Gas drilling causing bad roads. Need to reroute roads
All the money they get from timber and drilling and they don't go and fix the roads till the gas people come along. And why can't people drive 4-wheelers on these lands. That ain't right. Why are more privileges given to the snowmobiles than 4-wheelers? Roads have potholes something terrible
Trucks with lift kits drive down Pond road causing potholes and un-drivable conditions… the roads are not constructed well enough for that
Other (5)
More guard rails on the back roads or wider roads around turns
There are some guard rails that need fixed near Cedar Run
More parking for weekend use, sometimes lots get full
Make sure parking lots are plowed
Road access is horrible

***Improve Recreation Facilities** (58)*

Facilities (24)
Add bathrooms (6)
Add trash cans (2)
Recycling/trash bins
Add benches (2)
Keep bathrooms open
Bathrooms, can't even use, bugs everywhere
The only thing we noticed, in July, this bathroom was awful
They need a bathroom and a trash can or two at the parking lot
There is nowhere to go to the restrooms if you're kayaking

Put in areas to pump your bike tires up along the rail trail
I would love to see some park attractions like a playground for kids on some areas
Add some water availability along trails
More drinking water available
Maybe better shower facilities
Try to get water back on
More places to BBQ
Put in grills

Camping (6)
Drive up to unload camping gear
Open the road to the campground so we can unload
Letting people drive back to the site so we can unload our things at the campsite
Nothing, we love this place except they closed an old campsite we used to go to and made it a public area
Food service campsite
Widen paths to campsites

Trail Maintenance/Access (15)
More trails (2)
More public access
Better upkeep on trail
Better trail maintenance
More maintenance on trails
Mark family friendly trails
Some of the trails are overgrown and just need to be better maintained
Trim back some of the trails better
Finish the trail surfacing. They stopped at Black Walnut Bottom. Get rid of standing water
Horses really tear up the trail so it's hard to walk as a pedestrian
Wider trails
Mark the trails better
More foot bridges across creeks
Maybe more patrols on trails

Snowmobiling/ATV/Biking/Other (13)
More grooming
Keep trails groomed like they are today
Everyone says groomed trails better, but they're good today
Maintenance on snowmobile trails
Keep cars off snowmobile trails
Marking some of the snowmobile trails better

More ATV trails
Four-wheelers should be used on the forest roads
Use smaller stones when building rail-trails
Removing one yellow guard post, for easier passage with bike

One thing about the trail, from Ansonia down, where the area is horse and multi-vehicle section was dangerous. It was slippery to ride, the barrier between, a mound that is two different levels
Be nice if there was a shooting range
Permit shooting on forest lands and putting the areas available for shooting

Fish, Streams, and Pond Management *(25)*

Habitat Health (5)
Could be more sanitary with the creek
Don't want bathrooms here. Too close to creek. Bathrooms would get messy fast
I would ask them to make sure that the Marcellus companies aren't contaminating the water. I'm not too happy about the gas wells... We fish a lot of natural streams, so worry about contamination

Access (9)
Easier access to the creek
More access to fish
Some access area to get to the creek. Not canoe access or rail-trail access, but just for walk-in fishing. Just a small trail, so I don't need a machete.
Easier access to the water, stairs, a ramp
Need to clear brush off bank for kids to have easier time fishing on bank
Easier ways to get down to the water. For a mother with a 4-year-old kid, it isn't safe
Can't think of anything in particular, maybe add more access points for fishermen
Make the river a little more accessible from the banks
Access to these areas. A lot of private land. Keep areas available for us [the public]. Folks with kids might have a hard time getting to the creek if their land doesn't border the creek. Us guys can get anywhere, but it's important to keep easy access areas for everyone available and well maintained

Stocking and Policy (9)
Hope to see more fish
Nothing, more fish
Put bigger fish in
Stock more fish, the numbers seem to be down this year
Stock more trout
Don't limit youth's access to fishing
Open up the delayed harvest for fishing. That was my favorite fishing stop but they closed it for spring
Encourage catch and release more
They do a good job. Opposed to the catch and release proposal that's been happening

Other (2)
I love the forest overall but the fishing this year isn't very good
Into on public fishing more advertisement of it

Wildlife Management *(16)*

Game Management (10)
Cut back on the DMAP licenses (permits to shoot antlerless deer). You have to walk days to see a deer. I look at it from a deer hunting perspective, and from that view it's poor. Otherwise no complaints. Also, this gate needs to stay closed all seasons, during deer season it's a circus. It should be rugged, not commercialized
Get more deer back here. You see more bear up here than you do deer
Why does DCNR want zero deer…? Manage them better
Keep gates open after hunting season and improve habitat for grass
Maybe some more cutting for the wildlife

Improve food plots for the wildlife
More food plots for game
More food plots for the deer

No hunting
Cut back the deer areas. Less days for deer hunting. Also, they can have more grass habitats

Fencing (4)
Take down wildlife fences. Not doing a bit of good, a waste of money
Take fences down where they need to be taken down
Take the fences down
I think they waste a lot putting these fences up. We don't have enough deer around here to browse off the new growth

Other (2)
Do whatever to help amphibian life and don't want to see signs of fracking
Too many roads have been opened during hunting season

Forest Management *(31)*

Timber Harvesting (5)
Get the state to do some more timber harvesting
More clear cuts for new trees to grow for a healthier forest
Better timber sales, management - cut more tees

Reduce the amount of timbering and reforest it
Don't do so many clear cuttings

Marcellus Shale (19)
Allow less gas extraction
Don't let the gas wells on
Get rid of the f****ing oil companies

Get rid of the gas companies
Get rid of the gas companies due to their indiscriminate activities and the pollution, specifically
Get rid of the gas companies
I think this place is great, I would ask that they don't totally ruin it with the drilling or go too overboard with that though
Keep better tabs on the frackers
Keep gas drillers out
Kick the gas companies out
Stop the fracking
Take away gas drilling
Less drilling
Less gas company activity
Less gas traffic
Less truck traffic on the roads
Less truck traffic, repair roads, tax the drilling, the staff isn't friendly, sewer drainage into Pine Creek
Not as much drilling
Quit allowing the frackers to build roads

Other (7)
Ferns are a problem. Far fewer deer here than in the 70s. There are more turkeys and bear. It's a tricky question about the forest and my satisfaction, there are things that the foresters can't help and might actually share my concerns about but are unable to fix
Open up more areas for firewood cutting, especially before the fencing goes up
Kill the laurel, manage fenced in areas better, and cut down trees
Spray poison ivy. Some people get airborne poison ivy
Keep forest clean, well monitored
Keep the forest clean
Keep the forest clean and beautiful

If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do? (Experience Addition, question # 8, Satisfaction Addition, question #2)

Tioga State Forest, 315 responses

Note – Some single responses addressed multiple topics and are coded in multiple categories

No Suggestions *(38)*

Keep Up the Good Work *(57)*

Absolutely nothing, it's beautiful
Actually, they are doing well
Already nice
I think they are doing a good job
Doing good
Doing a great job
I think it's adequate
Everything is good (2)
Everything is good so far
Everything is good. Keep the forest clean
Everything seems fine
Good job
Good job working on bank and other facilities. Keep it up
Good job. I like this forest
Great shape with crushed stone. Great trail because of the surface of the trail. Two thumbs up. I'll definitely come back
I am okay with it
I am really enjoying this forest
I am very impressed, this is superb. I am so impressed that there was no trash
I don't think anything. It's well marked with signs and the roads are nicely kept.
I don't think so, it's all good
I like the area but it has been developed a lot since I was a kid
I like this forest. Keep it as clean as it is.
I like this forest. Nothing really. Keep it clean
I like this place
I like this place. Everything is good
I love this forest
I think it's wonderful
I like it the way it is
I think they're doing a good job
I think this is well-managed
I thought it was great
It is a beautiful place. Keep it clean
It's a very nice area

Keep it as is, keep it open, hopefully nobody ruins it for everybody
Keep up the good work
Leave it the way it is, keep it as natural as possible
In my limited experience, it's always been fantastic
No improvements, good
Nothing, I think it is awesome that there is an ADA trail that leads to the vista
Nothing, I think this place is pretty nice and it's much cleaner than other parks that I've been to.
Nothing much, I love this area because of the park
Nothing really, I like that this place isn't developed entirely. It allows you to have some alone time, or time with friends.
Nothing really. Everything is good
Nothing really. Usually pretty good here
Nothing, pretty awesome
They are doing a good job
They do a good job, forestry is better than the townships
They manage this place well
They recently changes the restrooms, that's nice
This place is perfect
This trail is amazingly well maintained
Very clean, nothing. Well marked
Very good (2)
We haven't had any problems in this area. We love it

Improve Information and Maps *(32)*

Maps (5)
Better maps. Maps of primitive sites
Have maps out year round. Accurate maps
More maps at trailheads, more information on use
More state forest maps printed out
Have a map for hiking trails

Recreational Signage (20)
Better signs, more of them
Better signs for trails with detailed information
Better signage at trail junctions
Maybe more signs and directions for trails
Maybe more signs on trails
More information or signs about bike trails
More signs
More signs and directions for trails
More signs for trailhead
More signs and information about bike trails

Make sure road signs are marked
I know some people are stealing the signs
Poor signage on water trail to identify location
Posted maps at intersections should have a "you are here" mark
Put mile markers on the trail
Signs need to be better
Some signs could be improved
The signage on some of the forest roads is really confusing
They can mark forest roads better
Trails are not clearly marked, this is very frustrating

Educational Signage (3)
I would like to know local wildlife
I would like to see more information about wild animals
Post info about different resources available such as water, food, stores, etc. Show signs of things other than the rattlesnakes. Have more signs about history
Promotion (2)
Make information a little more available to the public
Make information more available about where to kayak. I only know of places because of friends
Other (2)
Access is one concern, It's hard to understand the rules, you read them, and they interpret them another way. White Deer Creek is confusing with the campsite.
More staff to be around and help people if needed

Improve Road Conditions *(48)*

Road Maintenance (43)
Allow this road to be open to ATVs
414 is a mess, single lane and road is falling apart. Access is important
Better maintenance on road (pave the holes)
Better management on forest road
Better management on roads (holes and rocks)
Maybe better road maintenance
Better road management
I'm 80 percent happy. A nice ride, but I personally like a smoother surface
Improve roads but don't pave
Improve the roads
Pave the road
Maintain roads better, road drainage
Make it easier to get back here by vehicle
Better road maintenance. There are many holes
Maybe clear the branches on forest roads
More signs on forest roads (directions and distance)
The roads down in the natural area are a little rough, but I love the area
Open more gates

Open some of the Bureau of Forestry trails to trucks for mudding
Pave all the roads
Pave forest roads. There are many uneven roads in this area
Pave holes on forest roads
Pave roads
Pave the forest roads
Put a little more gravel and make the road and parking less muddy
Put in a speed limit because people drive so fast on the dirt roads
Road conditions
Road management
Smooth the road. We got stuck on a muddy road on top
Some forest roads have holes. These holes can be better maintained
The roads need improvement, they are rough
There is limited access to some forest roads
They should pave the roads better
Take care of down trees
The road back here is pretty bad and it's really hard to find
The road down to the water is a little rough
The roads are a little rough at times but I guess paving them would really take away from the feel of the forest
The roads are horrible
The roads are still horrible in this area, the same as they were when I was younger
The roads need improvement (pot holes and ruts)
This forest road is bumpy. Better road maintenance
This place is pretty cool, but I'd widen the roads, especially on the curves
Wider roads

Heavy Trucks (3)
Have specified hours for truck traffic due to the drilling
Keep fracking and logging trucks out
Roads, trucks

Other (2)
Secure logging roads to prevent access
Signage to let you know you are coming to a parking area

Improve Recreation Facilities *(79)*

Facilities (43)
A light in the bathrooms (2)
Lights in bathroom, playground for the kids
Lights in the bathroom, toilet paper
Add some more trash cans
Bathroom maintenance
Bathroom smells horrid
Better restroom management (clean and shower facilities)

Better trash disposal receptacles
Clean the restroom
Have sinks to be able to wash hands
Do something about bathrooms, cleaner
Make drinking water available
Electricity would be nice
Maybe better restroom and shower facilities
Keep the restroom clean
Keep the restroom clean, maybe shower booth
Maybe drinking water at trailheads
Maybe playground for children
Maybe renovate the restroom. Keep it clean and neat
Maybe shower facilities on campground
More dumpsters and trash bins, better recycling management
More recycling
Need to renovate restroom
Maybe ventilate the bottom of the fire pits
A lot of the biking trails don't have restrooms and you go 20 miles and no restrooms. So that's nice
Maybe more bathrooms
A covered pavilion would be nice
Put in water more often and fix the pumps for water
Showers in the bathrooms
Some of the bathrooms need attention
Pick the garbage up sooner
Playground, renovate the restroom
Potable water
Put a bathroom in this parking lot
They could put a trash barrel here
They need a covered pavilion
The bathrooms are bad
The bathrooms are kind of gross
The campground bathrooms are absolutely disgusting
The restroom at the campground should be improved
The litter around here, take it away

Camping/ Picnic Areas (16)
Allow alcohol in picnic areas
Allow alcohol everywhere
Allow overnight parking and camping here
More campsites
Lower camping prices. Level out sites more
More campsites if possible, don't want this area (Asaph) too developed, like the primitive getaway
More overnight camping facilities

More patrols around camping areas
I would maybe consider getting new picnic benches in the near future, some are pretty torn up
People come and put their campers here but don't camp, if they don't stay here they shouldn't be allowed to take the site
Put better places for lanterns, clean the campground up overall
So many of the picnic tables need replaced, especially at this site
Some picnic tables should be replaced
They closed down the campground two years ago during the peak season (e.g. Labor Day). Do not close down the camp ground for peak season (e.g. Labor Day).
Spread the campsites out a bit, provide water, I'd like to have showers, lower the cost
They've added picnic tables, expand the camping area

Trail Maintenance/Access (20)
A nice hiking trail on the campground would be nice
Accessibility, trails,
Better designated trail system
Better trail management (pave it and cut down branches)
Better trail management. Cover the holes and uneven trails
Clean the trail of debris
Extend the trail. In all directions
Fix icy walkway
I would ask them to maintain and mark trails better
It gets used so much the trail needs graded out
More hiking trails, and easier ones for children, not so rigorous
More trails
More trails (hiking)
I would like to see more accessibility (ADA trails)
Some of the trails are overgrown in areas so maybe clear those
Provide area for walkers instead of walking on ski trail
The trails aren't being cared for like they used to
Some trails need to be smoothed out
Make trail system more accessible to older people. Better access on side trails
Use rubber paths for the handicap trails, they are a lot easier for running on as well

Snowmobiling/ATV/Biking/Other (6)
Don't let the Marcellus companies plow the roads completely so people can snowmobile
Don't plow snowmobile approved roads in the winter
There are a couple of trails for biking that could be improved upon. We have a bike club but the state could help us out more
More off road trails for motorized vehicles, jeeps, motorcycles, etc. PA is lacking in that. The Tioga forest has a few trails but it would be nice to have some open trail days on the fire roads.
More ATV trails
Open road to ATVs

Parking (4)
Parking is a big theme
Needs more parking
Parking is a little low. Could be more
Add parking, double the size. Fifty percent more parking

Other (10)
Add cell service in places, in case of injury
A place to get gas
Better cell phone service
Cell service
Do not develop the area any further
Emergency phone
Have a warning system for storms
Improve the swimming hole
More restaurants. More access
Have a person patrolling for injuries and crime. Place an emergency phone, since there is no cell service

Fish, Streams, and Pond Management *(20)*

Habitat Health (3)
The streams under bridges collect debris and trash, it's not appealing
Make the water clean if possible
More splash dams for the creek

Access (3)
Put in a better place to put your kayak in the water
Make a designated launch for boats and be able to park in the lot over-night
Make more access points to the river, just a few small paths so we can check out some of the spots

Stocking and Policy (11)
I hope to see more fish
Fishing just doesn't seem right this year
I'd like to see more fish
Maybe more fish
More fish
Put more fish, not stock them
Stock trout near the picnic grounds
Stock fish, do not put them in all at once
Make most areas just fly-fishing
Better fish management. Evenly distribute them throughout the seasons
Maybe better fish management

Other (3)
Block that extra channel to make rapids at Wassey
More parking on put-ins and take-outs
We need a bridge over Babb Creek, on Stony Fork

***Wildlife Management** (16)*

Game Management (16)
Deer habitat
Hope to see more wild animals
Hunting and deer situation in PA isn't good anywhere, as far as the big forest
Hunting is getting worse but I don't know why. Maybe fracking or other things
I hope to see more deer and wild animals
More deer/game
More food plots
More game
Let a few more deer live
More wildlife
Quit killing all the wildlife, killing too much wildlife
Quit shooting so many doe. The DCNR is issuing too many doe permits
See more animals, better wildlife management
We have otters again
Too much hunting, need more safety zones
More wildlife management and cover for the wildlife

***Forest Management** (25)*

Timber Harvesting (11)
Do more clear cutting of semi-mature forests to create more browse for deer
Do not understand why they spray undergrowth before logging
Cut more trees down before they fall on someone
Don't think that the forest is managed correctly. Timber management. Plant chestnut trees
Keep the logging under control
Better timber practices
DCNR does not have PA resident interests at heart when deciding the course of management actions (logging)
Post where they are going to be timbering, for forest users
The state in general has lost sight with protecting the trees. I think it really impacts the significance of the forest. Create a more viable forest, as in trees. New York fern is invasive. Do something about it. If the public can't see it and it's not pretty, it's forgotten about
Likes clear cutting, there should be more effort towards cover for wildlife
When finished logging, keep roads clear. Do not clear cut, do a more selective harvest

Marcellus Shale (8)
Get rid of the fracking. It's stirring up a lot of the natural habitat
Get rid of the Marcellus Shale
Get the gas companies out
The logging and Marcellus is so bad in this area
Plant areas near gas lines to make them look more natural
Stop leasing the land to the gas companies for fracking
Stop restricting trails and hunting areas for gas lease
Stop the gas drilling in the forest land. It's the last sacred land we have and they should be kept out.

Other (6)
Basic conservation practices
Get rid of the poison ivy
Give me a plot of land. I want to live here
Plant blueberry bushes
Spraying for the power lines kills the berry bushes. Huckleberries, raspberries, they are all dying and it makes me upset
Spray less underbrush

Marcellus Shale Open-Ended Responses by Forest

Tiadaghton SF

Has Marcellus shale-related activity changed your recreational use of this State Forest?
n = 369 , Yes = 112, No = 257

290 total open-ended responses

If yes, why? (112 open-ended responses)

Road/Traffic (27)

Trucks (3)
Trucks and noise (2)
Traffic
A lot more traffic and people in the state forest
More traffic out on road
Traffic is worse
Traffic because they are there
Being on roads, waiting for traffic
Traffic is a distraction
Trucks, traffic
Traffic and everything, the pollution
Truck traffic on the State Forest land
Traffic, do not visit some areas because of the traffic
Traffic is heavier, some areas aren't good anymore if you want to get away
Just the trucks. Truman Road.
When we came up Truman Run we had to wait for the traffic coming down the mountain
Past traffic issues
For a while it did, there were so many trucks that I would turn around and go back home and not recreate here
It is inconvenient getting through because of trucks' activity
Ruining roads
Plow roads to dirt and close roads
Road constructions have increased
Crowded, too much activity, road is busy
Roads, gas, people stop, inconvenient, feel like being watched

Displaced/Closed Areas (52)

Some trails closed (2)
Areas used to hike and hunt in have been closed off
One place used to bike ride, can't now
Restrict motorcycle use

Hunting spots are well pads now or holding ponds
Denied access for hunting
It's changed areas we hunt and stuff
Took away trails and hunting
Some of the lookouts and hunting isn't as accessible
Couldn't go to sites
Areas that we can't hunt in that we used to use
Certain areas are used to ski but not now because of the limited access
Changing roadway access not able to get places
Limited access to the forest because of constructions
Access is more limited because of the gates
Slows you down sometimes
Some areas closed and more access through pipelines
Take over roads and close them off to access from others
Some restrictions on Forest access
Snow trails closed. Put on the website which trails are closed
Snowmobile trails are screwed up
They had shut down access roads for snowmobiles
Yeah, I don't have access to some of the roads I use to use for snowmobiling
They shut down half the roads that we use to be able to snowmobile on
I couldn't go to the visits up Dam Run Rd for a while
Can no longer access overlook
Access getting up Truman road
Limits our access to Bureau lands
Some roads we can't go on and the truck traffic makes a big difference
A lot of the places that you can go to have wells and trucks now
I don't go where they are working
We try to avoid them
I just don't want to bother trying to get to certain places because it's too much of a hassle with the trucks and wells
Taking up my previous hunting areas, open up some other hunting roads so we can have greater access to the forest because of the gas companies
I was an avid hunter and snowmobiler, but I "retired" from both because the fracking is invading the areas I used
On top of mountain where I hunt and hike, don't feel safe with them around
There are certain places we can't go or don't feel comfortable going anymore
Kept out during seismic testing, stopped walking in forest all together
They took my Lebo Vista Rd and I don't dare go down there anymore, it would break my heart to see what they have done.
We had to be escorted up our road so we were tired of that... So we stop coming up as much
At first but since the trails have been opened it's been improved
Roads were closed for a while and had to find alternate routes. Many are back open now though
Change where we go on snowmobiles. Once the Marcellus get infrastructure in it'll go back to normal

At first there were restrictions for where I could go, but now I'm adapting to those
No worries about traffic now, with State Forest available, I come here more often because it is away from roads that shale activity has caused elsewhere

Effects on Wildlife/Hunting (23)

Affecting my hunting areas (2)
Areas used to hike and hunt in have been closed off
Areas that we can't hunt in that we used to use
Denied access for hinting
Hunting spots are well pads now or holding ponds
It's changed areas we hunt and stuff
Took away trails and hunting
I was an avid hunter and snowmobiler, but I "retired" from both because the fracking is invading the areas I used
Some of the lookouts and hunting isn't as accessible
Taking up my previous hunting areas, open up some other hunting roads so we can have greater access to the forest because of the gas companies.
In the hunting areas. Like low key areas. Noise
The game is running off because of trucks, they could also have been killed by trucks
Deer less spooked and used to people
Drilling everywhere they hunt
Drilling affected snake hunts, less animals
Many of the fishermen are skeptical to fish in certain areas anymore
The scenery has significantly changed and there's less wildlife around
They changed wildlife patterns from what it used to be for years
Changes how game live in the mountain
First time here. Just encroach on all the game
Utilizing pipelines causes food plots to get deer

General Concerns (22)

Watershed concern, clean?
Concern about water pollution
I'm more hesitant to go into the water
Less water volume
They may influence the water condition of the creek
Worried about environment contamination
No surface water at camp in forest
More threatened springs
Fear for health of watershed. See excessive heavy runoff. Unusual
I don't participate in as much leisure because the way the gas company is tearing up the forest disgusts me
Loss of recreational vehicle opportunities on the roads, and the loss of the natural environment and pollution
They have absolutely ruined areas

More trucks, pipelines would be environmentally harmful from a long-term perspective.
Because I have seen man destroy the environment from other resources like coal and now they are doing it with fracking. I sold a house in this area because of it
We run into them occasionally
We're giving this land away without getting money for any sort of education or clean up
Oh yeah. We have pads up there all over the place.
Some construction areas bother me
There are more construction sites or pipelines in the forest
Seen some people protesting
Yeah I stop to take photos of it, I wouldn't have if it wasn't there

Noise and Visual Impacts (10)

Trucks noise (2)
Interrupted the peaceful enjoyment. Noise. Litter. Trucks everywhere
Vista walk only, truck noise, big change
The scenery has significantly changed and there's less wildlife around.
Mountain tops carved up from what used to be when they were beautiful and I don’t go there any more
Aesthetic
I see some construction going on
Seems like there is more light in the sky than we are use to
Putting road type thing that borders our property. Retention pond in our right of way. Every time we use our driveway we have to go through a gate

Positive Impacts/Statements (12)

More access
Roads that are more accessible where it goes
Improved, pipelines to walk
Made it better, better on planning trails
Nicer trails to ride
Made new trails
Came off pipeline so that's new but roads are plowed out too which is nice.
Familiar with the area, they see very little impact, a positive one for deer if any because the deer seem to like the edge habitat that it creates
Actually I think it made my forest experience better. Now the deer have stuff to eat with them clearing out trees
Met folks that work for the shale industry. Seen an active drill site
Got more money to fish more
I am working for Marcellus shale. It gives me a lot more opportunities to visit this State Forest

If no, why not? (178 open-ended responses)

No Effect on Use (89)

Not affecting me (18)
No (10)
It doesn't bother me (7)
No, still use it the same (5)
No impact (2)
No reason (2)
No comment (2)
Not hurting anything (2)
Just hasn’t
Not Applicable
I know they are around this area but not affecting my recreational use here.
Don’t let it interfere with them
I don't come here much so it doesn't bother me
Nothing to compare it to
We don't get bothered by it in most things that we do
Still able to do activities
Because they don't affect us enjoying the forest
Not really the use
It hasn't changed what we do
I do the same stuff as before
I still recreate here as often as I did before drilling started.
We mostly just drive and see the sites. We still do the same thing
Just came to fish
We can still fish pretty much wherever
Still snowmobiling
Primary purpose = hunting so if they can still do that, will keep caring
They stay out of the way
Has good and bad associations
Been no disruption except security stops
The traffic isn't heavy anymore, they stay out of the way
Activity died down recently
It didn't bother us this year as much as last
Always been around where I live
We are fine with the area
Not changed but they are annoying and frustrating. Trucks wailing horns
Not bothered by it. But I don't like it.
There are still many areas to fish but I don't like the drilling at all
Not really. But I am against it
I put up with them
I don't care about what they're doing as long as they aren't hurting anything
I don’t care about the drilling it doesn't bother me
We don't care about it
Just hasn't taken us off our path

I used trails most of the time.
Hasn't had too many effects other than trails
They haven't redirected me from anywhere
Doesn't stop us from going anywhere
Don’t see where it affects that much
I think they do what they can to accommodate
Managed pretty well to date
I worked for them for a while
Usually working for them

Don’t Notice/Haven’t Seen Any Activity (22)

Haven't seen anything (9)
Don't notice it (5)
Haven't seen any negative impact, no problems
Don't really come in contact with it
We didn't have any run-ins with them
Don’t see any evidence of it
I don't see them with the activities that I do
I have a hard time seeing it. I don't notice it.
Didn't see it in Tiadaghton
We don't see it besides the trucks

Not Drilling Here or in Areas I Care About (36)

Not in this area (3)
I haven't seen them here (3)
Not here
No activity here
Isn't around here
Doesn't affect here
They are not in the valley they are on
Nothing here that bothers us
Not right here
I didn't even know they were drilling here
This area doesn't seem to be impacted
I don't think there is much going in this area
I haven't seen much of it since I got here
Haven't seen any activity here
I didn't notice they are drilling here
I don't see it around here
Not in the areas I do activities
They seem to avoid the major rec areas
Not affected prime areas
They don't really seem to be in the way of recreation
Not in our area

Trails still good
The rail trail isn't really impacted by it
It wasn't prevalent along the trail at all
We only use the bike trails
Not in way of bike trail
They stay hidden in areas that we don't really go
Don't go into Marcellus area
We've managed to avoid it
Just Truman run road. Haven't seen as much activity this year
Just the one drive off at Truman Run Road we noticed.

Not Yet (implies concern for future) (8)

Not right now, but if they are drilling around here it would affect my recreational use or experience
Not at the moment, but it will at the top of the mountain because it will chase the wildlife out
Not yet
Not now. But it will be negative eventually
Hasn't affected my leisure yet
Hasn't impacted yet
Not yet. I cannot say for 3-4 years later. And I heard they are pumping water from the creek but am not sure whether it is true or not
They are not affecting my hunting or fishing. Too early to say

Don't Know About It (14)

Not familiar with it (3)
We didn't know there was activity here (2)
Doesn't know about it (2)
We don't know much about it
I've never really thought about it like that
I don't know what that is
I don't know anything about it
I don't know
Don't know where it is
Don't know enough about it to care

Pro-Drilling (8)

We can still go up to the hunting area. But yeah I think the fracking is a good thing, saved the area, gave a bunch of jobs.
Roads have improved
Good thing, done decent job
Likes it, thinks not harmful, thinks it is beneficial
First, doesn't really apply. But frack on.

Do well taking care of stuff
I think they've done a great job
They pay me

Has Marcellus shale-related activity changed your recreation experience at this State Forest?
n = 368 , Yes =133 , No = 235

246 total open-ended responses

If yes, why? (127 open-ended responses)

Road/Traffic Issues (43)

Traffic (10)
Truck traffic (4)
More traffic hazards
Truck traffic on the State Forest land
Annoying with truck traffic
The traffic is terrible sometimes
All those damn trucks on the road. Makes driving slow.
Made it worse, the trucking is a pain.
Yeah there was a lot of truck traffic and construction happening. We weren't expecting that
The trucks impact hunting, they are fast, they take up so much of the road it's hard to drive and park
Up 414 all the trucks up Truman Run. It's just a pain. And all the noise
More traffic, doesn't like all their yellow trucks, paint it a green like woods
Increased traffic. Worse roads
Ruining roads
Negatively. The traffic is horrible
They have destroyed the roads
Roads taking a beating. Truck weight
More traffic and construction on roads
More traffic and trucks may destroy roads
There are a lot more road kill incidents caused by heavy load activity, some roads are now locked
Traffic and everything, the pollution
The traffic is horrible and there are so many new roads, which is disappointing
Because we had some limited access, plus the helicopters and extra traffic was bad
Yeah the roads were crazy for a bit there. Yeah not really sure what else to say
Once again, it was terrible (noise and truck traffic) at first, but I am glad I stuck through it. It's not as bad anymore, things have died down
Traffic was rough for a while there

Crowding/Loss of Solitude or Relaxation (17)

The feel isn't the same as it had been, you always have to watch for trucks and places are gated
Although I haven't seen it much, all the trucks and big business take away from the setting
Less tranquil
I want to enjoy quiet nature
Not as peaceful
Deteriorated experience
Seeing the equipment in the middle of the woods, it takes away from natural setting
Change the style
It's more crowded
It's definitely harder to find places where there isn't so much activity
I feel more regulated when I come here now
On top of mountain where I hunt and hike. Don't feel safe with them around
I don't feel as safe
Took away relaxation, fear of safety from workers

Visual Impacts (11)

Not as pleasant. Land was stripped and not as pretty
Been here whole life and has changed the scenery to a certain extent
Some areas yes because the scenery has vanished
The scenery has significantly changed
It has changed the landscape
Aesthetics
Wires left in woods take away from beauty
Not a "pretty" site anymore
It's going to pollute the area and change the experience
Yeah because we see stuff
Yeah, it just gave us another thing to look at. Not really negative or positive

Noise Impacts (11)

Noise (2)
All the noise
Made it more noisy
Interrupted the peaceful enjoyment. Noise. Litter. Trucks everywhere
Noise, trucks, traffic, constant helicopters over camp, workers around fracking, noise outside camp
Noise and too many trucks and more garbage
We come for the quiet
Severely. Noise factor and quality of the Forest
Just all around, it's been noisier and less pleasant

General Concerns (34)

Yeah, it just made us feel concerned about the quality of the recreation experience
All I want is the peace and quiet and that all went away in 2008. I am also worried about the air and water quality
Because my past hunting area has been polluted and I sit there all day and smell methane gas, and the truck traffic makes a lot of noise and spooking the wildlife.
The pollution
Worried about environment impact
They destroyed everything up here
More constructions are going on
I don't think it's good for us or the environment
Fear contaminate creek and natural beauty
I feel like sometimes they take water from the river and the river is low because of it
It's hard when you never know what the water is like and if it's being polluted
It just bothers me that the water might be contaminated
Affects water supply. It's not a good thing for recreation. Bad for the earth. And the chemicals they won't even tell us about! They are impacting the water and all of the environment
More cautious of wood quality
Not pleased about the trees being chopped down
We are going about dealing with it the wrong way. We need to have an extraction tax and closely monitor the companies and what they are using
They need to get money from the companies for cleanup
I don't like that they use State Forest land
I think it's terrible what they are doing to the environment
It's a shame that we're just giving this land away
Disruptive and disgusting
It has been more negative
Overall it's been negative
Annoyed
I was just annoyed and disappointed
You do worry about the impact but it doesn't cross the mind too much
Yeah immediately, but I don't see it having a long term negative impact

Effects on Wildlife/Hunting (19)

There's less wildlife around
I haven't seen any bobcats in the last three years which is really disappointing
There are a lot more road kill incidents
A little bit, with the wildlife being chased out
I don’t’ see as much wildlife
They were doing seismic helicopters when hen turkeys were nesting. Low treetop fly overs.
It may affect the number of fish in this creek
No more eagles since the activity
Less hunting, wires left in woods take away from beauty, scaring animals

Because my past hunting area has been polluted and I sit there all day and smell methane gas, and the truck traffic makes a lot of noise, spooking the wildlife
Hunting all different
The trucks impact hunting
Slightly, our favorite spots for hunting look different than they used to, but that's progress I guess.

Displaced/Closed Areas (16)

Seem like every place we hunt there is a pad now and all the truck traffic is terrible
It has affected my hunting areas. Places we used to hunt can not do anything there now
It's affected my hunting spots but the hiking places seem to be okay
Ruined some favorite hunting spots. They put a pad on one of my hot spots for deer
Some roads are now locked
Need a different campsite
Try to stay away from where it is
I use different areas
Closed the trail and has limited access
Finding new routes
Can no longer access overlook by car or foot
Less skiing areas
Limited access to the forest
Roads have been closed limiting access to certain areas

Better Access (11)

Some of the roads have actually improved because of it
Some extent is the roads are better
Roads are better
Better roads, better access, some scenery
Made easier to get in new roads
Vista trail seemed better than before
Better riding trails
Pipelines are awesome to ride on. I definitely enjoy riding those
Access is easier to more areas
Made stuff wide open
I am working for it

If no, why not? (119 open-ended responses)

Changed Location/Adapted (5)

Don’t go into Marcellus area
We knew it was only a matter of time till they opened the trail back up
They have built new trails and can still make your way to places

Other places to go
The only thing I'm disappointed is the snowmobile trails are closed, like Boone Road

No Effect on Experience (63)

No (6)
It doesn't bother me (6)
Does not affect (5)
Experience is the same (2)
No reason (2)
No impacts
Just hasn’t
Not applicable
Not a bit
No not too much
I can still do all that I want to do so my experience is the same really
Do the same thing
Can still do what I want to do in forest
Hasn't affected too much of the views
They don't bother anything
Not hurting anything
They haven't taken away from anything
They don't bother me for the most part
They don't get in the way
We've been able to have a good time
Still have a good time regardless
Just came to fish
We didn't have any issues with them
We love coming here, it doesn't matter to us that they drill
It doesn't matter to me
We weren't impacted by it this year
It's not an issue to us
It's not something I think about because I'm not from the area
First time here
Always been around where I live
We are fine with the area
I don't get worked up about it
If it does I will work around it
Nope. We don't mind waiting
Still enjoying, exist together
Keep going along. Tolerate them
Been no disruption except security stops
Not really. Had a couple incidents where we got yelled at for walking across the pads
I put up with them
Only seeing trucks on the road so it doesn't bother me
Traffic just sucks

They don't change anything except for the trucks
The traffic isn't as bad anymore
They seem to be pretty safe
Wish we got royalties from it

Don't Notice/Haven't Seen Any Activity (17)

I don't notice it (4)
Didn't see any activity (3)
It wasn't apparent that they were there
We didn't even notice the drilling
Don't really come in contact with it
Haven't noticed any of that
Don't see any evidence of it
Have not seen a difference
You don't see them much
They do a good job of staying behind the scenes

Not Drilling Here (or in areas I care about) (19)

Haven't seen any activity here
Just don't see it around here
Didn't know they drilled here
I don't think there is much going in this area
Isn't any in this area
Not in this area
Not in the areas I do activities
No activity here
Isn't around here
Doesn't affect here
They aren't here
They are not in the valley they are on
Nothing here that bothers us
Keeping our fingers crossed that nothing happens here
We only use the bike trails
I used trails most of the time
No negative effects on trails
They haven't really shown up anywhere
Because there's areas that the trucks can't access and they are limited to where they go

Not Yet (implies concern for future) (4)

Not yet
Not yet - isn't any in this area
Keeping our fingers crossed that nothing happens here
Not so far it hasn't

Don't Know About It (7)

Doesn't know about it (2)
Don't know where it is
I don't know anything about how it works so it doesn't bother me
We aren't educated enough about it
Don't know enough about it but it probably isn't good
Not that I'm aware of

Pro-Drilling (2)

They have done a good job of making it look nice and clean
Fact, Marcellus brought a lot of work to the area. But in many ways Marcellus is inconvenient

Positive Impact (8)

They have built new trails and can still make your way to places
They have new trails
Made better trails
Roads are better
New opportunities
Important because deer come out but wells ugly. Thinks State Forest harvesting of trees has made it more unattractive
Got more money to fish more
They give me money so can't complain

Tioga SF

Has Marcellus shale-related activity changed your recreational use of this State Forest? *n* = 527, Yes = 106, No = 421

435 total open-ended responses

If yes, why? (104 open-ended responses)

Road/Traffic (37)

More trucks and traffic on forest road (4)
Traffic (4)
Roads are getting damaged by water trucks (2)
More traffic (2)
They increased the traffic on the road
Heavy traffic
More traffic on the roads than ever
Traffic is crazy, riding down a road and a big truck is coming at you, where do you go
More trucks and traffic
The trucks are back here so often
Trucks on roads bother me
Busy with trucks
Roads increase with traffic when drilling, make noise
Plowed roads, traffic noise
Activity of them on roads
Well pads and tankers on the roads
They tear up the roads here
Road conditions especially. Use to be wait times and driving. Now it's big manholes in back roads
Roads being closed. Roads being limited. Roads being destroyed
Roads, water trucks
Road condition and traffic
The roads have been ripped up and make it difficult for wildlife to move around, destroying woods and habitat
Roads, inconvenience with road dust. Large vehicles on 414, coming from Liberty trucks
When water trucks are around, it is quite dangerous, they go too fast
Because I hate sharing the roads with the tractor trailers. They drive way too slow
Trucks destroy some roads
There are more trucks in this area although it doesn't bother me a lot
Traffic and trash, more vehicles on roads. But I know they are almost gone by now. So it is not so bad any more

Displaced/Closed Areas (43)

Road closings (3)
Some areas off limits (2)
I cannot get in some state forest roads. Basically they shut down some state roads.
Changed route to get here
Changed road access
Some roads are limited to access
Taking up land on the roads
Some places are limited to access
Some places are limited to use
Areas I used to hunt are now off limits
Hunting spots have been developed
Prohibited my hunting area
Hunting spots have been developed
Several spots I can't hunt anymore
Access has been limited, cannot hunt where they used to
They displace hunters and the animals that are being hunted
Used to go where there are now drill sites, it has limited access to areas
Areas closed off for use, cut up areas and change routes of access
Changed road access
I use to camp in Waterville and can't anymore
I won't go places sometimes because of the trucks
You can't go certain places but the campground isn't impacted
You can't really hike some of these areas because sections are closed
Closed some trails
They've actually interrupted a lot of trails we ride bikes on. They cut across our trails and leave a mess there
Messing up trails
Old areas I used to hike are now closed off
They've made it harder to go on some trails with my truck because they close them off or at least care if you go on them when they are closed
Trails have been cut up
I avoid areas of activity
I know where they are so I avoid them
There are some spots you don't even want to bother going to
We had to walk our bikes around construction on rail trail south by Jersey Shore. They were putting in a pipeline under the trail we think
They had the trail closed down near the bottom where they had the pipeline cross the rail trail
Put wells in area and messed up some trails, but some good new trails
They blocked some trails and plowed snow, it is negative to snowmobiling
Some snow mobile trails are not accessible
Some of snowmobile trails are closed due to their gas pipes and snow plowing, even there will be more activities in spring
Plowing snowmobile trails is making it hard on equipment

They closed road to snowmobiles where there are scenic hollows with waterfalls on Trout Run Road
Interrupted trails used for snowmobiles
They plowed some of the roads to get rid of snow, it makes less snow for snowmobiling

Effects on Wildlife/Hunting (20)

Less wildlife (3)
Affected hunting (2)
Areas I used to hunt are now off limits
They chased the wildlife off
Disrupting the habitat. Not good for grouse
Destroys animals
Ruining grounds for hunting, not as much game
The roads have been ripped up and make it difficult for wildlife to move around, destroying woods and habitat.
Scared the game, more activity that means surroundings are disturbed
See less birds
It hasn't been bad these past few years. It used to have rainbows in the water.
It's a little louder because of the trucks and I don't know if that impacts that hunting or not

General Concerns (20)

Destroying forest
Destroys the forest, reduces quality, busy
I hate it. Every aspect
All over the place and awful
I hate the drilling, they all act so secretive
It causes me to not want to come to the woods anymore, it's disgusting to see what has happened to the forests.
Makes area more crowded, increase in crime
Crowded, people and equipment, water quality
More crowded, cuts up land, less wildlife, affected water
Has affected tourism business
The stream is polluted by their activity. It can influence water supply. No supervision for environmental impact.
Pollution
Hesitant to let the dog swim in the water
Worried about water quality. They destroy the woods
Could plant more trees
Area more developed
Construction bothers me enjoying the forest
More constructions have occurred
Don't like the gas companies, have restored areas, but still not in favor

Worried about potential impacts, if drilling is done responsibly and wildlife and hunting is not disrupted then it is ok

Noise and Visual Impacts (6)

Lights on 24 hours
Can't see stars too bright
Makes the forest ugly
Noise increase
It's a little louder because of the trucks and I don't know if that impacts that hunting or not
Roads increase with traffic when drilling and make noise

Positive Impacts/Statements (11)

Only when there are pads, hunting improved
Roads better and open fields for deer
Better, can run on pipelines, more trails
Helped improve sledding
It's great because we get to ride the pipelines
I know where pipes are but this is a big forest, and actually they create access to some roads
Back roads have improved
I think they have made an attempt to develop areas better, which has changed use
Open area makes it more scenic
We had some private land but we sold it for Marcellus use so now we use public lands more

If no, why not? (330 open-ended responses)

No Effect on Use (175)

Has not affected me (35)
Has not changed activities (20)
No (11)
No impact (10)
Does not bother me (8)
Not really (4)
Not at all (3)
They aren't in my way (3)
I know they are around here. But they don't affect my experience in the forest.
Fracking issues are important to us but it has not affected my desire to use the State Forest
Has not impacted where I go and what I do
Don’t see it having impact on what we like to do
Doesn’t impact on anything we use at park

No effect on biking
Still hunt and fish in the forest
We can still camp here
We camp in the forest
It did not affect me, anything I do
They don't really interfere with things that I want do to
I always do the same things, that hasn't changed
There are so many places to fish
We were just in the water
I would say that I can still do everything I want to do without my route being altered
It's still a great place to walk with great trails
I can still hunt on the lands and do whatever I feel like
I still hike and hunt up here like I used to do before
I don't use the forest much
I don't visit often
Only been here once
We don't come here very much
Not familiar with it cause we aren't from around here
I don't recreate much
First time I've been here
I don't come here enough to know whether they changed anything
Does not concern him
Well run operations, not concerning
It's here but we don't care about it
I work for the companies so it doesn't bother me
Didn't affect us. Didn't know this was a state forest.
I'm not worried about any of it
It's been the same since we've been coming
Close by, convenient
Have come here for years
Nothing has been changed
I thought it would but I haven't noticed anything
What we use it for it hasn't influenced the rivers
I don't care about that stuff
Don't care about the trucks and drilling
The trucks come by occasionally but it's not a big deal
Just tank trucks
The area has not really changed, noise was bad before dropped off from 3 years ago
Did not affect it, couple years ago did
Not this year. It has before
Traffic was bad 2 years ago because of the trucks. But it is okay now.
The forest seems back to normal
Been what you expect
I don't mind them being here
They don't take me off my track
Hasn't affected my use at all besides looking at it.

Aware of it but does not affect activities
Used to its existence
It does not. I know it is nearby
Everybody has a job to do, it doesn't bother me
Not as bad, as crowded
I don't agree with them but it would be a great resource
They are causing bad traffic in some areas. But not affecting my recreational use in this forest
Nothing is changed. I have been here for 30 years but nothing has been changed actually.
It does not change mine. I think they are. At least it can give some money to people.
They don't affect my way of living. I used to work for them.
We just passed some on the roads
I don't think so. Reading a lot about it. We were going to move to PA but shale issues cropped up on the property
We've seen it. Doesn't mean it's bothered us
Not this visit
No. I saw people associated with it
I know they are around this area but not affecting me enjoying the forest
I know there are some activities going on. But not affecting me
We still use the same. Maybe more trucks in city but same here
We are still doing things we want to do
Nothing is changed
Haven't gotten any money out of it yet
I know they are around here but do not bother me
We wish the shale people would come thru and put a bridge in. They took the bridge out in 1991 after deer season and now you have to either drive through the creek, or detour 6 miles around
I heard about this activity but it hasn't changed anything to enjoy this place
It's everywhere, my grandson works for them
Nothing detrimental. You see trucks, yeah
It's really had no impact. I don't use the main roads anymore because of the trucks

Don't Notice/Haven't Seen Any Activity (75)

Have not seen it (33)
Haven't noticed it (7)
Has not encountered (4)
Don't see any change (4)
No contact (3)
Not visible (3)
Have not seen it much, does not affect activities
I don't know where it is
Did not realize it was here
I don't really come here much but it seems the same as always
They stay out of the way pretty much
I don't pay attention to it
Not around it enough

I was told they are active around this area but haven't seen it here.
We haven't run into any in this area
You rarely see anything but the trucks unless you go looking

Not Drilling Here or in Areas I Care About (62)

Not here (10)
I haven't seen it around here (9)
Not in this area (6)
Doesn't affect the area where I recreate (4)
The areas I visit aren't affected (2)
I haven't run into too many trucks or too many roads personally, haven't noticed any activity in Asaph
I was told they are active around this area but haven't seen it here.
What we use it for it hasn't influenced the rivers
No reason, they have not started building the area he has hunts at
No trucks up here
Did not get to that area
Has not affected hunting area
Away from home and has not done anything to this trail
Not in the areas I've visited. Not seen it in the places I've been
Not this one, others yes, no gas wells close to here
Made busy where he lives, too many people. Contact with out of staters is deeply disliked
They didn't alter this place in particular
They don't drill in the state parks and we're close enough to the park
When you're in an area like this you just don't think about it much because it's not right in front of you
We don't typically run into that stuff up here
It's much more evident in other places
They seem to stay away from the popular rec areas
You can still fish the creek so I don't care
They don't bother the campground
Hasn't changed anything for this picnic area
Has not disrupted bike trails
Not this trip on this trail. If we went to different trails, it would bother us.
Because I hunt on private land
It has not changed the state forest although it has definitely changed where I live
Not in this forest
Not to enjoy this place
Not aware of activity up here
No, not on the trail
Has not impacted lookout areas yet, water still drinkable
We are on the bike trail and it doesn't affect us
Not this one. But yes, where I hunt

Not Yet (implies concern for future) (14)

Not yet (3)
I haven't seen it here yet
Has not impacted lookout areas yet, water still drinkable
Hasn't affected us yet, haven't hardly seen it
I have not seen their activity yet. Hope not to see in the future
Have not seen anything yet
Hasn't affected anything I've done yet
Hasn't affected me yet
Not yet. We're concerned
Just puts a rock in my stomach
Not yet. When it goes into the trout streams, then yes
Not us but I know other people don't like to camp in certain areas anymore

Don't Know About It (14)

Don't know what is (3)
Not that we would know (2)
I don't know
Did not know about it
I am not aware of it
Did not know it was going on
I don't know what's going to come of it
We don't know much of anything about it
I don't know much about the drilling. It hasn't changed my plans really.
I am not aware of what type of activity is around here
Out of state, no idea what that is

Pro-Drilling (5)

It really hasn't disrupted anything or defaced the countryside and I don't really see a problem with it. I think it's a good thing using our own resources
It helps benefit town. No change
I think it is good for economy
Why would it? In favor of drilling
No. Think it's a good thing. Hasn't come through and affected us yet

Has Marcellus shale-related activity changed your recreation experience at this State Forest?
n = 521, Yes = 112, No = 409

268 total open-ended responses

If yes, why? (97 open-ended responses)

Road/Traffic Issues (28)

Traffic (7)
Traffic, waiting at gate
There are a lot more people and traffic, the roads seem a little torn up
Heavy traffic
The truck traffic is immense and annoying
Annoyance of the truck traffic
The traffic is a little heavier
More big trucks driving up here, have to be more cautious
A lot more traffic and noise, makes it hard to find deer
The trucks are a pain
It's busier through roads like this now
Increased traffic
I think some roads are destroyed by their trucks
Road access
More trucks than ever
Because I hate sharing the roads with the tractor trailers. They drive way too slow
Trucks slow down and reduce the enjoyment of motorcycling
Trucks on roads
Road condition and traffic
Road conditions especially. Use to be wait times and driving. Now it’s big manholes in back roads
Tankers on the road force him to the side or to stop his activity while they pass by
Traffic - need to watch out for trucks that drive fast

Crowding/Loss of Solitude or Relaxation (17)

More people (5)
Activity
Sometimes it seems a little more busy but I can still do what I want mostly
It is not as peaceful
It’s on her mind and it is a travesty, drilling noise, up and down right, not why you come to park, opposite of why you come here
It's a little busier
It's a little more touristy but I'm not bothered by it much
More commercial around here now
Less of a positive experience
Little more crowded

Hate seeing them taking away from quality of life
It's not as private in some areas as it used to be
Everything is too regulated around here now

Visual Impacts (12)

Scenery, trash
Garbage
Cut up forest
Forest less attractive
Not as aesthetically lovely as before
It affects the aesthetic quality of the forest.
Wasn't as pretty
It's not very pretty in some of these areas anymore
You see wellpads
Saw cut through, made us stop and look at ugly gash
It just seems like we are ruining the landscape
Change in landscape

Noise Impacts (5)

Drilling noise
A lot of activity going on noise
Environmental impact and noise are disturbing
Hear trucks and continuous helicopters overhead and no longer recreate
Our forests used to be quiet

General Concerns (23)

Environmental impact
Pristine places have been logged off.
Cabin booking changed
Pipeline through property
They're tearing up the land
I wish they'd all go away
We've heard that some of the water is nasty but we haven't really changed what we do because of it
It's good and bad in terms of economy and conservation
Cuts up forest area, reduces area to use
It's unfortunate that PA didn't take a hard line to stop spills. Legislation to force penalties
I am changing my activity habits
It may make it worse
Concern about that will happen with the water
We should be allowed to know what's going on and what they are doing
Worried about water quality. They destroy the woods.
Get aggravated at times

Negative
I think they ruin the river
Just slightly annoyed is all
No money to state no benefit (personally) from drilling
I don't like it

Effects on Wildlife/Hunting (13)

Less wildlife (4)
Affected hunting (2)
Hunting is worse
Few hunting spots
Fewer places to hunt (3)
Bothers hunters
Hunt in different areas, more people
Not as fun to hunt and fish here anymore
It's not a place you want to hunt anymore

Displaced/Closed Areas (10)

Snowmobile trails are down
Some places are limited to access
Traffic and trail interruption really affect my overall enjoyment
Avoid places where they are and make sure to track where they are
Areas once enjoyed are now cut off
Closed some trails
Not able to use trails
Restricted areas now
Limits access
You can't snowmobile in areas in the winter so it's less enjoyable for me

Better Access (3)

Easier movement
Open area makes it more scenic
Made it better

If no, why not? (171 open-ended responses)

Changed Location/Adapted (2)

Stay away from it
We find other places to go

No Effect on Experience (73)

Has not changed activities (9)
No (4)
Not affecting me (3)
It doesn't bother me (3)
Not really (2)
No impact (2)
Don’t see it having impact on what I like to do
Doesn’t impact on anything we use at park
What you expect when you visit a state park
My experience isn't impacted
Just haven’t really been interfered with
They don't interfere
It's not a big deal
I don't care about it
I had a good time
The area is still fun
I can still enjoy time away from the city
We still come here and have a good time
Haven't changed what I've been doing here
Has not affected hunting area
Hasn’t affected normal habits
Has not stopped him from coming to park
I just do what I've always done
All my experiences here have been similar
Not much has changed
No changes
No change in water quality
They haven't impacted the waters as far as anyone can tell
The area has not really changed
They haven't altered the area
They haven't changed the places that I ride
There's no big trucks or pads
They don't cause us any inconvenience ultimately
I don't get bothered by it because it doesn't really change my daily life at all
Only been here once

It doesn't impact us because we don't use the forest much
I don't recreate much
Not around here enough
We wouldn't know if it had changed anything
They are pretty friendly
I can't complain about it
They are accommodating to the users
They don't take away from anything
The town in general seems to have gone back to normal
Just tank trucks again
They don't drive by the campground late at night or anything like that
Hasn't affected my use at all besides looking at it
They tear the roads up a little but not bad
Traffic a bit
Seen construction vehicles
You get a truck occasionally but not too bad
We've noticed more truck traffic but it's quieter. Just have to watch yourself crossing the street
Hasn't changed what you do but has still left taste
Not concerning, they take care of the sites, more impact on private land than state forests
If we were getting the money we wouldn't complain
Not applicable
Did not want to give a reason

Don't Notice/Haven't Seen Any Activity (44)

Have not seen it (10)
Don't notice (8)
Not visible (4)
Never come in contact with (2)
No contact
Haven't encountered it
Have not experienced any shale related activity
Did not see any while here
Didn't see much
Haven't seen signs of anything
We really haven't come across many of the MS operations. They keep them clean and it really hasn't been a problem
I didn't see anything today. On the hard roads you see more traffic for that business
Don't see too much in this area
I have not seen any effect in this particular forest
I don't know where it is
Did not realize it was here
Not applicable, did not run into them
Besides the trucks on the road it really has not been evident that they are here
Did not affect it, couple years ago did, no contact
Not today. Didn't see anything

Not Drilling Here (or in areas I care about) (25)

Not in this area (4)
The areas I visit aren't affected (2)
Don't see too much in this area
Hasn't affected the areas that I use
Doesn't affect the area where I recreate
Hasn't changed anything for this picnic area
Not in here
Isn't much over here
Have not seen it around here
I haven't run into too many trucks or too many roads personally, haven't noticed any activity in Asaph
Some areas it's a pain but it's not too bad out here
Haven't started developing on area where he hunts
Did not get to that area
Away from home and has not done anything to this trail
Not this one, others yes, no gas wells close to here
Our cabin isn't on shale land. Cabin in Leetonia
There are still trails to hike so I suppose as long as those are here I don't care
Not really in the area
Have not been in any drilling areas
It would if they drilled in the state parks but if they are hidden in forest sites I don't care

Not Yet (implies concern for future) (10)

Not yet
Not here yet
Hasn't affected us yet, haven't hardly seen it
Have not seen anything yet
Hasn't affected anything I've done yet.
I really haven't seen anything but don't know about the future
Hasn't affected me yet
Not so far
Not experienced it yet
Not directly affecting me yet. But there will be much more impacts on my experience in Spring
Hope it does not

Don't Know About It (8)

Did not know about it (3)
Did not know it was going on
We don't know much about it
Wasn't aware of it
Not familiar with it because we aren't from around here
Talk to the locals, they may have something to say

Pro-Drilling (8)

Why would it? Likes it
It seems that the companies are accommodating to the tourists
They keep it nice after they're finished. Helped the economy up here
I support drilling. I think it's a good thing for the area and the state
I like the drilling as long as they are safe with it
I think it's wonderful. Proper stress on that word
I'm pro drilling
I used to work for them, I like the companies

Positive Impact (4)

I think that Marcellus has brought a lot of people to the area and made it more exciting
It is a great site for tourists and Marcellus has enhanced that
If anything it has made it better
They keep the roads nice

Appendix B

Zip Code Analysis of Tiadaghton and Tioga State Forest Visitors

2013-14 Pennsylvania Visitor Use Monitoring - ZIP Code Data

Each of the three versions of the survey asked for the respondent's home ZIP code as part of the socio-demographic data. These ZIP codes were then uploaded into ArcMap GIS software (ESRI, 2012). A basic spatial analysis was conducted for each forest to determine the geographic distribution of the respondents. Straight-line distances were computed from the respondent's ZIP code to the forest headquarters. Additionally, a breakdown of respondents by state and Pennsylvania County was performed. The results are shown below, segmented by forest. Maps illustrating the geographic distribution of visitors are included at the end of this section (Figure 1 and Figure 2).

Tiadaghton State Forest Highlights

- The average straight-line distance from the respondents' home ZIP code to the Tiadaghton State Forest Headquarters was 66.2 miles.
- 34.3% of respondents' home ZIP codes were within 25 miles of the Tiadaghton State Forest Headquarters, 76% were within 100 miles (Table 1).
- Respondents' home ZIP codes represent 10 states, 90.6% of the respondents reported a home ZIP code in Pennsylvania (Table 2).
- The Pennsylvania respondents' home ZIP codes represent 46 different counties (Table 3). The top three counties were Lycoming (23.5%), Clinton (13.4%), and Centre (7.3%).

Table 1. Straight-Line Distance from ZIP Code to Tiadaghton State Forest Headquarters (n = 362)

Distance (miles)	Number of Responses	Percent*
Less than 25	124	34.3%
25-49	63	17.4%
50-99	88	24.3%
100-199	66	18.2%
200+	21	5.8%

*may not add up to 100% due to rounding

Table 2. Tiadaghton State Forest Responses by State (n = 362)

State	Number of Responses	Percent*
Pennsylvania	328	90.6%
New York	19	5.2%
New Jersey	4	1.1%
Ohio	3	.8%
Maryland	2	.6%
Virginia	2	.6%
Delaware	1	.3%
Montana	1	.3%
Rhode Island	1	.3%
Vermont	1	.3%

*may not add up to 100% due to rounding

Table 3. Tiadaghton State Forest Pennsylvania Responses by County (n = 328)

County	Number of Responses	Percent*
Lycoming	77	23.5%
Clinton	44	13.4%
Centre	24	7.3%
Tioga	17	5.2%
Lancaster	15	4.6%
Dauphin	11	3.4%
Northumberland	11	3.4%
Berks	10	3%
Luzerne	10	3%
York	10	3%
Chester	6	1.8%
Clearfield	6	1.8%
Cumberland	5	1.5%
Delaware	5	1.5%
Schuylkill	5	1.5%
Bucks	4	1.2%
Lebanon	4	1.2%
Montgomery	4	1.2%
Snyder	4	1.2%
Union	4	1.2%
Allegheny	3	.9%
Bradford	3	.9%
Cambria	3	.9%
Columbia	3	.9%

Lehigh	3	.9%
Mifflin	3	.9%
Montour	3	.9%
Northampton	3	.9%
Blair	2	.6%
Erie	2	.6%
Franklin	2	.6%
Indiana	2	.6%
Lackawanna	2	.6%
McKean	2	.6%
Monroe	2	.6%
Perry	2	.6%
Potter	2	.6%
Westmoreland	2	.6%
Adams	1	.3%
Beaver	1	.3%
Carbon	1	.3%
Elk	1	.3%
Fulton	1	.3%
Huntingdon	1	.3%
Juniata	1	.3%
Philadelphia	1	.3%

*may not add up to 100% due to rounding

Tioga State Forest Highlights

- The average straight-line distance from the respondents' home ZIP code to the Tioga State Forest Headquarters was 82.5 miles.

- 32% of respondents' home ZIP codes were within 25 miles of the Tioga State Forest Headquarters, 61.4% were within 100 miles (Table 4).

- Respondents' home ZIP codes represent 14 states, 83.7% of the respondents reported a home ZIP code in Pennsylvania (Table 5).

- The Pennsylvania respondents' home ZIP codes represent 46 different counties (Table 6). The top three counties were Tioga (33.2%), Lycoming (8.5%), and Lancaster (6.7%).

Table 4. Straight-Line Distance from ZIP Code to Tioga State Forest Headquarters (n = 518)

Distance (miles)	Number of Responses	Percent*
Less than 25	166	32%
25-49	76	14.7%
50-99	76	14.7%
100-149	124	23.9%
150+	76	14.7%

*may not add up to 100% due to rounding

Table 5. Tioga State Forest Responses by State (n = 518)

State	Number of Responses	Percent*
Pennsylvania	434	83.7%
New York	42	8.1%
New Jersey	14	2.7%
Maryland	9	1.7%
Ohio	5	.9%
Delaware	3	.6%
Virginia	3	.6%
Massachusetts	2	.4%
Colorado	1	.2%
Connecticut	1	.2%
Florida	1	.2%
Indiana	1	.2%
Kentucky	1	.2%
Utah	1	.2%

*may not add up to 100% due to rounding

Table 6. Tioga State Forest Pennsylvania Responses by County (n = 434)

County	Number of Responses	Percent*
Tioga	144	33.2%
Lycoming	37	8.5%
Lancaster	29	6.7%
Bradford	28	5.5%
Lebanon	18	4.1%
York	16	3.7%
Clinton	11	2.5%
Chester	10	2.3%
Berks	9	2.1%
Luzerne	9	2.1%
Bucks	8	1.8%

Centre	7	1.6%
Montgomery	7	1.6%
Potter	7	1.6%
Union	7	1.6%
Allegheny	6	1.4%
Cumberland	6	1.4%
Dauphin	6	1.4%
Ere	6	1.4%
Columbia	5	1.2%
Lehigh	5	1.2%
Northumberland	5	1.2%
Blair	4	.9%
McKean	4	.9%
Schuylkill	4	.9%
Butler	3	.7%
Lackawanna	3	.7%
Monroe	3	.7%
Perry	3	.7%
Philadelphia	3	.7%
Adams	2	.5%
Northampton	2	.5%
Snyder	2	.5%
Washington	2	.5%
Cambria	1	.2%
Clearfield	1	.2%
Delaware	1	.2%
Elk	1	.2%
Franklin	1	.2%
Mifflin	1	.2%
Montour	1	.2%
Pike	1	.2%
Somerset	1	.2%
Sullivan	1	.2%
Susquehanna	1	.2%
Venango	1	.2%
Wyoming	1	.2%

*may not add up to 100% due to rounding

References

ESRI 2012. ArcGIS Desktop. Release 10.1. Redlands, CA: Environmental Systems Research Institute.

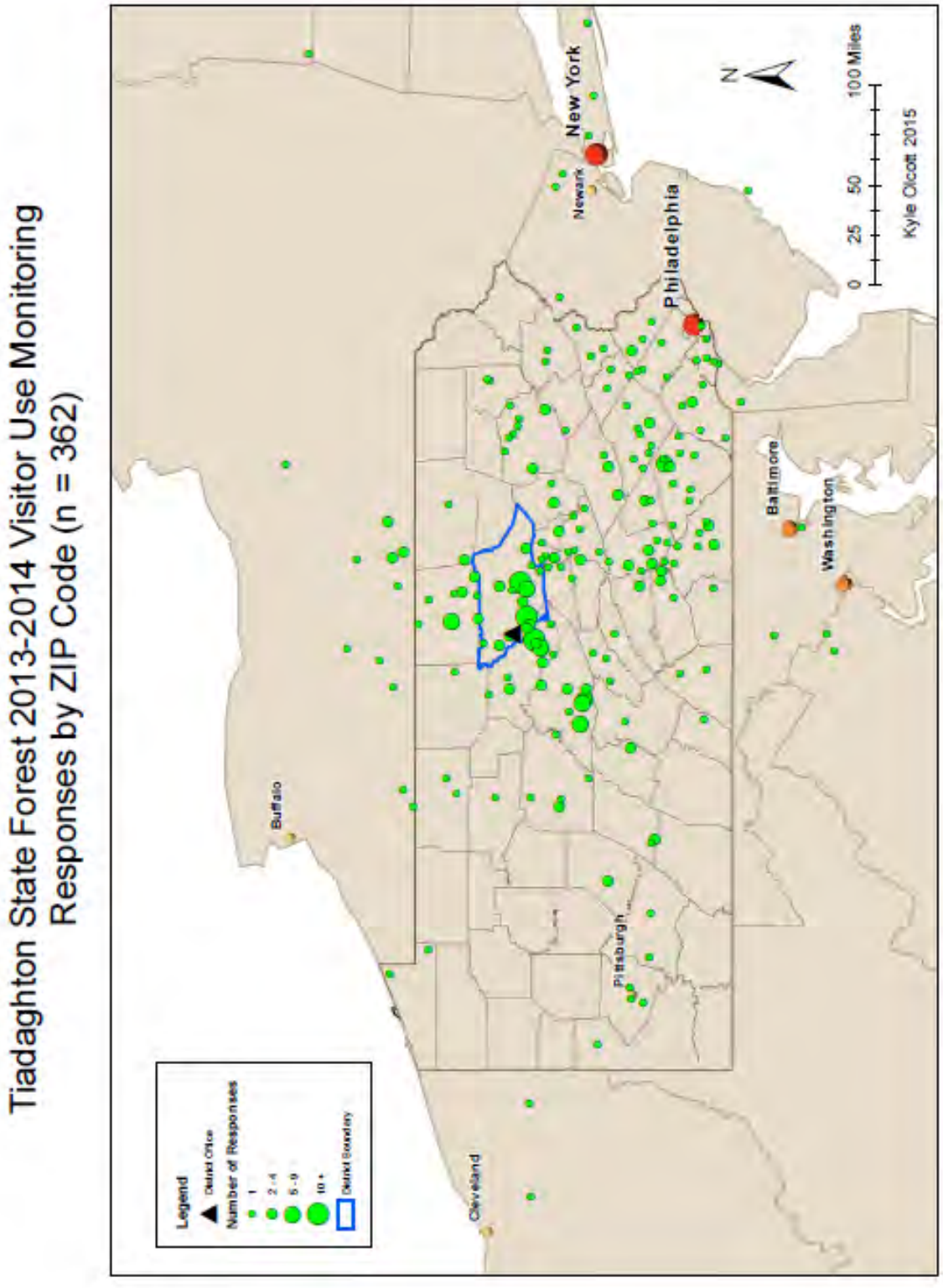

Tiadaghton State Forest 2013-2014 Visitor Use Monitoring
Responses by ZIP Code (n = 362)
New York
Newark
Philadelphia
Baltimore
Washington
Buffalo
Pittsburgh
Cleveland
N
0 25 50 100 Miles
Kyle Olcott 2015
Legend
District Office
Number of Responses
1
2 - 4
5 - 9
10 +
District Boundary

Figure 1

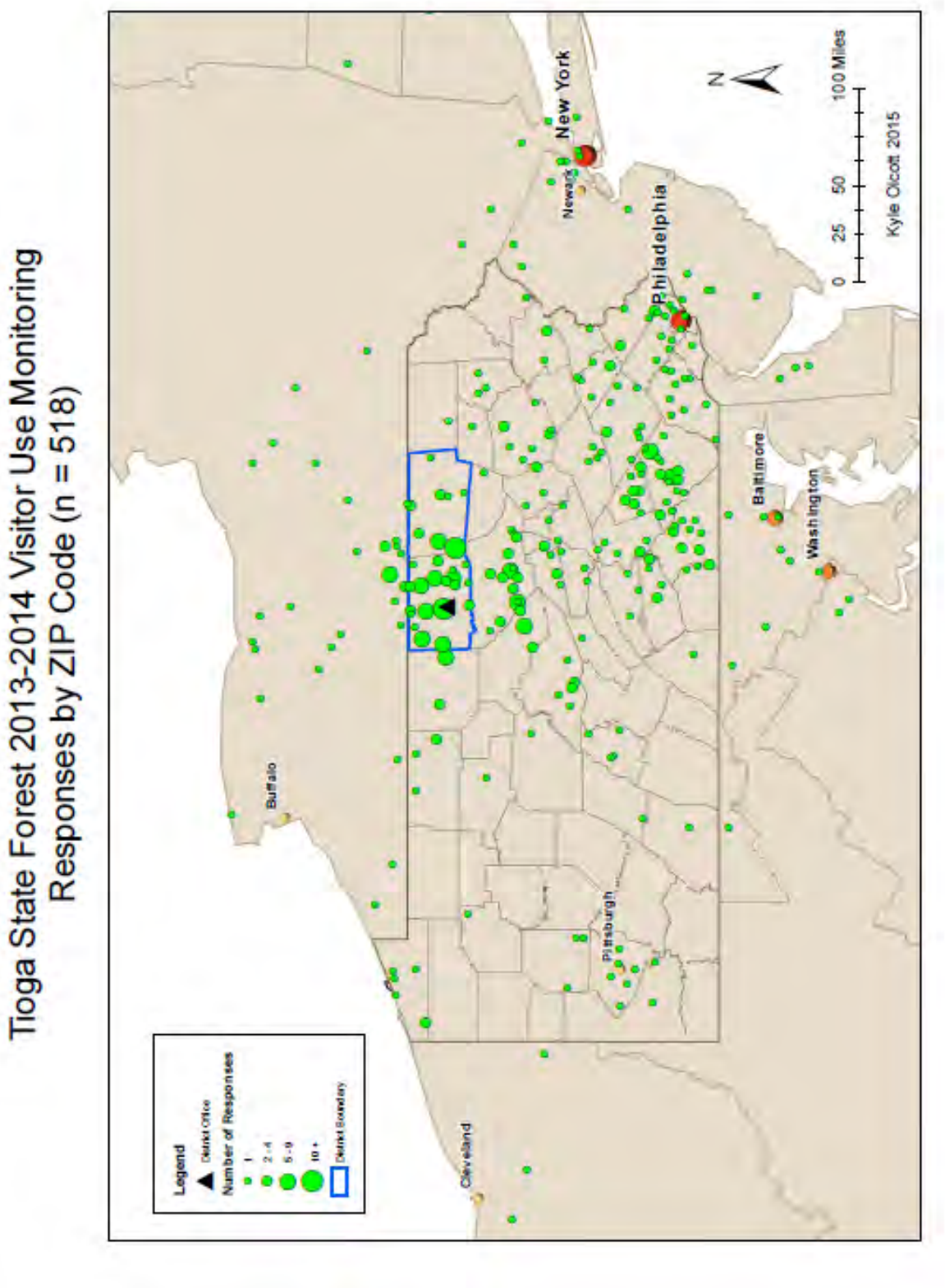

Tioga State Forest 2013-2014 Visitor Use Monitoring
Responses by ZIP Code (n = 518)
Legend
District Office
Number of Responses
1
2 - 4
5 - 9
10 +
District Boundary
New York
Newark
Philadelphia
Baltimore
Washington
Buffalo
Pittsburgh
Cleveland
N
0
25
50
100 Miles
Kyle Olcott 2015

Figure 2

Appendix C

Survey Instrument

Tiadaghton/Tioga State Forest:
2011 - 2012 Recreational Use Survey

Interviewer:_____ Site: _____ Date: _____

Time of Interview: _____ Vehicle Axle Count: _____ Clicker Count: _____

Hello, my name is _____, I'm from Penn State and we are doing a survey of State Forest visitors. The information collected will help the DCNR better serve their visitors. Your participation is voluntary and all information is confidential.
May I have a few minutes of your time to complete this survey?
___ Yes (If refusal, thank them for their time.)

Section 1 (Screening Questions)

1. What is the primary purpose of your visit to this site?

- ❑ Recreation—CONTINUE INTERVIEW
- ❑ Working or commuting to work (stop interview)
- ❑ Just stopped to use the bathroom (stop interview)
- ❑ Just passing through, going somewhere else (stop interview)
- ❑ Some other reason (specify)_____

Complete 2 and 2a for DUDS and OUDS ONLY

2. Are you leaving (site name) for the last time today or will you return later?

- ❑ Leaving for last time today
- ❑ Will return later

2a. When did you first arrive at (site name) on this visit?
Month_____ Day_____ Year_____ Time (military)_____

Complete for GFA ONLY

3. Are you leaving the Tiadaghton/Tioga SF for the last time today or will you return later?

- ❑ Leaving for last time today
- ❑ Will return later

Section 2 (Basic Information)

Now I want to ask you some more questions about where you went on your whole visit to the **Tiadaghton/Tioga** SF, which includes the use of this area and other portions of the **Tiadaghton/Tioga** SF.

1. Did you spend last night in the Tiadaghton/Tioga SF?
No Yes
❑ ❑ **If yes, how many nights in a row did you spend in the Tiadaghton/Tioga SF?** _____

2. When did you first arrive at the Tiadaghton/Tioga on this recreation visit?
Month_____ Day_____ Year_____ Time (military)_____
❑ **Same as site arrival time**

3. When do you plan to finish your visit to the Tiadaghton/Tioga SF on this recreation visit?
Month_____ Day_____ Year_____ Time (military)_____

❑ **Same as site arrival time**

4. What other areas did you visit, or do you plan to visit in the Tiadaghton/Tioga SF for recreation on this trip?
(List sites or areas visited)

_____

4a. Lodging facilities include campgrounds, cabins, hotels and lodges. How many different overnight lodging facilities will you use during this State Forest visit? Number_____

4b. How many developed day use sites (like picnic areas or visitor centers), not including trailheads, will you use on this trip to the Tiadaghton/Tioga SF? Number_____

5. In what activities on this list did you participate during this recreation visit at the Tiadaghton/Tioga SF? (Can choose more than one)		**6. Which of those is your primary activity for this recreation visit to the Tiadaghton/Tioga? (Choose only one)**
Question 5 answers		**Question 6 answer**
	Fishing—all types	
	Hunting—all types	
	Viewing & Learning Nature & Culture	
	Viewing natural features such as scenery, wildlife, birds, flowers, fish, etc. (circle one)	
	Visiting historic and prehistoric sites/areas (circle one)	
	Nature study	
	Visiting a nature center, nature trail, or visitor center (circle one)	
	Nonmotorized Activities	
	Hiking or walking	
	Horseback riding	
	Bicycling, including mountain bikes (circle one)	
	Nonmotorized water travel (canoeing, sailing, kayaking, rafting, etc.)	
	Downhill skiing or snowboarding (circle one)	
	Cross-country skiing, snowshoeing (circle one)	
	Other nonmotorized activities (e.g. swimming, games & sports)	
	Motorized Activities	
	Driving for pleasure on roads	
	Riding in designated off-road vehicle areas (non-snow)	
	Snowmobile travel	
	Motorized water travel (boats, etc.)	
	Other motorized activities (endure events, games, etc.)	
	Camping or Other Overnight	
	Camping in developed sites (family or group sites)	
	Primitive camping (motorized)	
	Backpacking or camping in unroaded areas	
	Resorts, cabins, or other accommodations on State managed lands	
	Other Activities	
	Gathering mushrooms, berries, firewood, or other natural products	
	Relaxing, hanging out, escaping heat, noise, etc.	
	Picnicking and family gatherings in developed sites (family or group sites)	
	OTHER (fill in activity) _____	

7. Including this visit, about how many times have you come to the Tiadaghton/Tioga SF for recreation in the past 12 months? Number_____

7a. How many of those visits were to participate in the main activity you identified a moment ago? Number_____

8. Overall, how satisfied or dissatisfied are you with this visit to the Tiadaghton/Tioga State Forest? _____

- ❑ (1) Very dissatisfied
- ❑ (2) Somewhat dissatisfied
- ❑ (3) Neither dissatisfied nor satisfied
- ❑ (4) Somewhat satisfied
- ❑ (5) Very satisfied

9. What is your home ZIP code or Canadian postal code? _____

- ❑ **Visitor is from a country other than USA or Canada**

10. How many people (including you) traveled here in the same vehicle as you? Number_____

10a. How many of those people are less than 16 years old? Number_____

11. What is your age? Age_____

12. Gender? Male Female

13. Which of the following best describes you?

- ❑ Black/African American
- ❑ Asian
- ❑ White
- ❑ American Indian/Alaskan Native
- ❑ Native Hawaiian or other Pacific Islander
- ❑ Spanish, Hispanic or Latino
- ❑ Other _____

14. Information about income is important because people with different incomes come to the forest for different reasons. Into which income group would you say your household falls?

- ❑ Under $25,000
- ❑ $25,000-$49,999
- ❑ $50,000-$74,999
- ❑ $75,000-$99,999
- ❑ $100,000-$149,999
- ❑ $150,000 or over

___ Don't Know

___ Refused to Answer

Economics Addition

1. If for some reason you had been unable to go to the Tiadaghton/Tioga SF for this visit, what would you have done instead:

- ❑ Gone elsewhere for the same activity
- ❑ Gone elsewhere for a different activity
- ❑ Come back another time
- ❑ Stayed home
- ❑ Gone to work at your regular job
- ❑ None of these: _____

2. About how much time, in total, will you be away from home on this recreation trip?

- ❑ Days _____ or
- ❑ Hours _____

3. On this trip, did you recreate at just the Tiadaghton/Tioga SF, or did you go to other State Forests, parks, or recreation areas?

- ❑ Just the **Tiadaghton/Tioga** SF (skip question 4, go to question 5)
- ❑ Other places (go to question 4)

4. Was the Tiadaghton/Tioga SF your primary destination for this recreation trip?

❑ Yes ❑ No

5. Did you or other members of your party spend any money on this trip within 50 miles of this park?

___ Yes (Go to Question 6) ___ No (Skip to Question 7)

6. For the following categories, please estimate the amount you (and other members of your party) will spend within 50 miles of here on this trip.

Motel, Lodge, Cabin, B&B, etc. $ _____	Restaurants & Bars $ _____	Groceries $ _____	Outfitter Related Expenses (guide fees & equipment rentals) $ _____	Sporting Goods $ _____
Camping $ _____	Local Transportation (bus, shuttles, etc.) $ _____	Gasoline & Oil $ _____	Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.) $ _____	Souvenirs, Clothing, Other Misc. $ _____

6a. How many people do these trip expenditures cover? _____ group members

6b. In total, about how much did you and other people in your vehicle spend on this entire trip, from the time you left home until you return home? Dollar Amount_____

7. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

____ No (If no, why not?_____

8. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

____ No (If no, why not?_____

Satisfaction Addition

1. **This section asks you about your satisfaction with the recreation services and quality of the recreation facilities in the Tiadaghton/Tioga SF. Please rate the following attributes of <u>this recreation site or area of the forest</u>. Also rate the importance of this attribute toward the overall quality of your recreation experience here.** Rate importance from 1 (=not important) to 5 (=very important) in terms of how this attribute contributes to your overall recreation experience.

	Poor	Fair	Average	Good	Very Good	N/A	**Importance**				
Scenery	1	2	3	4	5		1	2	3	4	5
Availability of parking	1	2	3	4	5		1	2	3	4	5
Parking lot condition	1	2	3	4	5		1	2	3	4	5
Cleanliness of restrooms	1	2	3	4	5		1	2	3	4	5
Condition of the natural environment	1	2	3	4	5		1	2	3	4	5
Condition of developed recreation facilities	1	2	3	4	5		1	2	3	4	5
Condition of Forest roads	1	2	3	4	5		1	2	3	4	5
Condition of Forest trails	1	2	3	4	5		1	2	3	4	5
Availability of information on recreation	1	2	3	4	5		1	2	3	4	5
Feeling of safety	1	2	3	4	5		1	2	3	4	5
Adequacy of signage	1	2	3	4	5		1	2	3	4	5
Helpfulness of employees	1	2	3	4	5		1	2	3	4	5
Attractiveness of the forest landscape	1	2	3	4	5		1	2	3	4	5

2. If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

_____

3. Please rate your perception about the number of people at this area today. Use a scale of 1 to 10, where 1 means there was hardly anyone else there, and 10 means that you thought the area was very overcrowded?

HARDLY ANYONE								VERY OVERCROWDED	
1	2	3	4	5	6	7	8	9	10

4. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

5. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

State Forest Experience Addition

1. Is this your first visit to the state forest?

❑ Yes ❑ No

[If no] In what year did you make your first visit to the state forest _____ year

In a typical year, how many days do you spend recreating in the state forest? _____ days

In a typical year, how many days do you spend recreating at other forest recreation sites outside of the state forest? _____ days

2. Which of the following best describes the composition of your group? [check only one]

❑ Alone ❑ Family

❑ Friends ❑ Family & friends

❑ Commercial group (group of people who paid a fee to participate in this trip) ❑ Organized group (club or other organization)

❑ Other [please specify]_____

3. Overall, how would you rate the quality of each of the following at the state forest:

	Awful	Fair	Good	Very Good	Excellent	Not applicable
Sanitation and cleanliness	1	2	3	4	5	NA
Safety and security	1	2	3	4	5	NA
Condition of latrines, picnic pavilions & other facilities	1	2	3	4	5	NA
Responsiveness of staff	1	2	3	4	5	NA
Natural environment	1	2	3	4	5	NA

4. Which of the following was the most important reason for this visit to the state forest? [Please check only one]

_____ I came here because I enjoy being in the forest

_____ I came here because it is a good place to spend time with friends/family

_____ I came here because it's a good place to :

_____ Hunt _____ Hike

_____ Bike _____ Horseback ride

_____ Fish

_____ Other reasons for visit (e.g., cabin owner, private inholding):

5. On a scale of 1 to 5, how do you feel about access to the forest: [1 poor, 5 very good]

By roads	1	2	3	4	5
By trails	1	2	3	4	5

6. Does anyone in your household have a disability?

❑ Yes ❑ No

6a. [If yes] Please tell us if you believe our facilities are adequate

7. Here is a list of possible reasons why people recreate at outdoor recreation sites. Please tell me how important each of the following benefits is to you as a reason for visiting a state forest in Pennsylvania. [one is not at all important and five is extremely important] [N/A does not apply to this question. Should be able to answer for each]

REASON	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important
To be outdoors	1	2	3	4	5
For relaxation	1	2	3	4	5
To get away from the regular routine	1	2	3	4	5
For the challenge or sport	1	2	3	4	5
For family recreation	1	2	3	4	5
For physical exercise	1	2	3	4	5
To be with my friends	1	2	3	4	5
To experience natural surroundings	1	2	3	4	5
To develop my skills	1	2	3	4	5

8. If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

_____

9. We are interested in knowing what facilities/services in the state forest are most important to you. Please tell me how important each of the below listed items is to you.

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important	No Opinion
Wildlife viewing areas or opportunities	1	2	3	4	5	x
Picnic areas	1	2	3	4	5	x
Parking	1	2	3	4	5	x
Signs directing me to recreation facilities	1	2	3	4	5	x
ATV Trails	1	2	3	4	5	x
Snowmobile Trails	1	2	3	4	5	x
Hike, bike, & horse (non-motorized)Trails	1	2	3	4	5	x
Printed Interpretive information	1	2	3	4	5	x

10. Please look at this list of statements that address your feelings about the recreation <u>area</u> that you visited on this trip in the state forest. Please indicate your level of agreement with each of the statements listed below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
This place means a lot to me	1	2	3	4	5
I enjoy recreating at this place more than other places I could visit	1	2	3	4	5
I am very attached to this place	1	2	3	4	5
I get more satisfaction out of visiting this place than from visiting most places	1	2	3	4	5

11. Have you obtained any information about this area during this trip or in preparation for it?

❑ Yes ❑ No

[If yes] Please continue with follow-up questions

11a. What type of information did you obtain?

❑ State forest map ❑ Trail map

❑ PA visitors guide ❑ Other:

11b. When did you receive information?

❑ Before leaving home ❑ After arriving here

11c. Where or from whom did you receive information?

11d. Was the information you received helpful to plan your trip?

❑ Yes ❑ No

[If no] what would have made the information more useful?

12. What services in nearby communities (OFF of the forest) do you wish were available? Please list:

_____

13. This section asks about your satisfaction with your recreation experience at <u>this recreation site</u> or <u>area of the forest.</u> Please rate the following attributes of this recreation site or area of the forest.

	Awful	Fair	Good	Very Good	Excellent	Not applicable
Opportunity to recreate without feeling crowded	1	2	3	4	5	NA
Places to recreate without conflict from other visitors	1	2	3	4	5	NA
Compatibility of recreation activities at the area	1	2	3	4	5	NA
Helpfulness/courteousness of Forest employees	1	2	3	4	5	NA
Helpfulness/courteousness of people in surrounding communities	1	2	3	4	5	NA

14. Was the state forest your primary destination for this recreation trip?

❑ Yes ❑ No

[If no] Please list your primary destination for this recreation trip:_____

15. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

16. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

Visitor Use Monitoring of Pennsylvania's State Forests: Year 4 Report – Elk and Moshannon State Forests

by

Alan Graefe

Andrew Mowen

Maxwell Olsen

Tom Mueller

Department of Recreation, Park and Tourism Management
The Pennsylvania State University

and

Donald English
USDA Forest Service

Final Report Submitted to the Pennsylvania Bureau of Forestry
Department of Conservation and Natural Resources
Harrisburg, Pennsylvania

August, 2016

Table of Contents

Introduction....1
Purpose....2
Objectives....2
Methodology....3
Organization of this Report....4
Recreation Use Estimates....5
Survey Results....12
- Trip Visitation Patterns....13
- Demographic Characteristics....16
- Activity Participation....17

Satisfaction Addition....19
- Satisfaction Ratings....19
- Importance Ratings....20
- Other Visitor Satisfaction Ratings....22
- Overall Satisfaction....22
- Crowding Ratings....23

Economics Addition....24
- Visitor Expenditures....26

Experience Addition....29
- Forest Access....29
- Recreation Experience....30
- Place Attachment....31
- Motivations/Reasons for Visiting the State Forest....33
- Visitor Response to Potential Facilities and Services....34
- Information Services....35
- Visitor Response to Questions about Marcellus-Shale Related Activity....36

Summary and Conclusions....40
Appendices....44
- Appendix A – Visitor Responses to Open-ended Questions....45
- Appendix B – Zip Code Analysis of Moshannon and Elk State Forest Visitors....77
- Appendix C – Survey Instrument....85
- Appendix D – List of Survey Sites....94

List of Tables

1 Description of the Sampling Sites....6
2 Summary of Mechanical and Observational Counts at Sampling Sites....8
3 Recreation Use Estimates for the Moshannon and Elk State Forests....11
4 Trip Visitation Patterns in the State Forests....14
5 Demographic Characteristics of State Forest Visitors....16
6 Activity Participation of State Forest Visitors....18
7 Satisfaction Ratings for Customer Service Attributes in the State Forests....18
8 Importance Ratings for Customer Service Attributes in the State Forests....21
9 Visitor Satisfaction Ratings for Various Forest Attributes....22
10 Overall Satisfaction of State Forest Visitors....22
11 Summary of Perceived Crowding Ratings....23
12 State Forest Recreation Trip Profile (for economics section)....25
13 Summary of Trip Spending Patterns of State Forest Visitors....27
14 Amount Spent for Various Categories of Trip Expenditures....28
15 Visitor Ratings of Access to the State Forests....29
16 Visitor Ratings for Various Recreation Experience Attributes....30
17 Most Important Reason for this Visit to the State Forest....31
18 Summary of Place Attachment Scale Items....32
19 Summary of Motivations/Reasons for Recreating in the State Forests....33
20 Visitor Importance Ratings for Various Types of Facilities and Services....34
21 Visitor Responses to Questions about Information Services....35
22 Visitor Responses to Questions about Marcellus Shale-Related Activity....36
23 Responses to How Marcellus Shale-related Activity has Changed your Use of the Forest....37
24 Responses to Why Marcellus Shale-related Activity has not Changed your Use of the Forest....38
25 Responses to How Marcellus Shale-related Activity has Changed your Recreation Experience at the Forest....38
26 Responses to Why Marcellus Shale-related Activity has not Changed your Recreation Experience at the Forest....39

Introduction

Resource managers in the Pennsylvania Department of Conservation and Natural Resources have identified a need to better understand the recreational visitors who use the State Forests and State Parks. This need includes understanding visitors' use patterns, as well as their expectations, spending patterns, desires and satisfaction levels. Relevant questions asked by managers might include:

i) Who are our customers?
   - What are the primary customer segments and sub segments?
   - What is the profile of each segment and sub segment?
   - What are the patterns of use, trip characteristics, purpose of visit, and demographic characteristics of our visitors?
   - What is our market niche?
   - What is the average number of vehicles entering/exiting State Forest/Park sites?
   - What is the average number of people per vehicle?

ii) What are our customers looking for?
   - What are their expectations and satisfaction levels?
   - What gaps exist between expectations and satisfaction levels?
   - What do they want in terms of information/interpretation, services, and amenities?
   - What kind of experience do they desire?
   - What are their preferences for facilities?
   - How well are we performing in key areas (service, facilities, law enforcement, information/interpretation, resource protection, and visitor experience)?
   - What is an acceptable level of services/maintenance given existing and projected budget constraints?
   - What are the barriers to participation?

iii) What is the economic impact of State Forest/Park visitors?
   - How are State Forest/Park visitors impacted by oil and gas drilling operations on and surrounding State Forests and State Parks?

Purpose

The purpose of this study is to develop a long-term, systematic approach for answering such questions about Pennsylvania State Forest and State Park visitors. The study will survey visitors at selected State Forests and Parks over a five year period to measure recreational use and gather data to provide a profile of recreational visitors. Sampling will be designed to measure and describe recreation use on two State Forests and six State Parks per year over a five-year study period. In total, 10 forests and 30 parks will be surveyed during the five-year duration of the project. After the initial study period, additional surveying may be conducted.

This report provides results from the fourth year of the project. Specifically, surveys were conducted in the Moshannon State Forest (District #9) and the Elk State Forest (District #13) to measure recreation use and develop a profile of State Forest visitors and their use patterns. Concurrently, surveys were conducted in six State Parks located adjacent to or near these two State Forests (Bendigo, Elk, Clear Creek/Cook Forest, Black Moshannon, Parker Dam, S. B. Elliott). Results from the State Park surveys are presented in a separate report.

This project builds on earlier surveys and will incrementally create a database that can be used to better understand State Forest and State Park visitors and provide a longitudinal database for tracking trends in State Forest and State Park use. For example, results can be used to compare participation patterns and visitor characteristics for different individual forests and parks. As the database grows, findings can be extrapolated to the entire state systems and will ultimately represent all State Forests and State Parks within the Commonwealth by the end of the five-year study.

Objectives

1. To conduct surveys of visitors to selected Pennsylvania State Forest and State Park areas and develop a visitor profile, including information on the origin of visitors (e.g. local, non-local resident, out of state), trip context and purpose (e.g. day versus overnight visitor, primary purpose versus casual visitor), length of stay in the area, spending patterns, size and type of visiting groups, previous visitation history, activities pursued, and different patterns of visitation across seasons.

2. To measure overall recreation use and specific visitation patterns within the selected State Forests and State Parks, including the number of visitors per vehicle and the distribution of use across different types of sites within the given State Forest/Park.

3. To develop a demographic profile of visitors at the designated State Forests/Parks.

4. To identify visitor expectations and levels of satisfaction with various aspects of their visit.

5. To examine visitor opinions about possible future management practices occurring in State Forests/Parks and facility development decisions.

6. To examine visitor reactions to oil and gas activities and the impacts these activities have on recreational visitation patterns and visitor experiences.

7. To measure visitor expenditures and extrapolate these to determine their level of economic impact on surrounding communities.

Methodology

Data were collected through the use of on-site interviews and use measurements at a stratified random sample of the forests' developed sites and dispersed areas open for recreation. The overall survey methodology and sampling design is directly comparable to and consistent with the procedures established for the U.S. Forest Service's National Visitor Use Monitoring (NVUM) program. Details for the sampling and analysis approach for that program can be found in a report by English et al. (2001), available on the USDA Forest Service website for the National Visitor Use Monitoring Program.[1] A detailed sampling schedule, which identified the site, day, and time of day for on-site interviewing, was established for each forest in consultation with Bureau of Forestry personnel. Prior to the survey, meetings were held with the district forester and key staff in each forest to identify the range of sampling locations for each forest. The potential survey sites were visited by project personnel to confirm their suitability for the study and identify an optimal protocol and design of the sampling station for each site. A sample site inventory was created, with input from each forest's staff, to categorize the use levels for all designated sites and days of the year. From this matrix, a detailed random sampling calendar was developed by Dr. Donald English, manager of the NVUM program for the USDA Forest Service. The sampling schedule provided for a total of 200 sampling days per forest, allocated over various sampling strata per forest, and distributed throughout the calendar year.

Sampling for the survey was designed to obtain a database that accurately describes overall use of the forests, as well as use of selected types of sites and individual areas of particular interest within the State Forests. All on-site interviewing, data entry, and analysis were conducted by trained project staff. Concurrent with the visitor survey, area use patterns

[1] English, D. B. K., Kocis, S. M., Zarnoch, S. J., & Arnold,. J. R. 2001. Forest Service National Visitor Use Monitoring Process: Research Method Documentation. http://www.fs.fed.us/recreation/programs/nvum

were measured through traffic and trail counters and observations of vehicles using the area. Both the visitor count data and visitor survey data will later be used to validate and calibrate visitor use monitoring methods for future application in the State Forests.

On-site face-to-face interviews were used to obtain data from a sample of recreationists visiting the Moshannon and Elk State Forests. The on-site survey took approximately 5-15 minutes to complete, depending on which survey version was used in the interview. Approximately one-third of the visitors were interviewed with the basic version/experience addition, another third received the basic/satisfaction addition and the remaining third completed the basic/economics addition.

All of the sampling for this study followed a detailed sampling schedule and took place between 8:00 am and 8:00 pm, during a morning shift or an afternoon shift. The morning sampling period ran from 8:00 am to 2:00 pm, while the afternoon sampling period ran from 2:00 pm to 8:00 pm.

Organization of this Report

This report summarizes the results of visitor surveys conducted on the State Forests during the period October 1, 2014 through September 30, 2015. The results are organized by topic area, with different sections corresponding to different versions of the survey. Each section follows a consistent format, with the results reported separately for each forest. Appendices to the report include responses to open-ended questions in the survey and a copy of the survey instrument used.

Recreation Use Estimates

Following the National Visitor Use Monitoring (NVUM) protocols, recreation use of the State Forests was estimated through a process of obtaining mechanical traffic counts, calibrated by observation and on-site interviewing, at the sample of recreation sites and days scheduled throughout the study year. Mechanical traffic counts were obtained for a 24-hour period on the targeted sample days. Interviewers were on site for a 6-hour period. During that time, they both visually calibrated the mechanical counter by observing and counting exiting traffic, and interviewed a random sample of exiting visitors. State Forest sampling sites included all potential places that recreation users could exit the forests, and were classified by types and use levels (Table 1). Most of the sampling days were conducted at general forest area (GFA) sites. Such sites provide access to the forest without concentrating use at the site itself, and include trailheads, river put-in and take-out points, forest roads, etc. Other sampling categories include day use developed sites (DUDS) such as picnic areas, scenic overlooks and the like, overnight use developed sites (OUDS) including camping areas, cabins, resorts, etc., and "special areas." The latter category includes designated "natural" and "wild" areas of the state forests, and is analogous to the designated Wilderness areas within the national forests. See Appendix D for a listing of sampling sites included in these forests in each of these categories.

In addition to these categories, field personnel spent several days in each Forest at "View Corridor" sites. The view corridor sites were located on higher volume paved roads in each Forest (Routes 504, 322, 153, 555, Beaver Road, Cassanova Road, and Quehanna Highway in the Moshannon and Routes 555, 872, 120, 46, 155, and Quehanna Highway in the Elk). The intent of sampling at those sites was to estimate the volume of scenic driving through the respective State Forests, above and beyond that occurring on the forest roads already included in the sampling of GFA sites. Since traffic on these state routes includes all types of vehicles (work and commuting vehicles, etc.) and cannot all be considered scenic driving in the State Forest, the total traffic counts were adjusted to estimate the number of vehicles that could be considered participating in sightseeing or scenic driving to any degree. As for the other types of sites, mechanical traffic counts were obtained after 6 hours and 24 hours. Simultaneously, traffic was observed and counted in hourly intervals and categorized as regular vehicles and commercial vehicles during the 6-hour field visit. The visual counts were used to validate the 6-hour mechanical traffic counts. No interviews were conducted at these sites due to safety concerns related to the higher speed and volume of traffic. The proportion of scenic driving was estimated

using data from the National Visitor Use Monitoring study conducted in the Allegheny National Forest, and validated with the activity participation data collected in the current State Forest study.

Since most recreation use of the State Forests is dispersed rather than focused at developed day use or overnight use areas, GFA sites accounted for the greatest number of sampling days across both forests. Sampling of State Forest sites was also stratified by level of recreational use, including three use levels as estimated by Bureau of Forestry personnel (Table 1 and Appendix D). More specifically, the sampling strata were defined by best available estimates of the daily volume of exiting recreation traffic at each site, and classified as Low, Medium, and High. These estimated recreation use levels were based on relative criteria for each type of site and based on the collective knowledge and experience of Bureau of Forestry personnel.

Table 1. Description of the Sampling Sites.

	Moshannon		**Elk**	
	Percent of Sampling Days	**Percent of Interviews**	**Percent of Sampling Days**	**Percent of Interviews**
Site Type				
General Forest Area (GFA)	57.8	69.3	49.7	27.3
Day Use Developed Site (DUDS)	14.9	19.7	18.4	64.7
Overnight Use Developed Site (OUDS)	11.4	4.9	19.6	6.5
Special Area	10.4	6.1	7.8	1.5
View Corridor	5.5	0	4.5	0
Total	100.0	100.0	100.0	100.0
Use Level Stratum				
High	18.4	26.9	18.7	52.0
Medium	32.1	34.3	26.3	30.7
Low	49.5	38.8	55.0	17.4
Total	100.0	100.0	100.0	100.0

Stratification was designed to reduce the overall variance of the visitation estimate, and to ensure an adequate representation of varying levels of recreation throughout the study year. More sampling days were allocated to lower use general forest areas, but in the Elk State Forest particularly, more interviews were completed at the more popular developed sites and during higher use periods due to the greater number of visitors contacted. Survey results were weighted to the population of days in each stratum to correctly represent the use distribution across the various types of sites within the State Forests.

Pneumatic traffic counters were used to measure vehicular use at suitable locations such as forest roads and parking lots. Field personnel recorded counts at the end of each 6-hour sampling period and again after 24 hours had elapsed. Comparing the mechanical and observational counts at the end of the 6-hour period provides a calibration that can be used with the 24-hour mechanical counts to obtain an estimate of total daily exiting traffic. Survey screening questions were used to determine the proportion of exiting traffic that was completing a recreation visit, as well as the proportion of recreational visitors compared to other users of forest sites. Non-recreational forest users included those who were working or commuting to work, just passing through, or there for some other reason. Additional survey questions were used to convert vehicle counts to visitor estimates, based on the number of people per vehicle.

The 6-hour mechanical traffic counts ranged from 0 to 206, with a mean of 15.9 vehicles counted on the Moshannon and 15.5 vehicles on the Elk (Table 2). A significant number (9-14%) of these counts were zero, reflecting no traffic during the 6-hour sampling period. The 24-hour counts ranged from 0 to 579, with a mean of 45.2 on the Moshannon and 44.0 on the Elk. The hand tally counts for the 6-hour sampling periods averaged 6.4 and 6.2 on the Moshannon and Elk State Forests, respectively. These counts were naturally lower than (about half of) the corresponding 6-hour mechanical counts because the observational counts included only one-way (exiting) traffic while the mechanical counters recorded traffic moving in both directions. The 6-hour counts obtained via the hand tally clickers and mechanical traffic counters showed a very high degree of correlation (.87 on the Moshannon and .83 on the Elk), lending additional validity to the estimates of visitor use levels.

Results from the traffic counts and completed surveys were used to estimate total recreational use of the State Forests. Data were extrapolated from the sampled site-day combinations to all site-days within each stratum and totaled for the entire forest. The results include two measures of recreational use per forest: 1) the total number of individual site visits, and 2) the total number of recreational forest visits. Since many visits to the State Forests tend to include visits to more than one different site during each visit, the total site visits are considerably higher than the number of forest visits.

Table 2. Summary of Mechanical and Observational Counts at Sampling Sites

	Moshannon	Elk
Pneumatic Traffic Counter		
6-hour Traffic Counts (Percent)		
0	9.2	14.0
1 - 2	7.8	16.6
3 - 5	13.7	13.2
6 - 9	16.4	21.5
10 - 30	38.5	24.0
31 or more	14.4	10.7
Total	100.0	100.0
Mean	15.9	15.5
24-hour Traffic Counts (Percent)		
0	3.6	2.5
1 - 5	1.4	15.5
6 - 10	8.7	14.8
11 - 25	30.2	22.9
26 - 40	19.4	18.1
41 - 60	16.6	10.6
61 or more	20.1	15.6
Total	100.0	100.0
Mean	45.2	44.0
6-hour Hand Clicker Counts (Percent)		
0	14.7	16.2
1 – 2	20.3	28.9
3 – 5	26.0	29.5
6 – 10	20.9	13.4
11 or more	18.1	12.0
Total	100.0	100.0
Mean	6.4	6.2

A State Forest recreation visit is defined as "one person entering and exiting a State Forest for the purpose of recreation" (English et al., 2001). A single visitor may participate in any number of activities and visit any number of sites within a single visit. Also, a single visit can last multiple days or might be one person or group visiting a single site on a day trip for any amount of time. Site and forest recreation visits were estimated using the following process and data shown in Table 3. First, 24-hour traffic counts were used to measure the number of vehicles leaving the forest on any given day (Table 3, column 1). The vehicle counts within each stratum were multiplied by the percentage of exiting traffic whose purpose for visiting the forest was for recreation (column 2). To avoid double counting visitors who may be traveling to and from a site within the day, the next step was to multiply the number of vehicles on recreation trips by

the percentage of visitors reporting they were leaving the site for the last time that day (column 3). To convert the units from vehicles to people, the next step was to multiply by the average number of people per vehicle for each site-use stratum (column 4), resulting in an estimate of total daily recreation visits for each site-use category (column 5).

To convert daily recreation use measures to total forest use for the entire calendar year, the average daily use estimates were extrapolated to the population of site days (or total number of days at all sites for each site type and use level) in the year, shown in column 6. The results of this calculation represent the total yearly recreation site visits for all sites in each site type-level category (column 7). Finally, one additional variable was used to estimate the number of State Forest visits for each stratum: the number of sites visited within the forest during the current visit. Visitors reported visiting an average of 1.7 sites in the Elk and 1.6 sites in the Moshannon during their current visit. The number of site recreation visits was adjusted by the number of sites visited by each respondent, resulting in the estimated number of Forest visits (column 8).

The Elk State Forest received an estimated 166,750 recreational visits during the study year (October 1, 2014 – September 30, 2015). These forest visits included a total of 289,398 individual site visits, or about 1.7 site visits for each State Forest visit. The Moshannon State Forest received an estimated 240,257 recreational visits and 393,404 individual forest site visits during the same period (about 1.6 site visits per forest visit).

These recreation use estimates are typical of recreation use levels in other State Forests as shown in previous study reports. However, there is an important caveat to the interpretation of the numbers reported above for the Elk State Forest in particular. This caveat results from the popularity of wildlife/elk viewing and the existence of the Elk Country Visitor Center within the Elk State Forest near Benezette, Pennsylvania. This center is a major tourist attraction operated as a partnership between the Pennsylvania DCNR and the Elk Country Visitor Alliance. The numbers of visitors to this facility are measured using a permanent traffic counter and included in statistics maintained by the DCNR Bureau of State Parks. Since this site is managed by another entity and has its own visitor use measurement, it was not included in the calculation of total recreation use on the Elk State Forest in this report. Thus, the use numbers reported above and shown in Table 3 for the Elk State Forest underestimate the total recreational use of the forest. These estimates represent use of all State Forest sites other than the Elk Country Visitor Center.

For this study year (October 1, 2014 – September 30, 2015), the Elk Country Visitor Center recorded a total of 344,596 visitors. This volume of use exceeds the numbers recorded for all of the other forest sites combined, and should be considered another estimate of recreation use of the State Forest. It would not be appropriate to simply add the Visitor Center numbers and our site use estimates to calculate a total use measure for the Elk State Forest, as there is some overlap between these user groups. Many respondents in our survey reported visiting multiple elk viewing sites during their visit to the Forest and thus would be included in our use estimates and the Visitor Center counts as well. But it is appropriate to recognize the relatively large number of people using the Elk Country Visitor Center versus the more typical numbers visiting the other sites within the State Forest.

In addition to these recreation visits to the State Forests, the number of scenic driving visits was also estimated via the sampling procedure described above for the "View Corridor" locations. From the observational counts conducted, the number of vehicles per day ranged from 201 to1,472 total vehicles in the Elk (average = 534 vehicles) and from 125 to 1,472 in the Moshannon (average = 435 vehicles), and the proportion of non-commercial traffic averaged 89% for the different highways in these Forests. From these traffic counts and data from the visitor surveys on activity participation and number of people per vehicle, the total number of "viewing" or "sightseeing" visits was estimated to be 2,939,777 visits for the Elk State Forest and 2,287,974 visits for the Moshannon State Forest. These viewing use estimates are much larger than those for other State Forests studied previously for two reasons: first, the popularity of elk viewing in these Forests contributes to the high volume of sightseeing use; and second, these two Forests included a larger number of scenic routes than many of the other State Forests (6 in the Elk State Forest and 7 in the Moshannon State Forest). These annual visitation estimates might be considered another form of more passive or secondary use of the State Forests, above and beyond the primary recreation use measured in the visitor surveys conducted at the various sites throughout the Forests. While we have no data on how much sightseeing or other recreation activities these people may be doing, they are traveling through the Forests and may be partaking of their scenic or other values.

Table 3. Recreation Use Estimates for the Moshannon and Elk State Forests

Elk State Forest								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Site Type and Use Strata	**1-way Traffic Count**	**% Recreation Visits**	**% Leaving for Last Time**	**People per Vehicle**	**Recreation Visits per day**	**Site days in year**	**Total Site Visits**	**Total Forest Visits**
GFA–High	23.82	0.705	0.782	2.24	29.41	36	1059	591
GFA-Medium	19.18	0.789	0.596	2.38	21.47	1386	29,752	16,904
GFA–Low	12.34	0.533	0.816	2.35	12.61	14912	188,001	111,243
DUDS–High	230.67	0.828	0.604	3.08	355.30	27	9,593*	4,100
DUDS-Medium	75.34	0.650	0.846	2.82	116.82	73	8,528*	3,467
DUDS–Low	16.50	0.313	1.000	3.20	16.53	265	4,379*	2,190
OUDS-High	12.80	0.745	0.286	2.54	6.93	198	1,372	635
OUDS-Medium	12.80	0.745	0.286	2.54	6.93	98	679	314
OUDS-Low	4.72	0.733	0.636	2.09	4.59	463	2,127	1,013
Special-High	NA							
Special-Medium	NA							
Special–Low	11.22	0.571	0.857	3.13	17.19	2555	43,908	26,292
Forest Total							289,398*	166,750
Moshannon State Forest								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Site Type and Use Strata	**1-way Traffic Count**	**% Recreation Visits**	**% Leaving for Last Time**	**People per Vehicle**	**Recreation Visits per day**	**Site days in year**	**Total Site Visits**	**Total Forest Visits**
GFA–High	32.41	0.625	0.620	2.16	27.12	297	8,056	4,853
GFA-Medium	32.41	0.625	0.620	2.16	27.12	1594	43,234	26,045
GFA–Low	19.52	0.514	0.664	2.08	13.85	18724	259,395	168,438
DUDS–High	27.91	0.495	0.918	2.45	31.07	230	7,147	3,722
DUDS-Medium	27.91	0.495	0.918	2.45	31.07	320	9,943	5,179
DUDS–Low	26.61	0.439	0.957	2.93	32.76	1640	53,720	25,827
OUDS-High	10.16	0.545	0.400	2.08	4.60	78	359	211
OUDS-Medium	10.16	0.545	0.400	2.08	4.60	20	92	54
OUDS-Low	3.22	0.500	0.400	2.00	1.29	1362	1,752	876
Special–High	NA							
Special-Medium	14.50	0.444	1.000	2.5	16.10	365	5,875	3,456
Special–Low	12.50	0.28	1.000	3	10.50	365	3,833	1,597
Forest Total							393,404	240,257

* Total site visits for the Elk State Forest do not include visits to the Elk Country Visitor Center. Visitation of this facility is monitored separately through a permanent traffic counter. Use of the Elk Country Visitor Center for the study year (October 1, 2014 – September 30, 2015) was estimated by the Bureau of State Parks to be 344, 596 visitors.

Survey Results

Overall, a total of 1,370 State Forest visitors were surveyed. Among these, 78% were willing to participate in the interview. Of the unwilling visitors, 32 were people who had already completed the survey and were screened out. Thus the overall response rate, reflecting the proportion of selected visitors who were willing to complete the survey, was 79%.

One of the initial screening questions in the survey asked the visitors, "What is the primary purpose of your visit to this site?" Responses included: recreation, working or commuting to work, just stopping to use the bathroom, just passing through/going somewhere else, and some other reason. Among these forest visitors, the majority (62%) stated they were visiting the forest for recreation. Only those respondents who were visiting the forest for recreation were included in the estimates of recreation use and descriptions of visitors in this report. Most of the remaining individuals in the sample were working or commuting to work (19%), just passing through (11%), stopping to use the bathroom (5%), or there for some other reason (3%). "Other" reasons mentioned by respondents included travel to residences or private cabins, firewood collecting, letting the dog out, and just turning around.

Trip Visitation Patterns on the State Forests

- Most of the visitors contacted (91% in the Moshannon and 77% in the Elk) were repeat visitors to the State Forest.
- Among those who were repeat visitors, many in both Forests had made their first visit to the Forest prior to 1980 (44% in the Moshannon and 32% in the Elk). About 20% in both Forests made their first visit during the 1980s or 1990s. The remaining were relatively new visitors, with 13% in the Moshannon and 21% in the Elk reporting their first visit between 2000 and 2015.
- Moshannon State Forest visitors reported visiting the forest more often than Elk State Forest visitors.
  - About half of the Moshannon visitors (52%) versus one-fourth (27%) of the Elk visitors indicated that they typically make between 0 and 5 visits to the State Forest per year.
  - The average number of reported trips to the forest per year was about 19 for the Elk and 32 for the Moshannon.
- About one-fifth (19% of the Moshannon visitors and 16% of the Elk visitors) contacted indicated that they typically make between 0 and 5 visits to other forest areas each year (these could include other State Forests or any other public or private forests the respondent visited), and the average number of trips to other forests per year was about 24 and 26, respectively for the Moshannon and Elk State Forests.
- The majority of visitors sampled in both forests were day users.
  - However, Moshannon visitors were much more likely (48%) than Elk visitors (36%) to be on overnight trips to the state forest.
  - Of those respondents who were overnight visitors, the average length of stay was slightly longer in the Moshannon (3.5nights versus 2.7 nights in the Elk).
- Nearly two-thirds of the visitors in the Moshannon (66%) indicated that they used no day use facilities during their visit, while three-fourths in the Elk (70%) used one or more day use facilities on this trip. The greater use of day use facilities in the Elk State Forest reflects the presence of the large visitor center and other elk viewing areas in that Forest.
- About two-thirds (62-71%) of the respondents in both Forests had just one or two people in their vehicle on this trip. The average number of persons per vehicle was 2.3 in the Moshannon and 2.8 in the Elk State Forest.
- About one-fourth (22-25%) of the respondents in both Forests reported that they had at least one child under the age of 16 with them.
- The most common group type in both Forests was family groups (42% in the Moshannon and 58% in the Elk), with smaller proportions coming in groups of friends and groups containing family and friends.
- Less than one-fifth (14-17%) of the visitors in both Forests came to the Forest alone.

Table 4. Trip Visitation Patterns in the State Forests

	Valid Percent*	
	Moshannon	**Elk**
Previous Visitation History		
First Time Visitor	8.8	23.5
Repeat Visitor	91.2	76.5
Total	100.0	100.0
Year of First Visit		
Prior to 1980	43.5	31.7
1980-1989	4.7	12.5
1990-1999	15.3	10.6
2000-2009	23.6	24.0
2010-2015	12.9	21.2
Total	100.0	100.0
Number of Visits to This State Forest in Typical Year		
0-5	26.7	51.5
6-10	20.0	10.9
11-20	10.0	11.9
21-50	27.7	20.7
More than 50	15.6	5.0
Total	100.0	100.0
Mean	32.2	18.5
Number of Visits to Other Forests in Typical Year		
0-5	18.6	16.1
6-10	27.1	20.7
11-20	25.7	25.3
21-50	20.0	31.0
More than 50	8.6	6.9
Total	100.0	100.0
Mean	23.9	25.8
Length of Stay		
Overnight Visitor	36.4	48.3
Day User	63.6	51.7
Total	100.0	100.0
Number of Nights Spent (Overnight Visitors)		
1	16.5	21.6
2	37.4	41.0
3-5	33.9	30.2
6 or more	12.2	7.2
Total	100.0	100.0
Mean	3.5	2.7
Number of Day Use Facilities Used During This Trip		
0	66.4	30.1
1	21.5	37.5
2 or more	12.1	32.4
Total	100.0	100.0

	Valid Percent*	
	Moshannon	**Elk**
Number of People in Vehicle		
1-2	70.8	61.9
3-4	24.5	27.8
5 or more	4.7	11.3
Total	100.0	100.0
Mean	2.3	2.8
Number of People Less than 16 Years Old in Vehicle		
0	77.7	75.5
1	12.4	11.1
2	8.2	7.8
3 or more	1.7	5.6
Total	100.0	100.0
Type of Group		
Alone	16.7	14.0
Family	42.2	58.1
Friends	22.5	14.7
family and friends	18.6	13.2
Other	0	0
Total	100.1	100.0

*Percentages may not equal 100% because of rounding.

Demographic Characteristics of State Forest Visitors

- The majority (65-77%) of the respondents in both State Forests were males.
- About one-fourth of the visitors surveyed in the State Forests (26-29%) were between the ages of 36-50, while another one-third (36-38%) were between 51 and 64.
- The average age of visitors was about 50 in the Moshannon and 52 in the Elk State Forest.
- Almost all of the State Forest visitors surveyed reported their race/ethnicity as White/Caucasian.
- Other ethnicities reported by visitors included Asian, African-American, and American Indian/Alaskan Native.
- Elk State Forest visitors were more likely to include a person with a disability in their household (14%) than Moshannon State Forest visitors (5%).

Table 5. Demographic Characteristics of State Forest Visitors

	Valid Percent*	
	Moshannon	**Elk**
Gender		
Male	77.1	65.0
Female	22.9	35.0
Total	100.0	100.0
Age		
18 to 35	19.2	16.2
36 to 50	29.4	26.2
51 to 64	35.6	37.9
65 or older	15.8	19.7
Total	100.0	100.0
Mean	49.5	51.7
Ethnicity		
Caucasian	99.0	98.7
Other	1.0	1.3
Total	100.0	100.0
Income		
Under $25,000	6.2	4.0
$25,000-$49,999	27.8	24.1
$50,000-$74,999	26.3	28.7
$75,000-$99,999	23.8	26.0
$100,000-$149,999	13.9	13.4
$150,000 or over	2.0	3.8
Total	100.0	100.0
Does anyone in your household have a disability?		
Yes	4.9	14.0
No	95.1	86.0
Total	100.0	100.0

*Percentages may not equal 100% because of rounding.

Activity Participation

The basic survey administered to all visitors included a detailed list of recreational activities. Respondents were asked to identify each activity that they had participated in (or planned to participate in) during their visit, as well as their primary activity on this trip (Table 6). The first column for each forest (activity participation) shows the range in numbers of visitors participating in the various activities, while the primary activity column reflects what the visitors considered their most important purpose for visiting the forest on this trip.

- The majority of all State Forest visits included various viewing and sightseeing activities, and many people reported such activities as their primary recreation activity on the State Forests.
    - Nearly half of Elk State Forest visitors (43%) reported viewing natural features as their primary activity, compared to 12% on the Moshannon State Forest.
- About one-third (31%) of the Moshannon State Forest visitors sampled reported consumptive activities (fishing and hunting) as their primary activity at the Forest, compared to just 14% of Elk State Forest visitors.
    - Hunting was more common as a primary activity (21%) than fishing (9%) on the Moshannon State Forest and was the most common primary activity among all activities on the Moshannon State Forest.
    - Hunting (12%) was also more common than fishing (2%) as a primary activity on the Elk State Forest.
- Nearly half of the sampled visitors in both Forests (42% in the Moshannon and 48% in the Elk) did some hiking or walking during their visit.
    - About one-tenth of the sampled visitors in both Forests reporting hiking or walking as their primary activity during their visit.
- Relatively few of the Forest visitors surveyed reported any type of camping as their primary activity.
- Aside from driving for pleasure on roads, few of the respondents in either Forest reported motorized pursuits as their primary activity.
    - Snowmobiling was a popular motorized activity on the Moshannon State Forest, with 6% reporting it as their primary activity during their visit.

Table 6. Activity Participation of State Forest Visitors (during this recreation visit)

	Moshannon		Elk	
Consumptive Activities	**Activity Participation***	**Primary Activity+**	**Activity Participation***	**Primary Activity+**
Fishing—all types	18.9	9.1	12.2	2.4
Hunting—all types	26.7	21.4	17.6	11.8
Viewing, Learning about Nature & Culture				
Viewing natural features such as scenery, wildlife, birds, flowers, fish, etc.	54.4	11.7	83.3	42.5
Visiting historic and prehistoric sites/areas	7.8	0	11.7	0
Nature study	9.8	0.3	16.5	0.4
Visiting a nature center, nature trail, or visitor center	12.7	0.8	39.8	1.3
Nonmotorized Activities				
Hiking or walking	42.2	8.9	48.3	10.0
Horseback riding	0.5	0.3	2.4	1.7
Bicycling, including mountain bikes	5.4	2.6	4.4	0.4
Nonmotorized water travel (canoeing, sailing, kayaking, rafting, etc.)	3.1	0.8	1.5	0.2
Downhill skiing or snowboarding	0	0	0	0
Cross-country skiing, snowshoeing	0.8	0.5	0	0
Other nonmotorized activities (e.g. swimming, games & sports)	3.4	2.3	0.7	0.2
Motorized Activities				
Driving for pleasure on roads	42.2	9.9	52.8	7.2
Riding in designated off-road vehicle areas (non-snow)	3.1	1.8	3.0	1.3
Snowmobile travel	6.5	5.7	0.2	0
Motorized water travel (boats, etc.)	0.5	0	0	0
Other motorized activities (enduroevents, games, etc.)	0.3	0.3	0.9	0.2
Camping or Other Overnight Activities				
Camping in developed sites (family or group sites)	5.4	2.6	7.8	2.2
Primitive camping (motorized)	3.6	0.8	5.9	1.7
Backpacking or camping in unroaded areas	1.3	0.8	2.4	0.9
Resorts, cabins, or other accommodations on State managed lands	13.7	2.3	9.6	0.4
Other Activities				
Gathering mushrooms, berries, firewood, or other natural products	9.3	0.8	8.3	0.2
Relaxing, hanging out, escaping heat, noise, etc.	0.71	13.8	47.8	12.4
Picnicking and family gatherings in developed sites (family or group sites)	8.8	0.8	10.7	0.2
Other	4.4	1.8	5.4	2.2

*Percentages do not equal 100% because respondents could report more than one activity.
+Percentages may not equal 100% because of rounding.

Satisfaction Addition

This section of the survey asked forest users about the importance they attached to, and their satisfaction with, thirteen customer service attributes in the State Forest they visited. Respondents were provided with the opportunity to choose "not applicable" for any attributes that they did not experience during their visit. Additional satisfaction-related questions were also sked in the basic survey that was administered to all visitors and in the experience addition. Responses to those questions are also included in this section.

Satisfaction Ratings

- The State Forests were generally rated highly on each of the thirteen satisfaction attributes, with the most common responses in the "very good" or "good" categories.
- State Forest visitors were most satisfied with the scenery and attractiveness of the forest landscape (>90% good/very good).
- The items that received the most not applicable (N/A) responses included helpfulness of employees and cleanliness of restrooms (over 30% N/A). Generally these responses reflect the fact that the visitors did not encounter staff during their visits, and that restrooms are usually only present in developed areas in State Forests.

Table 7. Satisfaction Ratings for Customer Service Attributes in the State Forests (Percent)

Moshannon State Forest	Poor	Fair	Average	Good	Very Good	Not Applicable	Mean[a]
Scenery	0	0.9	5.2	27.0	67.0	0	4.6
Attractiveness of the forest landscape	1.8	0	3.5	28.1	66.7	1.4	4.6
Feeling of safety	0	0.9	6.1	26.3	66.7	0	4.6
Helpfulness of employees	0.9	1.7	2.6	13.0	31.3	50.4	4.5
Condition of the natural environment	0.9	0.9	8.7	30.4	58.3	0.9	4.5
Availability of parking	1.7	2.6	11.3	29.6	52.2	2.6	4.3
Condition of developed recreation facilities	0	2.6	11.4	25.4	31.6	28.9	4.2
Parking lot condition	1.8	6.1	13.2	28.9	42.1	7.9	4.1
Condition of Forest trails	0	3.5	12.3	33.3	27.2	23.7	4.1
Adequacy of signage	2.6	6.1	20.9	31.3	35.7	3.5	4.0
Cleanliness of restrooms	4.3	0.9	3.5	11.3	15.7	64.3	3.9
Availability of information on recreation	4.3	6.1	16.5	29.6	35.7	7.8	3.9
Condition of Forest roads	3.5	7.8	16.5	40.0	31.3	0.9	3.9

Elk State Forest	Poor	Fair	Average	Good	Very Good	Not Applicable	Mean[a]
Attractiveness of the forest landscape	0	1..4	1.4	17.7	78.7	0.7	4.8
Scenery	0	1.4	1.4	21.4	75.7	0	4.7
Feeling of safety	0	0.7	5.7	21.4	72.1	0	4.7
Helpfulness of employees	1.4	0	2.1	12.9	53.6	30.0	4.7
Condition of the natural environment	1.4	2.1	2.1	24.8	69.5	0	4.6
Condition of developed recreation facilities	0	3.5	7.1	22.0	61.0	6.4	4.5
Parking lot condition	0.7	1.4	9.9	27.0	57.4	3.5	4.4
Condition of Forest trails	0.7	0.7	5.7	27.0	34.8	31.2	4.4
Availability of parking	0	4.3	12.8	29.8	51.1	2.1	4.3
Adequacy of signage	1.4	1.4	17.0	27.0	51.8	1.4	4.3
Condition of Forest roads	2.1	2.8	12.1	27.7	48.2	7.1	4.3
Availability of information on recreation	0.7	2.1	12.9	25.7	47.9	10.7	4.3
Cleanliness of restrooms	0.7	0	9.2	17.7	34.0	38.3	4.3

[a]Response Code: 1 = "Poor" through 5 = "Very good"

Importance Ratings

Visitors were also asked how important they found each of the listed attributes or services.

- Importance ratings for the customer service attributes generally followed the same pattern as the satisfaction ratings across the attributes.
- The condition of the natural environment (mean = 4.8 in both Forests), attractiveness of the forest landscape (mean = 4.8 – 4.9 in both Forests) and scenery (mean = 4.8 – 4.9 in both Forests) were the most important attributes to the State Forest visitors.
- The least important items included parking lot condition and availability (mean = 3.8 – 4.2 in both Forests).

Table 8. Importance Ratings for Customer Service Attributes in the State Forests (Percent)

Moshannon State Forest	**1**	**2**	**3**	**4**	**5**	**Mean[a]**
Attractiveness of the forest landscape	0	0	2.7	13.3	84.1	4.8
Condition of the natural environment	0	0	3.5	13.9	82.6	4.8
Scenery	0	0.7	4.3	15.1	79.9	4.7
Feeling of safety	1.7	2.6	3.5	20.0	72.2	4.6
Condition of Forest trails	1.8	2.8	9.2	25.7	60.6	4.4
Condition of Forest roads	2.6	0	13.2	22.8	61.4	4.4
Adequacy of signage	2.7	0.9	12.5	26.8	57.1	4.4
Helpfulness of employees	5.2	6.3	8.3	18.8	61.5	4.3
Cleanliness of restrooms	4.3	3.2	12.8	27.7	52.1	4.2
Availability of information on recreation	5.5	3.6	17.3	19.1	54.5	4.1
Condition of developed recreation facilities	5.6	3.7	14.8	28.7	47.2	4.1
Availability of parking	8.0	4.4	15.0	35.4	37.2	3.9
Parking lot condition	8.2	7.3	16.4	36.4	31.8	3.8

Elk State Forest	**1**	**2**	**3**	**4**	**5**	**Mean[a]**
Attractiveness of the forest landscape	0	2.2	0	7.9	89.9	4.9
Scenery	0	0.7	0	9.9	89.4	4.9
Condition of the natural environment	0.7	1.4	0.7	10.7	86.4	4.8
Helpfulness of employees	1.5	3.1	5.3	14.5	75.6	4.6
Feeling of safety	1.4	2.1	5.7	15.0	75.7	4.6
Condition of Forest trails	3.1	2.4	6.3	15.7	72.4	4.5
Condition of Forest roads	1.4	1.4	8.6	21.6	66.9	4.5
Cleanliness of restrooms	1.7	2.5	12.5	20.0	63.3	4.4
Availability of information on recreation	2.3	3.0	9.8	22.6	62.4	4.4
Adequacy of signage	2.1	2.9	9.3	21.4	64.3	4.4
Condition of developed recreation facilities	2.2	3.6	10.2	22.6	61.3	4.4
Availability of parking	2.2	5.1	16.8	24.8	51.1	4.2
Parking lot condition	4.4	7.3	17.5	23.4	47.4	4.0

[a]Response Code: 1 = Least Important through 5 = Most Important

Other Visitor Satisfaction Ratings

Respondents for the experience addition were asked some additional questions about how they would rate the quality of various aspects of the State Forest.

- Most respondents indicated very favorable ratings (mean of 4.2 or above) for all of the items rated.

Table 9. Visitor Satisfaction Ratings for Various Forest Attributes (Percent)

	Awful	Fair	Good	Very Good	Excellent	N/A	Mean[a]
Moshannon State Forest							
Natural environment	2.0	0	6.9	22.5	68.6	0	4.6
Safety and security	0	2.0	4.0	22.8	69.3	2.0	4.6
Responsiveness of staff	1.0	1.0	4.9	15.7	35.3	42.2	4.4
Sanitation and cleanliness	1.0	2.0	11.8	23.5	61.8	0	4.4
Condition of latrines, picnic pavilions & other facilities	1.0	2.9	15.7	14.7	39.2	26.5	4.2
Elk State Forest							
Natural environment	0.7	0	1.5	14.7	83.1	0	4.8
Responsiveness of staff	0.7	0	2.9	12.5	43.4	40.4	4.6
Safety and security	0	0.7	7.4	21.3	69.1	1.5	4.6
Sanitation and cleanliness	2.2	0	5.9	22.1	68.4	1.5	4.6
Condition of latrines, picnic pavilions & other facilities	0	2.9	7.4	23.5	50.0	16.2	4.4

[a] Response scale = 1 (awful) to 5 (excellent)

Overall Satisfaction

- Overall satisfaction scores tended to be high, with around three-fourths of the respondents in both Forests reporting that they were "very satisfied" with their visit to the State Forest.

Table 10. Overall Satisfaction of State Forest Visitors

	Valid Percent	
	Moshannon	**Elk**
Very Dissatisfied	1.1	1.1
Somewhat Dissatisfied	1.5	1.1
Neither Dissatisfied nor Satisfied	3.7	2.7
Somewhat Satisfied	22.7	18.9
Very Satisfied	70.9	76.2
Total	100.0	100.0
Mean[a]	4.6	4.7

[a] Response code: 1 = "very dissatisfied" to 5 = "very satisfied"

Crowding Ratings

- Crowding scores tended to be relatively low, with nearly half of the respondents in the Moshannon and about one-third in the Elk choosing 1 or 2, reflecting that they encountered "hardly anyone" during their visit.
- Very few respondents in either Forest indicated conditions near the "overcrowded" end of the scale.
- Conditions appear to be slightly more crowded in the Elk State Forest. The average crowding score on the 10-point crowding scale was 3.8 among the Elk visitors and 3.1 among Moshannon State Forest visitors.

Table 11. Summary of Perceived Crowding Ratings (Valid Percent).

Perception of Crowding[a]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Moshannon	32.3	14.2	13.4	13.4	16.5	3.9	3.1	1.6	0.8	0.8
Elk	23.3	9.3	18.0	11.3	18.7	6.7	6.7	2.7	1.3	2.0

[a] Response code: 1 = "hardly anyone" to 10 = "overcrowded"

Economics Addition

About one-third of the survey respondents were asked about their monetary expenditures during their trip to the State Forest. Additional questions in the "economics addition" focused on the respondents' trip itinerary (Table 12). These questions were asked to establish a context for evaluation of the reported trip expenditures.

- When asked what they would have done if, for some reason, they had been unable to go to the State Forest on this visit, the responses differed between the two forests.
  - The most common response in the Moshannon (58%) was that they would have gone somewhere else to pursue the same activity.
  - The most common response in the Elk (32%) was that they would have stayed home. This finding is consistent with other survey results suggesting that a significant group of Elk State Forest visitors are very committed to viewing the wildlife (especially elk) on the State Forest and would be less likely to visit the Forest for any other reason.
- Likewise, visitors in the Elk State Forest were about twice as likely (17%) as those in the Moshannon (9%) to indicate they would have come back another time.
- Few visitors in either Forest (11% in the Moshannon and 15% in the Elk) would have gone elsewhere for a different activity.
- Overnight visitors were mostly on trips of 1-2 days (57 % of visitors in the Moshannon and 58% of visitors in the Elk).
- Day visitors were most likely to be away from their home for 6 hours or more (44% in the Moshannon State Forest and 58% in the Elk State Forest.
- The vast majority of visitors (78% in both Forests) were visiting only that State Forest on this particular trip.
- Most of the visitors who reported multiple destinations for their trip (60% in the Moshannon and 74% in the Elk) indicated that the State Forest was their primary destination.
- When queried about how many people their reported expenditures were covering, the most typical response for both Forests was two people (41% in the Moshannon and 48% in the elk).
- Besides the detailed economic questions about various spending categories, visitors were asked to estimate how much money everyone in their vehicle spent on the entire trip, from the time they left home until they return home. The total amounts spent in both State Forests were different, averaging $122.33 in the Moshannon and $233.67 in the Elk.

Table 12. State Forest Recreation Trip Profile (for economics section)

	Valid Percent	
	Moshannon	**Elk**
What Visitor Would have done if Unable to Visit SF		
Gone elsewhere for same activity	58.1	31.8
Gone elsewhere for different activity	11.0	14.5
Come back another time	9.0	17.3
Stayed home	16.8	32.9
Gone to work at your regular job	3.2	2.9
None of these	1.9	0.6
Total	100.0	100.0
Time Away from Home (Days)		
1-2	57.4	57.7
3-5	31.7	28.9
6 or more	10.9	13.4
Total	100.0	100.0
Time Away from Home (Hours)		
1-2	19.3	9.7
3-5	36.4	31.9
6 or more	44.3	58.3
Total	99.9	99.9
Single or Multiple Destination Trip		
Visited State Forest only	77.6	77.5
Visited other places	22.4	22.5
Total	100.0	100.0
Was State Forest Primary Destination for Trip		
Yes	60.0	74.4
No	40.0	25.6
Total	100.0	100.0
Number of People Covered by Expenses		
1	22.1	11.9
2	41.4	47.8
3	17.9	10.1
4 or more	18.6	30.2
Total	100.0	100.0
Estimated Total Trip Expenses for Group		
$25 or less	42.9	23.1
$26-$50	9.7	11.6
$51-$100	19.2	13.3
$101-$200	10.3	20.8
More than $200	17.9	31.2
Total	100.0	100.0
Mean	$122.33	$233.67

Visitor Expenditures

In the economics addition, visitors were asked how much they spent on this trip for ten categories of expenditures within 50 miles of the site visited (Tables 13 and 14). The results shown below provide the proportion of visitors reporting spending any money on their trip within 50 miles of the forest, the percentage reporting expenditures in each category, and the average amount spent in each category.

- Over two-thirds of the respondents in both forests indicated that they did spend some money within 50 miles of the forest on their current trip. Elk State Forest visitors were more likely than Moshannon State Forest visitors to spend some money during their trip to the Forest (85% in the Elk versus 69% in the Moshannon)
- Many respondents, however, indicated that they spent no money on many of the specific expenditure categories listed on the survey instrument.
- Few visitors in either Forest reported any spending for local transportation, camping fees, outdoor recreation and outfitter-related expenses (including guide fees and equipment rentals).
- Significant proportions (35-36%) of visitors in both forests reported some trip expenses for groceries.
- Visitors in the Elk State Forest were much more likely (56%) than those in the Moshannon State Forest (35%) to report spending money in restaurants and bars.
- The majority of the Moshannon State Forest visitors (61%) and Elk State Forest visitors (60%) reported buying gas or oil during their trip. This is not surprising since many visitors in both forests live within 100 miles of the State Forest visited and would not necessarily need to purchase gas during their trip.
    - However, Moshannon visitors spent slightly less on gas and oil, as they generally travelled shorter distances to visit the State Forest than Elk State Forest visitors. The average distance from home to the Forest was 92 miles for Moshannon visitors and 115 miles for Elk visitors.

Table 13. Summary of Trip Spending Patterns of State Forest Visitors

	Moshannon	**Elk**
Proportion of visitors spending any money within 50 miles of this state forest	68.6%	85.0%
Economic Expenditure Items	**Proportion of Visitors Spending Something in Each Category (percent)**	
Motel, Lodge, Cabin, B&B, etc.	10.5	22.5
Camping Fees	2.1	1.7
Restaurants & Bars	35.1	56.1
Groceries	35.8	34.7
Gasoline and oil	60.5	59.5
Local Transportation (bus, shuttles, etc.)	0	0
Outfitter Related Expenses (guide fees & equipment rentals)	0	1.2
Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.)	0	2.9
Sporting Goods	4.9	5.2
Souvenirs, Clothing, Other Misc.	3.5	21.4

The first column for each Forest in Table 14 shows the average amount spent among only those visitors reporting spending something in each category. These numbers cannot be totaled because they are based on a different number of individuals making the various types of purchases. The second column for each Forest in Table 14 shows the average amount spent among all visitors in the survey. These averages include those spending nothing in various categories, and therefore can be totaled to indicate the average total amount spent for all categories.

- For example, money was spent on motels, lodges, or cabins by about 11% of the visitors in the Moshannon State Forest, and the average amount spent was $138.33. More visitors in the Elk State Forest reported expenses for motels, lodges, or cabins (23%), and they spent on average nearly twice as much, or $253.03. for their lodging accommodations.

Table 14. Amount Spent by State Forest Visitors for Various Categories of Trip Expenditures

Economic Expenditure Items	Moshannon		Elk	
	Average Amount Spent - Among Visitors Spending Something in Each Category	**Average Amount Spent – All Visitors**	**Average Amount Spent - Among Visitors Spending Something in Each Category**	**Average Amount Spent – All Visitors**
Motel, Lodge, Cabin, B&B, etc.	$138.33	$14.51	$253.03	$57.04
Camping Fees	$31.67	$0.66	$70.00	$1.21
Restaurants & Bars	$63.75	$22.40	$85.64	$48.02
Groceries	$82.40	$29.51	$78.75	$27.31
Gasoline and oil	$50.12	$30.36	$55.62	$33.12
Local Transportation (bus, shuttles, etc.)	0	0	0	0
Outfitter Related Expenses (guide fees & equipment rentals)	0		$60.00	$0.69
Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.)	0		$57.20	$1.65
Sporting Goods	$72.86	$3.57	$212.78	$11.07
Souvenirs, Clothing, Other Misc.	$26.00	$0.91	$60.41	$12.92
Total	NA	$101.92	NA	$193.03

- In general, the categories showing the highest expenditures included gasoline and oil, groceries, and restaurants and bars.
- In total, the visitors in the Moshannon State Forest reported spending about half as much on average ($101.92) for all the expenditure categories included in the survey as those in the Elk State Forest ($193.03). Both of these averages are slightly lower than the overall trip spending reported at the bottom of Table 12 because the frame of reference for these individual expense categories focused on spending within 50 miles of the State Forest, while the overall trip expense estimate included spending by all party members during the entire trip regardless of where the money was spent.

Experience Addition

This section of the survey asked a series of additional questions of interest to managers of the Pennsylvania State Forests. As was the case for the "satisfaction" and "economics" additions, about one-third of the respondents were asked these questions. Some of the questions enhanced other sections of the basic survey and have been reported earlier (e.g. previous visitation to the forest and group composition were reported with other visitor trip characteristics in Table 4). The results presented below focus on visitor motivations, feelings towards the Forest, and opinions about various topics in the Pennsylvania State Forests.

Forest Access

- Most respondents in both Forests indicated favorable ratings for access to the State Forests by both roads and trails (mean of 4.3 – 4.5).
- There were no significant differences in the accessibility ratings between the two State Forests.

Table 15. Visitor Ratings of Access to the State Forests (Percent)

	1	2	3	4	5	Mean[a]
Moshannon State Forest						
By roads	1.0	2.0	9.8	38.2	49.0	4.3
By trails	3.5	0	9.4	38.8	48.2	4.3
Elk State Forest						
By roads	0.7	2.9	9.6	34.6	52.2	4.4
By trails	1.1	2.1	2.1	31.9	62.8	4.5

[a] Response scale = 1 (poor) to 5 (very good)

Recreation Experience

- Most respondents also indicated favorable ratings (mean of 4.4 or above) for all of the recreation experience items rated.
    - Most visitors in both Forests perceived the opportunity to recreate without feeling crowded and without conflict from other visitors.
    - Most visitors who encountered Forest employees or people in surrounding communities reported positive interactions.

Table 16. Visitor Ratings for Various Recreation Experience Attributes (Percent)

	Awful	Fair	Good	Very Good	Excellent	Mean [a]
Moshannon State Forest						
Opportunity to recreate without feeling crowded	0	2.0	9.1	16.2	72.7	4.6
Helpfulness/courteousness of people in surrounding communities	0	1.2	7.1	24.7	67.1	4.6
Places to recreate without conflict from other visitors	0	1.0	6.0	25.0	68.0	4.6
Helpfulness/courteousness of Forest employees	1.6	3.1	6.3	20.3	68.8	4.5
Compatibility of recreation activities at the area	0	4.1	15.3	15.3	65.3	4.4
Elk State Forest						
Helpfulness/courteousness of Forest employees	0	1.1	7.6	15.2	76.1	4.7
Helpfulness/courteousness of people in surrounding communities	0	0.9	7.8	22.4	69.0	4.6
Places to recreate without conflict from other visitors	0	1.5	9.6	17.0	71.9	4.6
Opportunity to recreate without feeling crowded	0	1.5	11.9	14.1	72.6	4.6
Compatibility of recreation activities at the area	0	1.5	12.0	24.1	62.4	4.5

[a] Response scale = 1 (awful) to 5 (excellent)

Place Attachment

Visitors were asked to choose their most important reason for visiting the State Forest from a list of alternative choices.

- Visitors in both Forests were most likely to report "I enjoy being in the forest" as their most important reason for visiting the State Forest (33% in the Moshannon and 42% in the Elk).
- About one-quarter of the visitors in both State Forests (21% in the Moshannon and 25% in the Elk) stated their most important reason for visiting was because it's "a good place to spend time with friends/family."
- Among the activities listed, visitors in the Moshannon State Forest were more likely to report that they came to the Forest because it's a good place to hunt (21% in the Moshannon versus 12% in the Elk).
    - This difference between forests is consistent with the activity participation results show earlier in this report (page 17).

Table 17. Which of the following was the most important reason for this visit to the State Forest?

	Valid Percent	
	Moshannon	**Elk**
I went there because I enjoy being in the forest	33.3	41.9
I went there because its a good place to spend time with friends/family	20.6	25.0
I went there because it's a good place to:		
Hunt	20.6	11.8
Hike	6.9	5.9
Bike	2.9	0
Fish	4.9	2.9
Horseback ride	1.0	1.5
Other Reason	9.8	11.0

Visitors also responded to a set of statements designed to measure the extent of place attachment to the State Forest.

- The vast majority of respondents (90-91%) agreed that the State Forest they visited "means a lot to them," with about half strongly agreeing.
- Most visitors also reported that they enjoy recreating in the State Forest more than at other places, and get more satisfaction out of visiting the State Forest than from visiting other places.

Table 18. Summary of Place Attachment Scale Items (Percent)

Place Attachment Items	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly agree	Mean[a]
Moshannon State Forest						
This place means a lot to me	0	0	8.8	40.2	51.0	4.4
I enjoy recreating at this place more than other places I could visit	0	2.0	17.6	32.4	48.0	4.3
I get more satisfaction out of visiting this place than from visiting most places	0	4.9	18.6	38.2	38.2	4.1
I am very attached to this place	2.0	5. 9	22.5	26.5	43.1	4.0
Elk State Forest						
This place means a lot to me	1.5	0.7	6.6	44.1	47.1	4.4
I enjoy recreating at this place more than other places I could visit	0	2.9	19.1	40.4	37.5	4.1
I get more satisfaction out of visiting this place than from visiting most places	3.7	2.9	20.6	36.0	36.8	4.0
I am very attached to this place	2.2	5.9	27.2	33.3	31.6	3.8

[a] Response Code: 1="Strongly Disagree" and 5="Strongly Agree"

Motivations/Reasons for Visiting the State Forest

- Visitors' most important motivations (reasons for visiting) the State Forest were to be outdoors and to experience natural surroundings.
- Visitors also attached great importance to the opportunity to relax and get away from their regular routine.
- Moderately important motives for visiting the Forest included the social motives of family recreation (mean = 4.2-4.3) and being with friends (mean = 4.1) as well as physical exercise (mean = 3.8- 3.9).
- The least important motivations in both Forests were to develop my skills (mean = 3.3-3.6) and challenge or sport (mean = 3-5-3.8). Moshannon State Forest visitors attached slightly more importance to these motives than Elk State Forest visitors.

Table 19. Summary of Motivations/Reasons for Recreating in the State Forests (Percent)

Reasons for Visiting	Not at all important	Somewhat important	Moderately important	Very important	Extremely important	Mean[a]
Moshannon State Forest						
To be outdoors	0	0	5.9	18.6	75.5	4.7
To experience natural surroundings	0	0	8.8	21.6	69.6	4.6
To get away from the regular routine	1.0	0	8.8	18.6	71.6	4.6
For relaxation	1.0	1.0	5.0	21.8	71.3	4.6
For family recreation	2.0	4.0	12.9	26.7	54.5	4.3
To be with my friends	2.0	6.9	17.6	23.5	50.0	4.1
For physical exercise	3.9	3.9	26.5	25.5	40.2	3.9
For the challenge or sport	6.9	6.9	23.5	26.5	36.3	3.8
To develop my skills	8.8	4.9	30.4	27.5	28.4	3.6
Elk State Forest						
To experience natural surroundings	0.7	0.7	2.9	13.2	82.4	4.8
To be outdoors	0.7	1.5	1.5	16.9	79.4	4.7
To get away from the regular routine	0	0	5.2	17.0	77.8	4.7
For relaxation	0.7	0.7	3.7	18.4	76.5	4.7
For family recreation	5.9	6.6	9.6	18.4	59.6	4.2
To be with my friends	7.4	3.7	15.4	22.1	51.5	4.1
For physical exercise	5.9	7.4	26.5	22.8	37.5	3.8
For the challenge or sport	11.0	10.3	26.5	19.1	33.1	3.5
To develop my skills	16.9	6.6	30.9	19.9	25.7	3.3

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Visitor Response to Potential Facilities and Services

Visitors surveyed were asked what facilities/services in the State Forest are most important to them.

- The respondents in both Forests attached great importance to wildlife viewing areas or opportunities (mean = 4.1 – 4.6).
- Visitors also attached relatively high importance to signs directing them to recreation facilities (mean = 3.8 – 4.0) and printed interpretive information (mean = 3.5 – 3.8).
- Visitors on both forests expressed more interest in hiking, biking, and horse trails (mean = 3.4-3.5) than in motorized ATV or snowmobile trails (mean = 2.0-2.6).

Table 20. Visitor Importance Ratings for Various Types of Facilities and Services

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important	Mean[a]
Moshannon State Forest						
Wildlife viewing areas or opportunities	4.9	4.9	19.6	18.6	52.0	4.1
Signs directing me to recreation facilities	9.8	10.8	18.6	24.5	36.3	3.7
Parking	8.9	7.9	30.7	24.8	27.7	3.5
Hike, bike & horse (non-motorized) Trails	16.7	5.9	18.6	32.4	26.5	3.5
Printed Interpretive Information	10.8	7.8	30.4	24.5	26.5	3.5
Picnic areas	15.7	9.8	35.3	13.7	25.5	3.2
ATV Trails	40.2	13.7	11.8	10.8	23.5	2.6
Snowmobile Trails	42.2	9.8	14.7	11.8	21.6	2.6
Elk State Forest						
Wildlife viewing areas or opportunities	4.4	1.5	2.2	14.7	77.2	4.6
Signs directing me to recreation facilities	10.3	5.1	10.3	24.3	50.0	4.0
Parking	5.1	8.8	21.3	25.7	39.0	3.9
Printed Interpretive Information	10.3	5.1	16.9	29.4	38.2	3.8
Picnic areas	11.1	14.1	23.0	22.2	29.6	3.5

Hike, bike & horse (non-motorized) Trails	21.3	4.4	12.5	34.6	27.2	3.4
ATV Trails	49.3	17.6	11.0	8.1	14.0	2.2
Snowmobile Trails	60.3	12.5	7.4	8.8	11.0	2.0

[a] Response Code: 1="Not at all important" and 5="Extremely important"

Information Services

State Forest visitors were asked a series of questions about their use of various types of forest information.

- A minority of the visitors reported that they had obtained information about the area they visited during or in preparation for their trip.
    - However, Elk State Forest visitors were almost twice as likely (41%) as Moshannon State Forest visitors (23%) to obtain information about the area.
- Visitors in both Forests were most interested in obtaining State Forest maps. Fewer visitors sought other types of information such as trail maps or the Pennsylvania Visitors Guide.
- The majority of visitors in both Forests (59% in the Moshannon and 66% in the Elk) obtained information before leaving home rather than after arriving at the Forest.
- Nearly all of the visitors who sought information reported that the information obtained was helpful in planning their trips.

Table 21. Visitor Responses to Questions about Information Services

	Valid Percent	
	Moshannon	**Elk**
Did you obtain any information about this area during this trip or in preparation for it?		
No	77.5	58.8
Yes	22.5	41.2
What type of information did you obtain?		
State Forest map	69.6	57.1
Trail map	30.4	30.4
PA visitors guide	17.4	39.3
Other	26.1	35.7
When did you receive information?		
Before leaving home	59.1	66.1
After arriving here	40.9	33.9
Was the information you received helpful to plan your trip?		
Yes	86.4	96.4
No	13.6	3.6

Visitor Responses to Questions about Marcellus Shale-Related Activity

Forest visitors were asked several questions about how Marcellus shale-related activity had affected their use of the State Forest and their enjoyment of their recreation experience at the State Forest.

- The vast majority of visitors in both Forests (88% in the Moshannon and 92% in the Elk) reported that Marcellus shale-related activity had not affected their use of the State Forest.
- Visitors were slightly more likely to report that gas-related activity affected their recreational experience at the Forest than their use of the Forest. However, again, most visitors in both forests (85% in the Moshannon and 88% in the Elk) reported that Marcellus shale-related activity had not affected their recreation experience at the State Forest.

Table 22. Visitor Responses to Questions about Marcellus Shale-Related Activity

	Valid Percent	
	Moshannon	**Elk**
Has Marcellus shale-related activity changed your recreational use of this state forest?		
Yes	12.3	7.7
No	87.7	92.3
Total	100.0	100.0
Has Marcellus shale-related activity changed your recreation experience at this state forest?		
Yes	14.6	11.6
No	85.4	88.4
Total	100.0	100.0

Follow-up questions probing the reasons for the visitors' responses to the initial yes/no questions revealed the following major themes. These responses are summarized in Tables 23-26 and listed in full detail in Appendix A.

- Based on the minority of visitors reporting that their use of the State Forest had been changed due to Marcellus Shale-related activity, there were fewer open-ended responses to the initial "yes" (use was affected) responses than to the "no" (use was not affected) responses.
- Among those reporting that their use of the State Forest had been impacted by shale-related operations, the most common responses reflected various major themes.
- The most prevalent theme in both Forests involved various forms of visitor displacement, or changes in visitors' destinations or activities due to area/road closures or fracking activity.

Table 23. Responses to, How has Marcellus Shale-related activity changed your use of the Forest?

Type of Comment	Number of Comments	
	Moshannon	Elk
Displaced/closed areas	13	4
Traffic-related concerns	10	3
Wildlife/Hunting-related concerns	9	6
General environmental concerns	5	4
Noise and visual impacts	1	3
Positive impacts/statements	3	9

- Many respondents also mentioned various traffic-related, wildlife or hunting-related concerns.
  - The most frequently mentioned traffic concerns included increased road traffic, especially truck traffic and noise pollution.
  - The most common hunting-related issues were that the drilling activity affects the way game act or reduces/changes their places to hunt.
- Visitors expressed several environmental concerns, including natural habitat destruction and changes in landscape and aesthetic quality.
- A few respondents also expressed positive impacts of the shale-related activity.
  - These comments focused on the creation of economic benefits or new access roads or trails providing better access to the Forest.

Those visitors who stated that their recreational use of the Forest had not been affected by Marcellus shale-related activity were also asked to explain why not. Their responses also reflected several dominant themes, which were grouped into topics reflecting awareness-related issues and general acceptance of the drilling activity (Table 24).

- The most common responses in both Forests were statements indicating that the drilling activity doesn't bother them, hasn't changed their use or doesn't affect their activities.
- Many visitors in both Forests indicated that they had not noticed the activity or had not noticed it in the areas they visit.
- Another common comment was that it had not changed their use yet.
- Some visitors stated that they had not heard of or did not know much about the Marcellus Shale phenomenon.
- A few visitors expressed support for the drilling activity, based on the opinion that it does not have a negative effect, is controlled, or is good for the economy.

Table 24. Responses to why Marcellus shale-related activity has not changed your use of the forest?

Type of Comment	Number of Comments	
	Moshannon	**Elk**
No effect on use	76	77
Don't notice/Haven't seen any activity	31	95
Not drilling here (or in areas I care about)	19	21
Not yet (implies concern for future)	3	8
Don't know about it	1	10
Pro-drilling	7	8

Forest visitors were also asked to explain the reason why Marcellus shale-related activity had or had not affected *their recreation experience* at the State Forest. As in the case of the previous question, many of their responses did not refer specifically to experiential impacts, but rather expressed a variety of types of opinions about the drilling operations (Table 25).

- The experiential impacts tended to reflect the same themes as the answers to the questions about the impacts of shale-related activity on visitors' use of the Forests.
- Road/traffic related issues were the most common responses to the question about how drilling-related activity had affected visitors' experiences at the State Forest, while visitor displacement and other issues were mentioned less frequently.
- The responses to how Marcellus shale-related activity had affected their recreation experience at the State Forest included more impacts to the quality of the recreation experience, such as a change in the character of the area or experience and noise or visual impacts.
- As in the case of the previous question about impacts of drilling on visitors' use of the forest, some respondents mentioned positive impacts such as better access when asked how their recreation experience had been affected.

Table 25. Responses to, How has Marcellus shale-related activity changed your recreation experience at the Forest?

Type of Comment	Number of Comments	
	Moshannon	**Elk**
Road/Traffic issues	12	13
General concerns	4	9
Displaced/Closed areas	8	2
Impacts on the environment	4	3
Noise and visual impacts	1	4
Wildlife/Hunting-related concerns	1	2
Positive impacts/Better access	6	9

Responses by those visitors who stated that their recreation experience at the Forest had not been affected by Marcellus shale-related activity also reflected the same awareness-related and general acceptance of drilling activity themes as their previous explanations for why the shale-related activity had not affected their recreational use of the Forests (Table 26).

- Again, many visitors in both Forests reported that the drilling activity doesn't bother them, hasn't changed their experience, or doesn't affect their activities.
- Many visitors in both Forests reiterated that they had not noticed the activity or had not noticed it in the areas they visit.
- The next most common acceptance-related comment was that it had not changed their experience yet.
- Some visitors stated that they were not aware of, or had not even heard of, the Marcellus Shale phenomenon.
- Finally, a small number of respondents voiced pro-drilling sentiments or mentioned positive benefits of the gas drilling activity, such as improved roads or access to the Forest.

Table 26. Responses to why Marcellus shale-related activity has not changed your recreational experience at the forest?

Type of Comment	**Number of Comments**	
	Moshannon	**Elk**
Don't notice/Haven't seen any activity	38	96
No effect on experience	30	51
Not drilling here (or in areas I care about)	15	15
Not yet (implies concern for future)	3	14
Don't know about it	3	6
Pro-drilling/Positive impact	7	7

Summary and Conclusions

The results published in this report are a compilation of the data collected at numerous State Forest recreation sites during the period of October 1, 2014 through September 30, 2015 (n = 1,370 interviews with Forest visitors). Besides the basic visitor use survey, three supplemental surveys were used to query visitors about their satisfaction levels, economic expenditures, and recreation experiences.

This report provides a summary of the characteristics, behaviors, and attitudes of visitors to the Moshannon and Elk State Forests, located in the north-central area of Pennsylvania. The results indicate that most of the State Forest visitors are repeat and frequent users, and have many years of experience in the forests. About two-thirds of the Moshannon State Forest respondents (64%) reported making their first visit to the Forest before the year 2000. The Elk State Forest showed a higher proportion of more recent visitors, with almost half (48%) making their first visit since 2000 and one-quarter (23%) reporting their first visit in the past five years.

Several notable differences were noted in the use patterns and characteristics of recreation visitors in the two Forests. First, the Moshannon State Forest has more "frequent visitors," showing an average of about 32 visits to the Forest per year versus 19 visits in the Elk. Conversely, the Elk visitors reported slightly more trips to other forest areas (26 days on average compared to 24 for Moshannon Forest users). Thus, the Moshannon State Forest may have a slightly larger loyal group of regular users who allocate more of their outdoor recreation trips to the Forest, while the Elk State Forest visitors include regular frequent users along with a greater percentage of occasional visitors coming to the Forest for wildlife viewing.

Secondly, visitors in the Moshannon were more likely (48%) than those in the Elk State Forest (36%) to be overnight users. Overnight visitors in the Moshannon State Forest also stayed longer, averaging 3.5 nights in the Forest compared to 2.7 nights for Elk State Forest visitors. Group size was one of the biggest differences between these two Forests. Elk State Forest visitors showed an average of 2.8 people per vehicle versus 2.3 people in the Moshannon. The unusually large number of people per vehicle in the Elk State Forest is consistent with DCNR records for groups visiting the Elk Country Visitor Center, which accounts for a large proportion of recreation use on the Elk State Forest.

The recreation activities pursued on the Forest also differed between the two Forest districts, reflecting differences in the facilities present on the two Forests. Consumptive activities

(hunting and fishing) were more prevalent on the Moshannon, while hiking was popular on both Forests. The Elk State Forest was unique in the extreme popularity of wildlife viewing, with over 80% of visitors reporting participation and over 40% reporting "viewing of natural features such as scenery, wildlife, birds, flowers, fish, etc." as their primary activity on the Forest.

Regarding satisfaction levels, most respondents in both Forests were clearly satisfied with their recreation experience and with the satisfaction attributes listed on the survey. State Forest visitors were most satisfied with the scenery and attractiveness of the forest landscape. They also reported very high feelings of safety while in the Forest and gave very favorable reviews of the helpfulness of employees. Some of the satisfaction items such as cleanliness of restrooms, provision of information for recreation, adequacy of signage, and condition of forest roads received slightly higher ratings on the Elk State Forest, reflecting the effects of the modern facilities present in the Forest, especially the Elk Country Visitor Center.

The economics section of the study asked visitors about their monetary expenditures in and near the State Forests. Results of this section differed greatly between the two Forests. Over half of the Moshannon State Forest visitors (58%) indicated that they would have gone somewhere else to do the same activity if they had not been able to visit the State Forest. Conversely, only 32% of Elk State Forest visitors would have pursued the same activity elsewhere, and one-third would have stayed home if they had been unable to visit the Forest. Most of the respondents (69% in the Moshannon and 85% in the Elk) indicated that they spent some money within 50 miles of the forest on their current trip. The largest expenditures reported were for gasoline and oil, food/drink at restaurants and bars, and groceries. Visitors of the Elk State Forest tended to spend about twice as much (average of $193.03) across all of the spending categories for their trip as Moshannon State Forest visitors (average of $101.92).

The experience section of the study was given to about one-third of the visitors, providing rich data about visitor attitudes, motivations, perceptions, and management preferences. The data clearly shows that State Forest visitors are interested in experiencing the outdoor natural surroundings available in the forest areas. Relaxing out of doors, getting away from the routine, and other nature-based social activities are very important to these recreationists. Only slight differences in motivations were observed between these two Forests. For example, Moshannon visitors attached slightly more importance to the motives of challenge and sport and skill development, perhaps reflecting their greater participation in fishing and hunting activities.

Visitor responses about the importance of facilities and services in the Forests were examined to ascertain support or opposition to various management alternatives. Visitors in both Forests expressed the greatest interest in wildlife viewing areas or opportunities. Visitors' interest in various types of trails tended to reflect their activity pursuits. For example, although many visitors showed little or no interest in specific types of trails, such as ATV or snowmobile trails, those kinds of trails were very important to certain segments of visitors interested in motorized activities. Respondents also attached relatively high importance to signs directing them to recreation facilities and printed interpretive information.

A minority of visitors obtained information about the area they visited during their trip or in preparation for it. Elk State Forest visitors, however, were more likely to obtain information (41%) than Moshannon visitors (23%). Information was more likely sought by first-time users, and visitors in both Forests were more likely to seek information before leaving home than after arriving at the Forest. In both Forests most of those who sought information found it helpful in planning their trips.

The vast majority of visitors in both forests reported that Marcellus shale-related activity had not affected their use of or recreation experience at the State Forest. Among those reporting that their use of or experience at the State Forest had been impacted by shale-related operations, the most common responses reflected various types of visitor displacement, or changes in visitors' destinations or activities due to area closures or fracking activity. Respondents also expressed some general environmental concerns including habitat destruction and threats to water quality as well as changes in landscape, noise pollution, and loss of a relaxing and serene environment. Traffic-related issues and concerns with wildlife and hunting were also mentioned. Among those reporting that gas drilling activity had not affected their use of the State Forest, many indicated that they had not noticed the activity or had not noticed it in the areas they visit, or that the drilling activity doesn't bother them, hasn't changed their use or doesn't affect their activities.

This report provides a representative snapshot of recreational use in two Pennsylvania State Forests. It thus contributes to building a profile of Pennsylvania State Forest visitors. Surveys are currently continuing in other forests and the overall database will include a total of ten forest districts by the completion of the five-year project. Future reports will provide yearly summaries of the individual forests studied as well as comparative and targeted data analyses

aimed at assisting Bureau of Forestry managers in their efforts to meet the needs of their recreation constituency.

Appendix A

Visitor Responses to Open-Ended Questions

If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

Moshannon State Forest, 291 responses

Note – Some single responses addressed multiple topics and are coded in multiple categories

No Suggestions *(62)*

Keep Up the Good Work *(27)*

Doing good
Doing good right now
Everything is good (4)
Everything is good so far
Everything is in good shape to me
Everything is okay
Everything seems fine
Everything well kept
Good
I really enjoy this place so far
I really like this state forest
I think it's well managed (2)
I think this forest is managed well
I think this place is being managed well
I this this place is managed well
I'm happy with everything
It is clean and beautiful, my favorite place
It's all great
Generally everything is great
This is one of the best spots I've visited
They are doing okay
This park is clean and managed well
We like this place. Well managed

Improve Information and Maps *(20)*

Maps (7)
Better and more maps… Just more information
Forks trail was not findable based on current maps. Maps need to be updated
Need a map with trails
I was looking to grab that trail map, but they are out… I've never ridden on these trails so I was coming to see if I could. The map would have been nice
More map information

More paper maps
Paper maps

Recreational Signage (9)
Improve trail signs and Map. Improve road signed to make finding trail heads easier
Better signage letting us know where we can bike
More signage on the snowmobile trails indicating where food and fuel. Kind of like how the road signs do it
More signs (2)
More signs and directions on trails. Maybe it is also possible to provide trail maps
More signs and maps for trails
More signs for trailhead
More signs, better signs for scenic areas, include mileage on signs.

Educational Signage (3)
Given that we are naturalist idiots, identify markers for flora and fauna would be amazing. Some good history around here. Robber David Lewis? Who is that?
More information about local plants and animals
More information about local fauna

Improve Road Conditions *(40)*

Road Maintenance (35)
Better maintenance of the forest road… Ruts in them from vehicles getting stuck and spinning wheels
Better road work
Better winter maintenance, like remove obstructions like trees
Black top Loosey Road
The road is a little rough down there… They could fill it in
Clean up the roads, hard on cyclists
Clearing of debris
Don't let them plow the roads when they are logging. You know leave half the road unplowed
Draw up bond on road for loggers to improve road
Finish bridge
Fix road down into Brown Springs
Fix the road
Fix the roads (3)
Fix the roads, keep maintenance
Fix the roads… This one is in bad shape down there
Fix Tower Road
Fix up some of the dirt roads
Improve the road
Improve the roads
Improve the roads… Sandrock is always pretty tough
Less gravel
Maintain muddy roads

Maintain roads
A lot of loose gravel… Bad for biking
Plow roads in the wintertime
Roads
Service road
Smooth the roads out
Some of the back roads need restored
Some of the road is very bumpy. Pave it for easy access
The road… Some nasty rivets and ditches
The roads a bit rough back there
The roads have gotten really bad… This grant trail road has been terrible. Grade the roads

Other (5)
ATV shouldn't be on this road but they are here all the time, and we can't even have a tractor for hauling wood at our camp
Bloom Road should be open
Little more trail and road access… I can't get my jeep to my lease 10 miles up the creek. I know a way but I'm not allowed to use it
Open up logging roads
Stop building as many side roads

Improve Recreation Facilities *(70)*

Facilities (26)
Bathroom at Shagger's Inn
Better maintenance on vending machines
Boat launch at Hick's Run
Bummer that restrooms are closed in winter
Bathrooms need regular cleaning
Garbage cans could be nice. Although I guess people abuse it
Garbage cans
Generally just more shower facilities and stuff for the kids… like playgrounds or sandbox
The women's room is a mess and needs toilet paper
Keep the restrooms here cleaner
Ladies room could use more toilet paper
Make the boat launch more accessible
Maybe more picnic tables and toilets
Maybe more restrooms and washrooms in campground
Maybe renovate restrooms in the forest (clean them up and make more restrooms available)
Maybe set up some benches and picnic tables
More bathrooms
Dangerous dead trees at day use sites
Playground for kids at the park… More stuff for the youth
Restroom is not available
Running water for the dog
Septic system at cabins

Set up more trash bins throughout the forest. Maybe at trailheads
Restrooms at Shagger's Inn
Trashcans. A wash station in the restroom
Want another swimming hole again

Camping (3)
Better management of campsite (e.g. fire rings, picnic tables, trash dumpster)
Fire ring in campsite
More camping facilities

Trail Maintenance/Access (19)
Better marked trails… There are a few that could be a little better
Better trail system
Gated roads to be open in the summer for scouting and hiking and ATV's allowed on forest roads
Get more trail maintenance
Keep the trails clear and in good shape
Let back into Winslow Hill
More access to area
More hiking trails
More mountain bike trails
More mountain biking trails
More trails
Open all DCNR roads for hunting
Open the gate on George Road… Especially during the doe season for youth and old folks…
Probably more ski trails and picnic areas for pit stops
Put bridge back over Mosquito Creek on Quehanna trail. Trail Maintenance (stinging nettles)
Open some gates for hunting. Currently locked for snowmobiles
Trail around pond
Trail maintenance
Work on the trails

Snowmobiling/ATV (21)
Allow ATV
ATV and bikes on state land trails
Besides more snow… connect our trails to go somewhere, you know, like long distance rides. I also feel like we shouldn't have to buy a permit to snowmobile on rails to trails
Designate some roads as non-snowmobile so that jeeps can use roads without worrying about snowmobiles
Hope to manage better for snowmobile trails
Keep the ATV's out
Let ATV on trails
Let the snowmobile season open earlier
It would be nice to block some of the trails off from vehicles… Especially after they've been groomed

Make some areas less accessible to ATV… Just more walking access, I'm not a fan of the motorized bikes and stuff
More ATV trail, maps, access to gas
More ATV trails
More dirt bike trails
More groomed trails
More grooming
More motor-cycle trails, open up more roads, more restrooms
Connecting these isolated trail areas
Run the groomers more when people are out
Open more ATV trails
Open up more state forest roads for licensed ATV's more access
Open up the rod to ATV's

Other (1)
Provide more diverse winter sport programs for kids

Fish, Streams, and Pond Management *(14)*

Habitat Health (5)
Better trash management alongside the creek
Litter around the water should be taken care of
Maybe clear up some broken trees in the creek
Well, was always hoping to plant White Ash. Hemlock Wooley Adelgid will kill all our hemlocks, making streams warmer. Do something about it

Stocking and Policy (9)
Hope to see more fish (2)
More fish
Pick up litter, Stock fish
Stock more fish (4)
Stock the fish more often

Wildlife Management *(30)*

Game Management (30)
Add some food plots
Bring more elk in, transfer elk to Pine Creek
Close some areas to doe hunting for a while
Cut back on DMAP's
Cut back on hunting to increase deer
Cut down on doe tags
Cut out doe season
Deer population increase
Improve feed lots
Improve grouse habitat

Increase deer herd
Not kill the doe
Leave more deer
Maybe food plot up on the hill
Maybe put in some more feeds plots
More deer
More DMAP
More food for game, shrubs and etc.
More food for wildlife
More food plots
More management for wildlife in area
More varied food plots
More viewing sites and distribute the elk population north into more counties
More wildlife
Quit selling extra doe tags
Put out food plots
Stop the doe hunting
Take off antler restrictions
Ticks, cut back on the doe tags. Let here grow
Unsatisfied with Game Commission releasing coyotes

Forest Management *(36)*

Timber Harvesting (26)
Better timber management, harvest more trees
Conscious tree planting
Cut down trees for viewing
Cut trees and log more for habitat for animals benefits
Allow more logging
Leave as natural as possible
Leave it alone (2)
Less timber activity
Lumber during the summer
Maintain natural area, don't develop things, Control invasive
More controlled burns
More clear cut areas
More berry bushes
More tree management (2)
Needs timbered
Prescribe burn in the forest
Quit logging
Quit cutting the trees down… leave some of them standing
Replant trees. Chop up some of the wood laying around the forest. Put the money back in the forest
Seems to be a lot of wood cutting- keep it looking nice
Stop logging

Stop timber cutting
Stop tree cutting
Thick shrubbery/ suggest controlled burning

Marcellus Shale (3)
Keep selective harvesting, less drilling
Clean the water, the fracking is polluting
Stop injection wells

Enforcement/Other (7)
Create jobs
Enforce littering and vandalism
Put more efforts to pick up trash in the forest
Keep the forest clean and safe
Also someone was out there shooting, must have been 500 shots up by where Upper Jerry and Dutchman Road… I don't know what the regulations are but it seemed inappropriate
Stay out of it. Don't change things like they do. Don't throw camps out. Leave roads the way they are. Less restriction on road access
Trash/Beer litter

If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

Elk State Forest, 337 responses

Note – Some single responses addressed multiple topics and are coded in multiple categories

No Suggestions *(115)*

Keep Up the Good Work *(51)*

All good
Alright the way it is
Doesn't know thinks it's nice
Doing a good job, less well though
Doing a good job as is
Everything is decent
Everything is fine
Everything is good
Everything is good and the staff is kind
Everything is good
Everything seems good
Everything was good
Generally good
Good (2)
Good how it is
Good job (2)
Good job new access road bypassing Benezette
Happy with the little improvements seen
I like how they manage
I like it as it is!
I think DCNR is doing excellent to keep this place clean and beautiful
It is clean and safe. I like this forest
It's all pretty good
It's clean and pretty good
It's pretty good and do a lot with the money they do have
Keep on doing what they are doing
Keep up the good work
Leave up to them… nothing
Let's leave it up to them… Maybe some more clearings
Good job rotating displays at visitor center
So far, everything is okay
So far, everything is good
They are doing a good job
They are doing great and taking care of everything
They are kind and informative (2)

They do a good job and send letters to inform
They do well
They like it because of the rustic areas
Think they've done a nice job
Thinks everyone's doing a good job
Thinks it has improved over the years
Thinks it's made improvements since started coming
Thinks they're doing well
Thought everything was pretty good
Thought it was good
Very clean and impressive
We like it how it is
Wouldn't do anything different, appreciates the viewing areas that are on back roads

Improve Information and Maps *(32)*

Maps (7)
Better maps and better signage
Map hiking trails
More accurate trail information
More detailed maps
More trail kiosks/maps of the entire forest
Update the maps
Wanted more maps and information on viewing areas. Though it would be nice to have more knowledgeable staff at the visitor's center

Recreational Signage (19)
Signage, animal warning signs
Better signage
Better signage, especially on backroads
Better signage off the main road
Better signage on 555
Better signage on trails. Got lost on trails because of old map
Directional signs
Have quiet signs around viewing areas because it's too noisy
Make the trail marks more visible
More signage for road directions
More signs and maps
More signs for snow warning
More trail markers
Put more signs for trail or set up a map on trails
Put more signs on porcupine road that it's a dead end.
The signs are bad for people who don't know where they're going
Signs for snow-covered roads

…Plus there is no signage along the trail saying what type of use is allowed. And they haven't had any maps in their box in years. DCNR never talks to the local land owners about what is going on in the area. We haven't seen an employee down here since the first year we bought our cabin. But I will say they (DCNR) have done a better job at controlling the quads… They aren't really an issue anymore.
Blazes for trail need better marked on Elk Trail

Educational Signage (3)
More interpretive information on trails. More education and maps
Keep up with interpretive information
Provide more information about wildlife in this area

Internet Information (1)
Better accessible information off internet about camping info

Lodging/ Camping (2)
Better advertising for places to stay. Wants every place to be advertised. Wants a better map of locations to hike, used to be one but stopped being made
More information on lodging and places to stay

***Improve Road Conditions** (25)*

Road Maintenance (20)
Better road maintenance
Better road management during winter
Cut down the dust from road, less clear cuts
Eliminate the traffic
Road drainage and style have become modernized and aren't preserving the natural look
Fix the potholes, put in outhouses
Improve road conditions and grade the dirt roads and make them wider
Improve road
Improve Straight Creek road
Improve the roads
Improvement of quality of pull offs and parking lots. Add more
Keep the dust down
Maintain roads
Make the roads wider, fix the road coming into Winslow Hill
Manage roadway traffic, install pull offs for viewing
More gravel on the road
Some areas the roads could be better
The roads and access roads
The roads between here and Williamsport, widen
There has been no maintenance on this road (Trout Run) and trail (Elk Trail) since we've owned our cabin (3yrs), if the DCNR provided the shale, the cabin owners out here would be happy to fix the pot holes. They just need to make it easier to meet us half way. The road

keeps getting wider because people are trying to avoid the pot holes

Access/Other (5)
Better access to some of the area… At the tops of the mountains
Too many duplicate roads paralleling each other
More access to gated roads
Open more of the back roads. Too many gates. Less gravel
That sign at the bottom of the hill blocks the view of on-coming traffic

Improve Recreation Facilities *(88)*

Facilities (46)
Add electric hook ups to the sites
Add more viewing areas to see elk
Addition of rural restrooms for hikers
Bathroom maintenance, trees limit viewing of elk especially at old site on Winslow Hill
Better picnic tables, trash pick-up, more vegetation, natural view areas (animal baiting), road maintenance, call boxes
Better upkeep of restroom facilities
Bleachers at the Winslow visitors center for senior citizens
Cell phone service for emergencies. Want it for safety
Clean women's bathrooms better
More restrooms available (modern and clean)
Put in outhouses
Flush toilets
General maintenance
Horse manure disposal such as compost
I hope to see more restrooms available
I like trails in this forest, keep it clean
Increase number of viewing areas because it is too crowded
Keep it natural and help people with ailments walk around
Larger viewing sites
Lodging areas that aren't camping, like hotels
Look outs could be elevated to be able to look out from because hard to see it
Maintenance of bathroom (4)
Maintenance of restrooms and enforce littering laws
Make facilities more accessible for people who have trouble walking and make it known that there are available wheelchairs inside for people who need them
Make things more accessible to people with disabilities
Manure pit like the one at Kelly Pines
Maybe restroom with shower
More trash receptacles (2)
More viewing access
More viewing areas (2)
Outside water faucets
Plow viewing area, winter maintenance

Put in bird viewing areas
More accessibility for people who have trouble walking
Sell firewood at Rangers Station
Some bathrooms could be maintenance
The amphitheater was crowded and it was hard to hear over children talking. There was not good lighting going down in to the front row and need a line marker to manage crowds
There should be a fireplace in the center
It would be a good idea to have a clipboard to record elk activity so people knew whether or not they were coming to those spots
Visitor center ground should stay open longer. Don't mind if the store closes at 8 but it would be nice if the grounds were open later. Regulate bear hunting to not have hunters kill immature bears
Visitor Center should have a snack bar

Camping/ Picnic Areas (13)
Add manure pit in camp grounds. Less trails on road because of safety issues, make woods trails
Add manure pit at Gas Well Equestrian camp
Cut back some of the trees to make it easier for RVs to get out, and take down some of the widow makers to make it safer… and taking out some of the trees might dry out the campground too… It can get pretty swampy in here
Cut the grass at Hick's Run viewing area near the parking lot
Maybe new picnic tables in the campsite
Dumpster at Hick's Run camp
More camping areas
More camping areas!
Mow grass at Hick's Run camp
Mow grass, police campers who reserve but do not show up
Need horse manure pit in camping areas even if need to start charging fee for it
Open Quehanna to primitive style camping
Shower available at campsite

Trail Maintenance/Access (9)
Better trails
More developed hiking trails
More hiking trails
More paths to walk to see walk
More trails (2)
Talk to horse people about where to put more trails. Do not care for road riding. Do not like the fact of state game lands being closed. Need manure pit here. And there is trash in the creek sometimes. Horse traffic is an issue… they don't use their designated trails and go on private property. Elk Trail is in terrible shape because of the riding use.
Tree down on Elk Trail off Dents Run needs cut because people are cutting around

Snowmobiling/ATV (10)
All dirt roads should be ATV accessible. Fire wood cutting in previously logged areas
Designate more areas for ATV's
Encourage more ATV rides
More ATV access
More ATV trails
More trails for motorized vehicles
Open more trails for ATV and snowmobile use
Probably develop more recreational trails for dirt or motor bikes
Reduce number of ATV, certainly don't expand the system
Ride Four wheelers

Parking/Pull-offs (5)
Add pull offs for people to view elk and add signage so they aren't stopping in the middle of the road or on private property
More parking
More pull-offs for parking
More pull offs on the road so don't disturb natives
Needs to have more pull offs on the highway for viewing and selling drinks in the building

Other (5)
Allow pets
Allow Side-by-Sides
Better accommodations, not happy with local accommodations, especially because they're usually over bars. Lodges aren't for small families or couples. Would like pet friendly cabins
Limitations on visitors
More programs for kids (wildlife demonstration, trail guide, etc.)

Fish, Streams, and Pond Management *(2)*

Access (1)
Designate the creek right near the campsite as child only access

Stocking and Policy (1)
Quit stocking over the wild trout. Less stocked fish in streams. Continue dirt and gravel roads movement to keep mud out

Wildlife Management *(23)*

Game Management (22)
Bring more elk in!
Cut out DMAP tags
Deer management

Deer management is my primary concern. Understand that there is a balance that needs to be struck but wildlife conservation is my biggest concern. There are too few deer on our state leased land. Drinking water would be good here too.
Eliminate doe hunting… focus on deer herd instead of elk
Get rid of rattlesnakes, wondering about increases in ticks
Has trouble with the hunting permits and thinks should be easier
Have officers hunt, not harass us
Hunting, deer population declining
I'd question their deer management and I think there are way too many rattlesnakes. The rattlesnakes, in certain areas are my big concern… Especially with the kids running around
Increase game habitat
Keep the no hunting on Sunday
More elk (2)
More deer
More elk or food places so they come
No, but don't like that they allow hunting
Not a fan of the commercialization of the elk tourism thing
Open up more area for elk hunting
Put some tracking collars on elk so public can locate them
Restrict doe license
Stop killing so many doe… I guess that's more Game Commission but they work together I guess

Fencing (1)
Less fenced in areas

Forest Management *(27)*

Timber Harvesting (19)
Better management of the state forest system and timber management
Clear out brush so we can see into the woods more
Cut trees out of the creek of Dents Run. Better signage
Leave forest alone, let them grow naturally
Leave it the way it is. Keep area clean.
Leave more oak stand, plant more. Beech blight management
Leave some trees
Leave the forest and animals alone
Minimize land clearing
More timbering
Maybe some timbering
Over cutting of hardwood cherry. If continues the population will diminish for future generations. Stop spraying roundup
People are da gone picky. Nothing wrong here. There would be more game if there was more timbering to let light to the forest floor
Quit cutting the woods down

Removal of fenced in areas that do not need to be there
Manage the tree line around Hick's Run
Some tree trimming… get rid of some of these widow makers… Electric would be nice, but not if they charged a fee
Timber management, stop clear cuts
Too many improvements that are taking away from the nature of it. Too populated

Marcellus Shale (3)
Cease drilling in State Forests
Not open up State Forest land to Marcellus Shale drilling
No more drilling

Enforcement/Other (5)
Enforce cycling rules
Lot of people in September
I like these more primitive and less crowded sites… Make more of these
Too many tourists
Too many tourists, concerned about habitat and tree canopy

Marcellus Shale Open-Ended Responses by Forest

Moshannon SF

Has Marcellus shale-related activity changed your recreational use of this State Forest?
n = 350, Yes = 43, No = 307

178 total open-ended responses

If yes, why? (43 open-ended responses)

Road/Traffic (10)
Affected our camp. Road is way bigger higher traffic. Gas well site
I can't ride the roads because they plow and cinder them… They're not supposed to do that… at least that's what DCNR tells us
Mainly when we mountain bike and we ride the forest roads, we cross paths with the trucks… and sometimes it is too much truck traffic for us to ride so we have to call it a day
Plow some of the snowmobile trails… They are allowed to drill but we can't ATV
Shuts roads down and busy
Traffic
Traffic trucks
Traveling route gets interrupted
Yeah some trails we made because of the roads around here
Yeah, the truck traffic can be heavy on the forest roads. I try to avoid where I know they are

Displaced/Closed Areas (13)
Have closed many of the snowmobile access roads
I am less inclined to go certain places
In the way
It restricts snowmobile access in some areas
Portions of the forest yes… I have to change locations for fishing and hunting
Preventing us to go further north… We heard they were closing roads up there
Put a pad where I used to hunt
Road blockage
Some area is restricted to access
Some areas are not available for public. It limits my recreational use
Some snowmobile trails are restricted
They have closed some areas and you need to be more careful with the truck traffic
Took some of the nice hunting areas away

Effects on Wildlife/Hunting (9)
Herbaceous opens attract wildlife. Traffic is inconvenience
I like to spend time in the woods, I like to hunt… In some way it helps and hurts… It opened up some areas that were too remote for folks and now there are a bunch of people back there
Less fish
Makes new areas for snakes, new roads

Ruin deer trails and they make trails into roads. Block stuff off
Ruin hunting grounds
Took away part of the hunting area
Took some of our hunting areas away… It's just rock piles now instead of forest
Use a lot of hunting area

General Environmental Concerns (5)
When it first started, but now it hasn't really
Disturbed the natural areas
I am concerned about natural environment
It cuts trees in the forest
Stripped the forest… Looks terrible…But improved the roads

Noise and Visual Impacts (1)
Louder in areas he was hunting

Positive Impacts/Statements (3)
Easier to navigate
Made the trails better
More wildlife hunting and viewing… With feed plots and openings

If no, why not? (135 open-ended responses)

No Effect on Use (76)
Does not bother
Doesn't bother at all
Hasn't interfered
It doesn't affect me
It doesn't bother me
It has no direct effect on me
Just driving
Little more gravel
N/A (5)
Never encountered it hiking
No (2)
No comment
No evidence (5)
No evidence of it
No problem with it, hasn't bothered ecology
No, but bring own water
None (5)
Not affecting me (9)
Not affecting our family
I don't think it affects me (2)

I don't think it affects us
I don't think so (8)
Not affecting us
Not affecting us to enjoy this forest
Not bother me
Not bothering me
Not for recreational use
Not for us
Not in the way
Not in this area
Not in this forest
Not particularly (5)
Not really (6)
Not related to my recreation
They don't bother me at all
Trails didn't have impact here

Don't Notice/Haven't Seen Any Activity (31)
Don't see it
Don't see them
First visit
Hasn't seen anything
Have not seen any
Haven't been close to them
Haven't experienced any drilling
Haven't noticed it
Haven't run into it
Haven't seen any
Haven't seen any indication
Haven't seen any wells
Haven't seen anywhere they were
Haven't seen evidence
Haven't seen the impact
Haven't used before no comparison
I haven't seen it
It has other places
Not noticed
Not seen (10)
Seem to be taking care of what they are doing
Unnoticeable

Not Drilling Here or in Areas I Care About (19)
Depends on area
Didn't drill out here
Haven't seen it here
Haven't seen them out here

I hate it, but my use areas aren't by the drilling. We should have learned from our mistakes with the coal industry
I don't see any drilling or construction in this area
I don't see it here
Never seen it here
It isn't affecting this place, but affects other places
Not at all here
Not drilling here
Not seen here (2)
Not here (2)
Not here but for other state forests
Not this one, but other ones
Nothing around here
Really haven't done anything in our part of the forest
We don't really have a history

Not Yet (implies concern for future) (3)
Not around yet
Not yet (2)

Don't Know About It (1)
Not familiar

Pro-Drilling (7)
A way of life
Clean
Do an excellent job of monitoring their business
Electric lines get fixed more readily
I think it is important for local economy. It is not affecting me to enjoy this forest
Road is nice
Works for Marcellus

Has Marcellus shale-related activity changed your recreation experience at this State Forest?
n = 350, Yes = 51, No = 299

142 total open-ended responses

If yes, why? (44 open-ended responses)

Road/Traffic Issues (12)
A few times trucks have been frustrating
A lot of truck traffic
Generally more negative when we see those trucks
I used to mountain bike on the roads but now I don't want to with my kids because of the heavy truck traffic

Large vehicle traffic on narrow roads negatively affected experience
Overall it's not pleasant… But those trucks kick up a ton of dust in the summer. That just makes it all the worse
Road blockage
Roads are more dusty
Rough road conditions
Some trucks driving through, but there is timber back there too. I don't really like the idea of it being here
Too much noise and trucks and clear cutting
Stripped the forest… Looks terrible… But improved the roads

Noise and Visual Impacts (4)
On the mid-state trail there were compressor stations and development. Changed character of area
Visually
Forest smells like gas
It's just disrupting… I just don't want to see it and hear it

General Concerns (4)
Just don't like it
Just less enjoyable
Negative… and it's bad in other places too
Negatively

Effects on Wildlife/Hunting (1)
Took some of the nice hunting areas away

Displaced/Closed Areas (8)
They have closed some areas and you need to be more careful with the truck traffic
Areas they are doing the well is avoided
Can't access favorite areas
Can't go to one particular area I used to hunt
Changing routes because of landscape change
Don't visit camp as much
Limited access for hunting and snowmobile
Same reasons, snowmobiling harder to access areas or not allowed

Impacts on the Environment (4)
Disturbed natural areas
Just drove past one of those trucks and was talking to my wife about how the fracking probably isn't so great for the environment
Knowing that it occurs - don't like that it is ruining habitat and preventing restoration of habitat
Yeah there was a spill and I can't drink the water from the public spout

Positive Impacts/Better Access (6)
Roads are better

Good for opening up area for the deer
I have noticed them opening up some more places but nothing really affecting me good or bad
Improved deer and turkey habitat
More deer
We get income from the industry that lets us have more free time

If no, why not? (98 open-ended responses)

No Effect on Experience (30)
Doesn't bother
First time (2)
First visit
Haven't been around
It almost needs to be done… Not a big deal
Just the logging
N/A (8)
No
No encounters
No impact (2)
None (7)
Not affecting
Not in the way
Nothing really I understand it as a short term inconvenience for me but good for everyone else
No problem with it, hasn't bothered ecology

Don't Notice/Haven't Seen Any Activity (38)
Didn't see any effect
Doesn't seem to be around
Don't see it
Don't see them
Haven't experience any drilling
Haven't experienced any here
Haven't had to deal with it
Haven't noticed it
Haven't seen any
Haven't seen them
I don't really see it happening
I haven't really noticed it
I haven't really seen any effects on the roads
I just haven't seen it around too much
Just don't see it really
No evidence (5)
No indication
Not noticed
Not really familiar with the area… Haven't seen any

Not really relevant to us
Not really… I mean we stick around here for the most part
Not seen (9)
Unnoticeable
We don't really get out enough to see it
We just don't typically notice anything
Yeah I don't really get out in areas where they are drilling
You don't see it much down here

Not Drilling Here (or in areas I care about) (15)
I haven't really seen any here… I'm not sure if there is any
Just don't see it where I go
Just not here, at least not where we go
I haven't really seen it in this area
I just haven't seen it where I go
Didn't drill here
No here
Not around here
Not here
Not here that he knows of
Not here that he's aware of
Not out here or on the trails
They're not here
Wasn't here

Not Yet (implies concern for future) (3)
It hasn't but I am worried
Not yet but it might in the future
There's some activity here and there but I've not been effected by it yet

Don't Know About It (3)
I didn't even know it was out here
I didn't even know they are doing it up here
Not familiar

Pro-Drilling/Positive Impact (7)
I support it and we don't really see it here
I think it's a good thing
I think they are pretty thoughtful about their practices
Let them keep drilling baby
The roads are wider and nicer… like four mile
They take care of the land
Works for Marcellus

Elk SF

Has Marcellus shale-related activity changed your recreational use of this State Forest? *n* = 413, Yes = 32, No = 381

264 total open-ended responses

If yes, why? (32 open-ended responses)

Road/Traffic (3)
Roads, vehicles, water trucks
Truck traffic, noise, disrupted forestry
Water truck activity affecting roads

Displaced/Closed Areas (4)
Changed cabin area
Changed route due to drilling in area
Close off roads for snowmobiling
Roads are closed sometimes, Noise

Effects on Wildlife/Hunting (6)
40 Wells and truck traffic affect hunting
Areas where they are at used to be hunting grounds
Hunting around the new gas line put in
It changes the way the game act
Opened up a lot of heavy undergrowth and helped wildlife
Roads intrusive to hunting grounds

General Concerns (4)
Could have an impact
Doesn't want to discuss because sees so much from where they're from and irritated with it
Sampling because of Marcellus shale
Wells near where staying and where they live

Noise and Visual Impacts (3)
At the campsite they use the well nearby runs all the time and it takes away from the quietness
Commotion that goes on
Not as quiet

Positive Impacts/Statements (9)
Gas is cheaper to travel here
Have a piece of land that has leased to company, has large contract with the company and gets to say what they do and don't do
I think it is good for state economy and creates more jobs
I think it would be helpful for local economy and forest conservation
Make more money for the area

Noticed the wells but thought it was an improvement
It has impacted positively
Thinks it's improved a little
Want to place a pipe through their land

If no, why not? (232 open-ended responses)

No Effect on Use (77)
Always been here
Because they don't affect us
Can still go walking
Did put in well but doesn't affect usage
Didn't start traveling to areas where it's been until after the mining began
Does not affect them
Doesn't bother him
Don't care
Don't see any reason for it to change recreation activities
First time here and do not see it
Has seen evidence but hasn't changed their experience
Hasn't changed anything
Hasn't disrupted any recreational activities
Hasn't impacted it
Hasn't noticed and doesn't pay attention to it
Haven't affected anything
Haven't had issues
Hunting activities haven't been effected
I do not think so
I don't mind it
I don't think it affects me
I don't think so
I see it but actually not affects me
It doesn't bother me. It may help local economy
Just hiking
Knows we need fossil fuels so it doesn't matter to his recreation use
No comment
Need to do it
No
No but don't think they should be doing it
No but has changed where they're from
No but questioned the spotting from trucks on Winslow Hill
No comment (10)
No doesn't seem to affect anything
No effect
No evidence

No it hasn't (2)
No hasn't changed the experience but does work in the industry
No hasn't done anything detrimental to this area
No interference
Nope, no reason
Nope, first time visiting
Not affected
Not affecting me (3)
Not affecting us (2)
Not at all
Not for me
Not for us
Not from this area
Not in the way
Not making a big impact
Not much activity
Not really
Not so much now, but the heavier truck traffic in the beginning was bad
Not that they noticed
Not the first but local roads
Not them particularly
Not today
Not too much, just well sites
Nothing for recreational use
Nothing going
100% No
Seen, but unaffected
They plow the snowmobile trails in the winter… Down to the bone… They don't care

Don't Notice/Haven't Seen Any Activity (95)
Are not going deep into woods to see it
Did not encounter
Did not notice any activity
Didn't encounter it in elk SF
Didn't hunt those areas
Didn't see it
Do not see it
Doesn't see much evidence
Don't see it (8)
Hasn't seen any (2)
Hasn't see any evidence
Hasn't seen any in the forest
Hasn't seen how it has
Hasn't seen it (3)
Hasn't seen the impact
Hasn't witnessed any activity

Have not run into it
Have not seen any vehicle traveling
Haven't been exposed to many Marcellus shale sites or activity
Haven't come across any activity
Haven't come in contact with it
Haven't encountered
Haven't noticed it (5)
Haven't seen a change
Haven't seen any
Haven't seen anything
Haven't seen impacts
Haven't seen it (5)
No evidence yet just getting started
No hasn't seen any
Not recreating in drilling locations
Have not seen it (4)
Not seen (41)
Too far from home. Not seen

Not Drilling Here or in Areas I Care About (21)
Avoid it
Hasn't seen at this site
Haven't really seen it here, not like home
Haven't seen it here (2)
Not seen it here
Haven't seen it in elk state forest, but see it at home in Ohio
I haven't really noticed it here
I haven't seen it where I go
Does not think it is here
Not out here where I go
Does not think they drill on state game lands
Here, no.
I don't think it affects here
I don't think they are drilling here
No active here
No impact here
Not here
Not in the area
Not in this area, not from this area
They have it around the area and you can't see it here

Not Yet (implies concern for future) (8)
I just know they closed some snowmobile trails… It hasn't affected me yet but it might in the future
It has not affected me yet
Not at this point
Not around yet
Not yet
Not yet at least
Not yet but not happy about it
Not yet it hasn't

Don't Know About It (10)
Doesn't know what it is (3)
Don't know
Don't know about it
Don't know where they are drilling
Hasn't heard of it
Haven't heard about it
Isn't informed
Not sure about how much has happened here

Pro-Drilling (8)
Did improvement to their driveway
No husband works for company
No, they think it is a positive to the area
No, they work in the business
Not here but thinks they have done a good job keeping it cleaned up
Not here, pipeline helps travel
Not hurting anything… it's good for jobs
Possibly beneficial, creates new habitats

Has Marcellus shale-related activity changed your recreation experience at this State Forest?
n = 413, Yes = 48, No = 365

242 total open-ended responses

If yes, why? (45 open-ended responses)

Road/Traffic Issues (13)
Commotion and lack of privacy
Have to be very careful on roads because of the tankers, noise pollution disruptive
Just a little bit because of the truck traffic
Lots of trucks really cut back on our enjoyment
Restricted use of roads
Road conditions are worse, with all the heavy truck traffic
Roads affect the peace that comes with hunting
Saw some trucks on highways
Traffic
Traffic, more trucks on the road, kills rattle snakes
Truck traffic (2)
Truck traffic during viewing

Noise and Visual Impacts (4)
It's different. Not the same as it used to be, relaxing and quiet. Altered landscape. It is a major difference
Loss of quiet, liked when roads were not used much
Noise, less pleasurable to know it happens
Wells near campsite

General Concerns (9)
Removal of survey ribbons
Disturbing to know that it happens
Doesn't agree with it
Don't like that it's happening in the state forests and not being taxed so it bothers me to know about it happening
Haven't seen them but haven't been affected by that. However feel that loggers are more disruptive because it disrupts hunting (the way deer run) and they're not allowing people to take the leftover firewood
Knowing that it happens in state forest bothers her
Knowing that the land is being disturbed changed experience and enjoyment
Yeah, I just don't like the idea of it being around
Ruined Parker Dam and disapproves

Effects on Wildlife/Hunting (2)
Interfered with wildlife in the evening
Some areas used to hunt in no longer favorable

Displaced/Closed Areas (2)
Can't get where we need to sometimes
Changed routine

Impacts on the Environment (3)
Cut in the stream, had to move down stream to sample
I don't like it and I don't think it is good for the environment
Scars the land

Pro-drilling/Positive Impacts (9)
Does well for the economy
I support it
Improved the road, more traffic
Improvement
In contact with a company
Made it better
Money for the community
Pipeline improves trails
Yes, noticed the wells and has helped

If no, why not? (197 open-ended responses)

No Effect on Experience (51)
Always been here
Does not bother him
Doesn't agree with it
Doesn't bother him
Doesn't bother them
Doesn't affect their trip
Encountered but was not bothered
Has seen it but not bothered by it
Hasn't impacted her
Hasn't impacted him
Hasn't impacted it
Hasn't impacted their trip
Hotel s room full during week
I don't see the big fuss about it
Just hasn't influenced our experience
Just see the well sites
N/A
No (2)
No, but doesn't agree
No comment (16)

No interference
Not impacted things I do in forest
No problem
None (2)
Nope
Not affected
Saw them working but it didn't seem to interfere
Seen, but unaffected
Slower getting in and out
Still uses
That doesn't bother me
Unavailable
Wants state forest to remain the same
Was not an interference

Don't Notice/Haven't Seen Any Activity (96)
Can't see it
Didn't notice anything yet
Didn't see any
Do not see it
Doesn't pay attention to it
Don't really see it
Don't see it (6)
Hasn't experienced it
Hasn't seen any (2)
Hasn't seen it
Hasn't seen the impact where they visit
Haven't encountered
Haven't noticed it
Haven't noticed it but opposed to it. They hope that they haven't voted to stop water skiing where they're from in their park because it's important to have and the accident that happened wasn't related to the condition of the creek
Haven't seen it (5)
No didn't see anything
No evidence no bothering
No evidence (6)
Not seen (56)
Not seen anything
Not seen it (2)
Not seen much
Haven't come across any activity
I haven't really noticed it here
We haven't really seen it
You know I haven't really seen anything… and I don't know if it is a good thing or a bad or something in between

Not Drilling Here (or in areas I care about) (15)
Haven't seen it here (2)
Haven't encountered here
I don't even see the trucks running up here
I haven't really noticed it here
I haven't really seen it where we go
Haven't noticed it here
Haven't noticed it around here (2)
No impact here
Not encountered here
Not here
There is no activity around Benezette that I'm aware of… That's all further north
Not in this area, not from this area

Not Yet (implies concern for future) (14)
Not today
Hasn't changed experience but worried about changes in the future
Have not caused disasters yet here
No but afraid of water level because of other parks
Not visible in area as of yet
Not yet (6)
Not yet but afraid of how it will affect wildlife, community and water
Not yet, I just hope they don't do as much up here as they do at home
Think it will affect it

Don't Know About It (6)
Didn't know what it was
Doesn't know if it's changed
Hasn't heard of it
Isn't informed
Not aware
Not sure about how much has happened here

Pro-Drilling/Positive Impact (7)
Actually thinks it good
Has helped the area
It is beneficial
I think it's a great opportunity for PA
No he works for them
No they work for them
Love that it is taking place

Appendix B

Zip Code Analysis of Moshannon and Elk State Forest Visitors

2014-15 Pennsylvania Visitor Use Monitoring - ZIP Code Data

Each of the three versions of the survey asked for the respondent's home ZIP code as part of the socio-demographic data. These ZIP codes were then uploaded into ArcMap GIS software (ESRI, 2012). A basic spatial analysis was conducted for each forest to determine the geographic distribution of the respondents. Straight-line distances were computed from the respondent's ZIP code to the forest headquarters. Additionally, a breakdown of respondents by state and Pennsylvania County was performed. The results are shown below, segmented by forest. Maps illustrating the geographic distribution of visitors are included at the end of this section (Figure 1 and Figure 2).

Moshannon State Forest Highlights

- The average straight-line distance from the respondents' home ZIP code to the Moshannon State Forest Headquarters was 92.4 miles.
- 29.2% of respondents' home ZIP codes were within 25 miles of the Moshannon State Forest Headquarters, 74.4% were within 100 miles (Table 1).
- Respondents' home ZIP codes represent 9 states; 96.2% of the respondents reported a home ZIP code in Pennsylvania (Table 2).
- The Pennsylvania respondents' home ZIP codes represent 46 different counties (Table 3). The top three counties were Clearfield (13.8%), Centre (10.2%), and Lancaster (7.7%).

Table 1. Straight-Line Distance from ZIP Code to Moshannon State Forest Headquarters (n = 357)

Distance (miles)	Number of Responses	Percent*
Less than 25	104	29.2%
25-49	56	15.8%
50-99	105	29.4%
100-199	80	22.3%
200+	12	3.4%

*may not add up to 100% due to rounding

Table 2. Moshannon State Forest Responses by State (n = 371)

State	Number of Responses	Percent*
Pennsylvania	357	96.2%
Virginia	6	1.6%
Ohio	2	.5%
Colorado	2	.5%
Florida	1	.3%
Illinois	1	.3%
New York	1	.3%
South Carolina	1	.3%

*may not add up to 100% due to rounding

Table 3. Moshannon State Forest Pennsylvania Responses by County (n = 357)

County	Number of Responses	Percent*
Clearfield	49	13.8%
Centre	36	10.2%
Lancaster	28	7.7%
Indiana	18	5.1%
York	18	5.1%
Westmoreland	13	3.6%
Blair	13	3.6%
Jefferson	11	3.1%
Lycoming	11	3.1%
Elk	11	3.1%
Clinton	9	2.6%
Franklin	9	2.6%
Allegheny	9	2.6%
Cumberland	7	2.0%
McKean	7	2.0%
Mifflin	7	2.0%
Northumberland	7	2.0%
Butler	5	1.5%
Clarion	5	1.5%
Erie	5	1.5%
Huntingdon	5	1.5%
Adams	5	1.5%
Perry	5	1.5%
Cambria	4	1.0%
Cameron	4	1.0%
Lehigh	4	1.0%

Armstrong	4	1.0%
Beaver	4	1.0%
Bedford	4	1.0%
Berks	4	1.0%
Union	4	1.0%
Venango	4	1.0%
Montgomery	4	1.0%
Carbon	2	.5%
Columbia	2	.5%
Crawford	2	.5%
Juniata	2	.5%
Fulton	2	.5%
Bucks	2	.5%
Tioga	2	.5%
Washington	2	.5%
Mercer	2	.5%
Montour	2	.5%
Northampton	2	.5%
Potter	1	.3%
Schuylkill	1	.3%

*may not add up to 100% due to rounding

Elk State Forest Highlights

- The average straight-line distance from the respondents' home ZIP code to the Elk State Forest Headquarters was 115.0 miles.
- 49% of respondents' home ZIP codes were over 100 miles away from the Elk State Forest Headquarters, 15.7% were within 50 miles (Table 4).
- Respondents' home ZIP codes represent 12 states; 92.7% of the respondents reported a home ZIP code in Pennsylvania (Table 5).
- The Pennsylvania respondents' home ZIP codes represent 62 different counties (Table 6). The top three counties were Clearfield (4.6%), Lancaster (4.6%), and York (4.6%).

Table 4. Straight-Line Distance from ZIP Code to Elk State Forest Headquarters (n = 451)

Distance (miles)	Number of Responses	Percent*
Less than 25	19	4.2%
25-49	52	11.5%
50-99	160	35.5 %
100-149	202	44.9%
150+	18	4.1%

*may not add up to 100% due to rounding

Table 5. Elk State Forest Responses by State (n = 451)

State	Number of Responses	Percent*
Pennsylvania	418	92.7%
Ohio	13	2.9%
New York	5	1.1%
New Jersey	4	.9%
Florida	2	.4%
Indiana	2	.4%
Michigan	2	.4%
District of Columbia	1	.2%
Minnesota	1	.2%
Texas	1	.2%
Virginia	1	.2%
West Virginia	1	.2%

*may not add up to 100% due to rounding

Table 6. Elk State Forest Pennsylvania Responses by County (n = 407)

County	Number of Responses	Percent*
Clearfield	20	4.7%
Lancaster	20	4.7%
York	20	4.7%
Blair	18	4.4%
Butler	16	3.7%
Westmoreland	16	3.7%
Centre	15	3.5%
McKean	15	3.5%
Jefferson	13	3.0%
Allegheny	12	3.0%
Dauphin	11	2.7%
Berks	11	2.7%
Indiana	10	2.3%

Lycoming	10	2.3%
Franklin	10	2.3%
Armstrong	9	2.3%
Cambria	8	2.0%
Clinton	8	2.0%
Elk	8	2.0%
Erie	8	2.0%
Huntingdon	8	2.0%
Chester	7	1.7%
Beaver	7	1.7%
Venango	7	1.7%
Northumberland	7	1.7%
Potter	7	1.7%
Clarion	5	1.3%
Cumberland	5	1.3%
Juniata	5	1.3%
Luzerne	5	1.3%
Bedford	5	1.3%
Warren	5	1.3%
Washington	5	1.3%
Mercer	5	1.3%
Montgomery	5	1.3%
Perry	5	1.3%
Schuylkill	5	1.3%
Somerset	5	1.3%
Lawrence	4	1.0%
Bradford	4	1.0%
Bucks	4	1.0%
Tioga	4	1.0%
Cameron	3	.7%
Lehigh	3	.7%
Union	3	.7%
Mifflin	3	.7%
Sullivan	3	.7%
Carbon	1	.3%
Columbia	1	.3%
Crawford	1	.3%
Lackawanna	1	.3%
Lebanon	1	.3%
Delaware	1	.3%
Fayette	1	.3%
Forest	1	.3%
Adams	1	.3%
Susquehanna	1	.3%
Monroe	1	.3%
Montour	1	.3%

Northampton	1	.3%
Pike	1	.3%
Snyder	1	.3%

*may not add up to 100% due to rounding

References

ESRI 2012. ArcGIS Desktop. Release 10.1. Redlands, CA: Environmental Systems Research Institute.

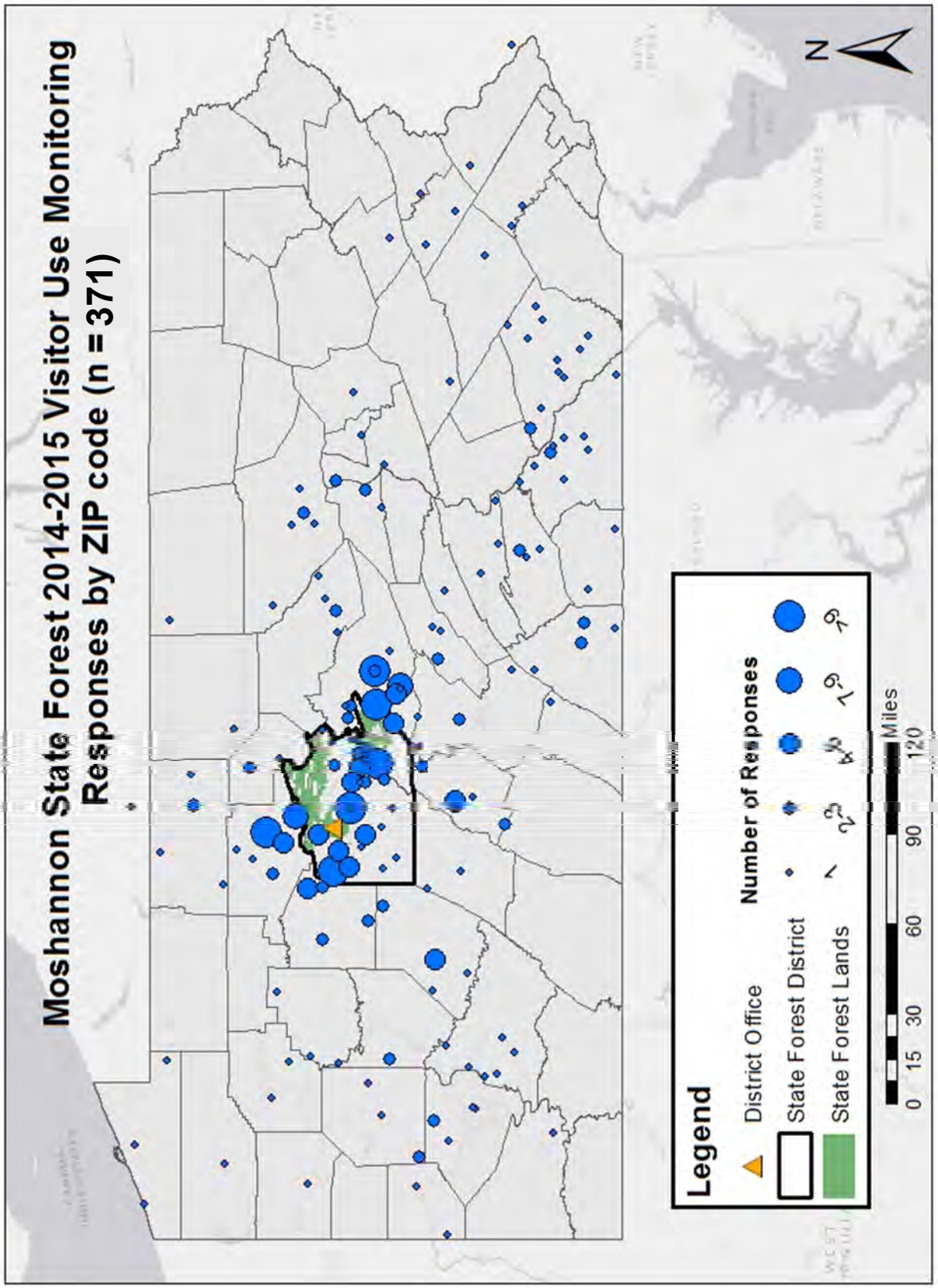

Moshannon State Forest 2014-2015 Visitor Use Monitoring
Responses by ZIP code (n = 371)
N
Legend
District Office
State Forest District
State Forest Lands
Number of Responses
1
2
4
9
19
29
Miles
0 15 30 60 90 120

Figure 1

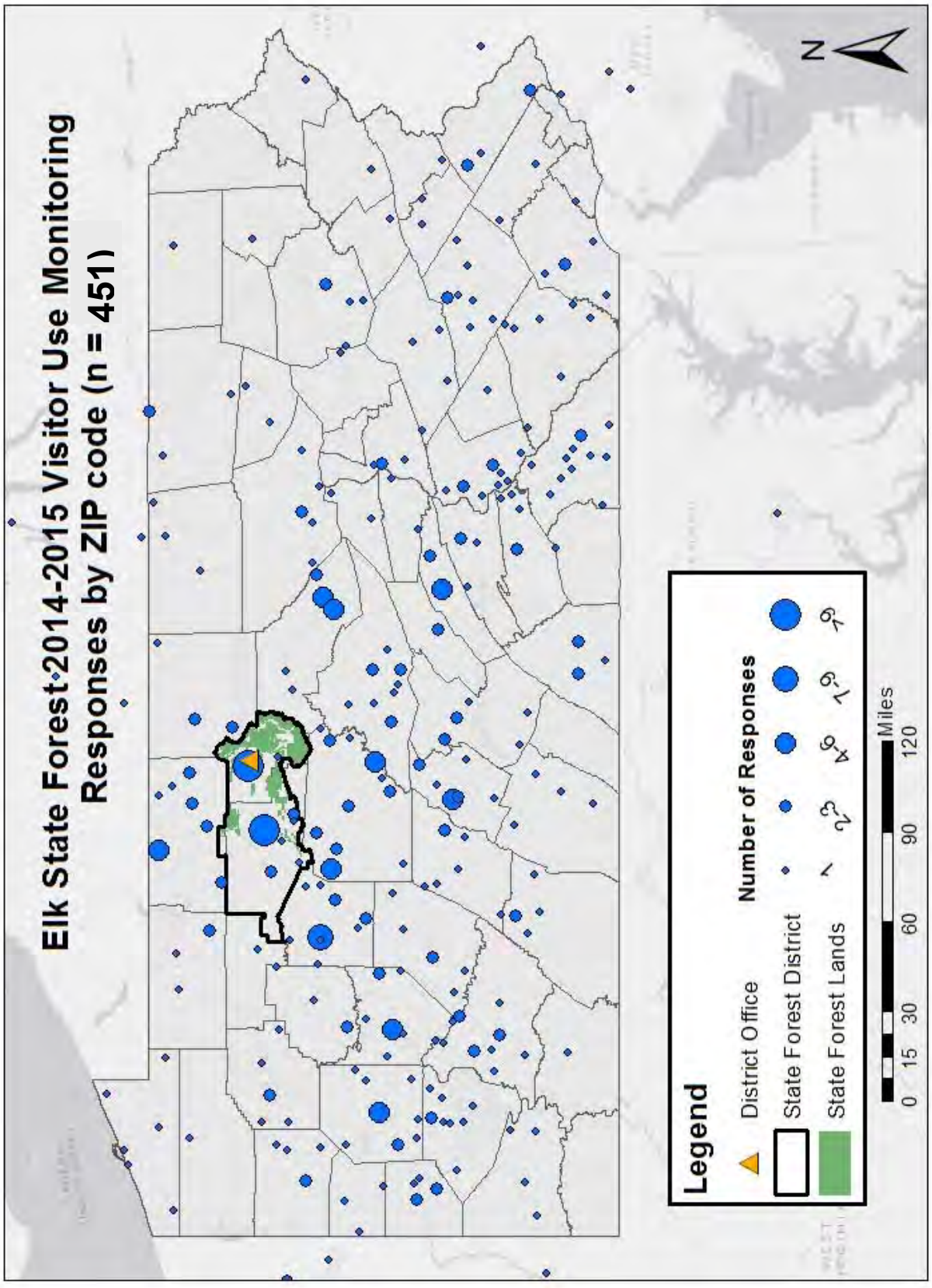

Elk State Forest 2014-2015 Visitor Use Monitoring
Responses by ZIP code (n = 451)
N
Legend
District Office
State Forest District
State Forest Lands
Number of Responses
1
2-3
4-9
10-16
17-26
Miles
0 15 30 60 90 120

Figure 2

Appendix C

Survey Instrument

Moshannon/Elk State Forest:
2014 - 2015 Recreational Use Survey

Interviewer:_____ Site: _____ Date: _____

Time of Interview: _____ Vehicle Axle Count: _____ Clicker Count: _____

Hello, my name is _____, I'm from Penn State and we are doing a survey of State Forest visitors. The information collected will help the DCNR better serve their visitors. Your participation is voluntary and all information is confidential.
May I have a few minutes of your time to complete this survey?
___ Yes (If refusal, thank them for their time.)

Section 1 (Screening Questions)

1. What is the primary purpose of your visit to this site?

- ❑ Recreation—CONTINUE INTERVIEW
- ❑ Working or commuting to work (stop interview)
- ❑ Just stopped to use the bathroom (stop interview)
- ❑ Just passing through, going somewhere else (stop interview)
- ❑ Some other reason (specify)_____

Complete 2 and 2a for DUDS and OUDS ONLY

2. Are you leaving (site name) for the last time today or will you return later?

- ❑ Leaving for last time today
- ❑ Will return later

2a. When did you first arrive at (site name) on this visit?
Month_____ Day_____ Year_____ Time (military)_____

Complete for GFA ONLY

3. Are you leaving the Moshannon/Elk SF for the last time today or will you return later?

- ❑ Leaving for last time today
- ❑ Will return later

Section 2 (Basic Information)

Now I want to ask you some more questions about where you went on your whole visit to the **Moshannon/Elk** SF, which includes the use of this area and other portions of the **Moshannon/Elk** SF.

1. Did you spend last night in the Moshannon/Elk SF?
No Yes
❑ ❑ **If yes, how many nights in a row did you spend in the Moshannon/Elk SF? _____**

2. When did you first arrive at the Moshannon/Elk on this recreation visit?
Month_____ Day_____ Year_____ Time (military)_____
❑ **Same as site arrival time**

3. When do you plan to finish your visit to the Moshannon/Elk SF on this recreation visit?
Month_____ Day_____ Year_____ Time (military)_____
❑ **Same as site arrival time**

4. What other areas did you visit, or do you plan to visit in the Moshannon/Elk SF for recreation on this trip?
(List sites or areas visited)

_____

4a. Lodging facilities include campgrounds, cabins, hotels and lodges. How many different overnight lodging facilities will you use during this State Forest visit? Number_____

4b. How many developed day use sites (like picnic areas or visitor centers), not including trailheads, will you use on this trip to the Moshannon/Elk SF? Number_____

5. In what activities on this list did you participate during this recreation visit at the Moshannon/Elk SF? (Can choose more than one)		**6. Which of those is your primary activity for this recreation visit to the Moshannon/Elk? (Choose only one)**
Question 5 answers		**Question 6 answer**
	Fishing—all types	
	Hunting—all types	
	Viewing & Learning Nature & Culture	
	Viewing natural features such as scenery, wildlife, birds, flowers, fish, etc. (circle one)	
	Visiting historic and prehistoric sites/areas (circle one)	
	Nature study	
	Visiting a nature center, nature trail, or visitor center (circle one)	
	Nonmotorized Activities	
	Hiking or walking	
	Horseback riding	
	Bicycling, including mountain bikes (circle one)	
	Nonmotorized water travel (canoeing, sailing, kayaking, rafting, etc.)	
	Downhill skiing or snowboarding (circle one)	
	Cross-country skiing, snowshoeing (circle one)	
	Other nonmotorized activities (e.g. swimming, games & sports)	
	Motorized Activities	
	Driving for pleasure on roads	
	Riding in designated off-road vehicle areas (non-snow)	
	Snowmobile travel	
	Motorized water travel (boats, etc.)	
	Other motorized activities (endure events, games, etc.)	
	Camping or Other Overnight	
	Camping in developed sites (family or group sites)	
	Primitive camping (motorized)	
	Backpacking or camping in unroaded areas	
	Resorts, cabins, or other accommodations on State managed lands	
	Other Activities	
	Gathering mushrooms, berries, firewood, or other natural products	
	Relaxing, hanging out, escaping heat, noise, etc.	
	Picnicking and family gatherings in developed sites (family or group sites)	
	OTHER (fill in activity) _____	

7. Including this visit, about how many times have you come to the Moshannon/Elk SF for recreation in the past 12 months? Number_____

7a. How many of those visits were to participate in the main activity you identified a moment ago? Number_____

8. Overall, how satisfied or dissatisfied are you with this visit to the Moshannon/Elk State Forest? _____

- ❑ (1) Very dissatisfied
- ❑ (2) Somewhat dissatisfied
- ❑ (3) Neither dissatisfied nor satisfied
- ❑ (4) Somewhat satisfied
- ❑ (5) Very satisfied

9. What is your home ZIP code or Canadian postal code? _____

❑ **Visitor is from a country other than USA or Canada**

10. How many people (including you) traveled here in the same vehicle as you? Number_____

10a. How many of those people are less than 16 years old? Number_____

11. What is your age? Age_____

12. Gender? Male Female

13. Which of the following best describes you?

- ❑ Black/African American
- ❑ Asian
- ❑ White
- ❑ American Indian/Alaskan Native
- ❑ Native Hawaiian or other Pacific Islander
- ❑ Spanish, Hispanic or Latino
- ❑ Other _____

14. Information about income is important because people with different incomes come to the forest for different reasons. Into which income group would you say your household falls?

- ❑ Under $25,000
- ❑ $25,000-$49,999
- ❑ $50,000-$74,999
- ❑ $75,000-$99,999
- ❑ $100,000-$149,999
- ❑ $150,000 or over

___ Don't Know

___ Refused to Answer

Economics Addition

1. If for some reason you had been unable to go to the Moshannon/Elk SF for this visit, what would you have done instead:

- ❑ Gone elsewhere for the same activity
- ❑ Gone elsewhere for a different activity
- ❑ Come back another time
- ❑ Stayed home
- ❑ Gone to work at your regular job
- ❑ None of these: _____

2. About how much time, in total, will you be away from home on this recreation trip?

- ❑ Days _____ or
- ❑ Hours _____

3. On this trip, did you recreate at just the Moshannon/Elk SF, or did you go to other State Forests, parks, or recreation areas?

- ❑ Just the **Moshannon/Elk** SF (skip question 4, go to question 5)
- ❑ Other places (go to question 4)

4. Was the Moshannon/Elk SF your primary destination for this recreation trip?

❑ Yes ❑ No

5. Did you or other members of your party spend any money on this trip within 50 miles of this park?

___ Yes (Go to Question 6) ___ No (Skip to Question 7)

6. For the following categories, please estimate the amount you (and other members of your party) will spend within 50 miles of here on this trip.

Motel, Lodge, Cabin, B&B, etc. $ _____	Restaurants & Bars $ _____	Groceries $ _____	Outfitter Related Expenses (guide fees & equipment rentals) $ _____	Sporting Goods $ _____
Camping $ _____	Local Transportation (bus, shuttles, etc.) $ _____	Gasoline & Oil $ _____	Outdoor Recreation and Entertainment (park fees, movies, mini-golf, etc.) $ _____	Souvenirs, Clothing, Other Misc. $ _____

6a. How many people do these trip expenditures cover? _____ group members

6b. In total, about how much did you and other people in your vehicle spend on this entire trip, from the time you left home until you return home? Dollar Amount_____

7. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

____ No (If no, why not?_____

8. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

____ No (If no, why not?_____

Satisfaction Addition

1. **This section asks you about your satisfaction with the recreation services and quality of the recreation facilities in the Moshannon/Elk SF. Please rate the following attributes of <u>this recreation site or area of the forest</u>. Also rate the importance of this attribute toward the overall quality of your recreation experience here.** Rate importance from 1 (=not important) to 5 (=very important) in terms of how this attribute contributes to your overall recreation experience.

	Poor	Fair	Average	Good	Very Good	N/A	**Importance**				
Scenery	1	2	3	4	5		1	2	3	4	5
Availability of parking	1	2	3	4	5		1	2	3	4	5
Parking lot condition	1	2	3	4	5		1	2	3	4	5
Cleanliness of restrooms	1	2	3	4	5		1	2	3	4	5
Condition of the natural environment	1	2	3	4	5		1	2	3	4	5
Condition of developed recreation facilities	1	2	3	4	5		1	2	3	4	5
Condition of Forest roads	1	2	3	4	5		1	2	3	4	5
Condition of Forest trails	1	2	3	4	5		1	2	3	4	5
Availability of information on recreation	1	2	3	4	5		1	2	3	4	5
Feeling of safety	1	2	3	4	5		1	2	3	4	5
Adequacy of signage	1	2	3	4	5		1	2	3	4	5
Helpfulness of employees	1	2	3	4	5		1	2	3	4	5
Attractiveness of the forest landscape	1	2	3	4	5		1	2	3	4	5

2. If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

_____

3. Please rate your perception about the number of people at this area today. Use a scale of 1 to 10, where 1 means there was hardly anyone else there, and 10 means that you thought the area was very overcrowded?

HARDLY ANYONE								VERY OVERCROWDED	
1	2	3	4	5	6	7	8	9	10

4. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

5. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?_____

_____

State Forest Experience Addition

1. Is this your first visit to the state forest?

❑ Yes ❑ No

[If no] In what year did you make your first visit to the state forest _____ year

In a typical year, how many days do you spend recreating in the state forest? _____ days

In a typical year, how many days do you spend recreating at other forest recreation sites outside of the state forest? _____ days

2. Which of the following best describes the composition of your group? [check only one]

❑ Alone ❑ Family

❑ Friends ❑ Family & friends

❑ Commercial group (group of people who paid a fee to participate in this trip) ❑ Organized group (club or other organization)

❑ Other [please specify]_____

3. Overall, how would you rate the quality of each of the following at the state forest:

	Awful	Fair	Good	Very Good	Excellent	Not applicable
Sanitation and cleanliness	1	2	3	4	5	NA
Safety and security	1	2	3	4	5	NA
Condition of latrines, picnic pavilions & other facilities	1	2	3	4	5	NA
Responsiveness of staff	1	2	3	4	5	NA
Natural environment	1	2	3	4	5	NA

4. Which of the following was the most important reason for this visit to the state forest? [Please check only one]

_____ I came here because I enjoy being in the forest

_____ I came here because it is a good place to spend time with friends/family

_____ I came here because it's a good place to :

_____ Hunt _____ Hike

_____ Bike _____ Horseback ride

_____ Fish

_____ Other reasons for visit (e.g., cabin owner, private inholding):

5. On a scale of 1 to 5, how do you feel about access to the forest: [1 poor, 5 very good]

By roads	1	2	3	4	5
By trails	1	2	3	4	5

6. Does anyone in your household have a disability?

❑ Yes ❑ No

6a. [If yes] Please tell us if you believe our facilities are adequate

7. Here is a list of possible reasons why people recreate at outdoor recreation sites. Please tell me how important each of the following benefits is to you as a reason for visiting a state forest in Pennsylvania. [one is not at all important and five is extremely important] [N/A does not apply to this question. Should be able to answer for each]

REASON	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important
To be outdoors	1	2	3	4	5
For relaxation	1	2	3	4	5
To get away from the regular routine	1	2	3	4	5
For the challenge or sport	1	2	3	4	5
For family recreation	1	2	3	4	5
For physical exercise	1	2	3	4	5
To be with my friends	1	2	3	4	5
To experience natural surroundings	1	2	3	4	5
To develop my skills	1	2	3	4	5

8. If you could ask the state foresters to improve some things about the management of the forest, what would you ask them to do?

_____

9. We are interested in knowing what facilities/services in the state forest are most important to you. Please tell me how important each of the below listed items is to you.

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important	No Opinion
Wildlife viewing areas or opportunities	1	2	3	4	5	x
Picnic areas	1	2	3	4	5	x
Parking	1	2	3	4	5	x
Signs directing me to recreation facilities	1	2	3	4	5	x
ATV Trails	1	2	3	4	5	x
Snowmobile Trails	1	2	3	4	5	x
Hike, bike, & horse (non-motorized)Trails	1	2	3	4	5	x
Printed Interpretive information	1	2	3	4	5	x

10. Please look at this list of statements that address your feelings about the recreation <u>area</u> that you visited on this trip in the state forest. Please indicate your level of agreement with each of the statements listed below.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
This place means a lot to me	1	2	3	4	5
I enjoy recreating at this place more than other places I could visit	1	2	3	4	5
I am very attached to this place	1	2	3	4	5
I get more satisfaction out of visiting this place than from visiting most places	1	2	3	4	5

11. Have you obtained any information about this area during this trip or in preparation for it?

❑ Yes ❑ No

[If yes] Please continue with follow-up questions

11a. What type of information did you obtain?

❑ State forest map ❑ Trail map

❑ PA visitors guide ❑ Other:

11b. When did you receive information?

❑ Before leaving home ❑ After arriving here

11c. Where or from whom did you receive information?

11d. Was the information you received helpful to plan your trip?

❑ Yes ❑ No

[If no] what would have made the information more useful?

12. What services in nearby communities (OFF of the forest) do you wish were available? Please list:

_____

13. This section asks about your satisfaction with your recreation experience at <u>this recreation site</u> or <u>area of the forest.</u> Please rate the following attributes of this recreation site or area of the forest.

	Awful	Fair	Good	Very Good	Excellent	Not applicable
Opportunity to recreate without feeling crowded	1	2	3	4	5	NA
Places to recreate without conflict from other visitors	1	2	3	4	5	NA
Compatibility of recreation activities at the area	1	2	3	4	5	NA
Helpfulness/courteousness of Forest employees	1	2	3	4	5	NA
Helpfulness/courteousness of people in surrounding communities	1	2	3	4	5	NA

14. Was the state forest your primary destination for this recreation trip?

❑ Yes ❑ No

[If no] Please list your primary destination for this recreation trip:_____

15. Has Marcellus shale-related activity changed <u>your recreational use</u> of this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?)_____

_____

16. Has Marcellus shale-related activity changed <u>your recreation experience</u> at this state forest?

____ Yes (If yes, how?)_____

_____

____ No (If no, why not?)_____

_____

Appendix D

List of Survey Sites

State Forest Visitor Use Survey
Sampling Site Inventory: Moshannon State Forest

Site	Site #	Use Level Classification		
		High Use	**Medium Use**	**Low Use**
General Forest Areas				
Black Moshannon State Park Area				
North Run Road	1		Peak fishing, peak hunting, peak holiday	Rest of year
Benner Run Road East	2			All year
Benner Run Road West	3		Peak fishing	Rest of year
Benner Run Parking	4		Peak snowmobile	Rest of year
Myers Run Road	5			All year
Huckleberry Road	6		Peak fishing	Rest of year
Straw Band Beaver Road North	7			All year
Straw Band Beaver Road South	8			All year
Beaver Road Parking Lot	9		Peak snowmobile	Rest of year
Horse Hollow Road	10			All year
Six Mile Run Road North	11		Peak fishing	Rest of year
Six Mile Run Road Mid	12		Peak fishing	Rest of year
Six Mile Run Road South	13		Peak fishing	Rest of year
Hannah Furnace Road North	14			All year
Hannah Furnace Road South	15			All year
Hannah Furnace Parking Lot - Snowmobile	16		Peak snowmobile	Rest of year
Underwood Road N	17			All year
Underwood Road S	18			All year
Western Area – near SB Elliot & Parker Dam				
Dubec-Schofield Road	19			All year
Dubec Road/Old Penfield Pike	20			All year
Dubec Road	21			All year
Jury Mill	22			All year
Greenwood Road Parking lot	23			All year
Greenwood Road North	24			All year
Gordon Road	25			All year
Anderson Creek Road	26			All year
Colby Road	27			All year
Kennedy Road	28	Peak snowmobile, peak holiday, non peak weekends	rest of year	
Firebreak Road	29			All year
Crystal Spring Road	30			All year
Fourmile Road	31	Peak holiday, peak hunting, peak fishing	Non peak weekends, weekdays	Winter days
OS Long Road	32			All year
Harley Deen/Laurel Run	33			All year
McGeorge Road	34	Peak holiday, peak hunting, peak fishing	Non peak weekends, weekdays	
Bark Camp Road	35			Peak Hunting – closed any other

				time
Mud Run Road	36	Peak holiday, peak hunting, peak fishing, Snowmobile	Non peak weekends, weekdays	
Moose Grade Road North	37	Peak hunting		Rest of year
Moose Grade Road South	38	Peak hunting		Rest of year
Tyler Road West	39			All year
Tyler Road East (McGeorge Road)	40		Peak snowmobile	Rest of year
Caledonia Pike North	41			All year
Tank Farm Parking Lot	42		Peak snowmobile	Not used rest of year
Tract West of Penfield				
Mill Run/Mt. Pleasant Road	43		Peak hunting, peak holiday	Rest of year
Mill Run Road North	44		Peak hunting	Rest of year
Nolan Road	45			All year
Bennett Road North	46		Peak hunting, peak holiday	Rest of year
Kersey Road/Boone Mountain Road	47			All year
Eastern Section				
Caledonia Pike South	48		Peak hunting, peak elk/foliage, peak holiday	Rest of year
Billotte Road	49		Peak hunting, peak elk/foliage, peak holiday	Rest of year
Knobs Road	50		Peak hunting, peak elk/foliage, peak holiday	Rest of year
Big Medix Road	51	Peak fishing, peak hunting	Peak holiday	Rest of year
Jack Dent Road	52	Peak elk/Foliage, peak snowmobile	Peak fishing, peak hunting	Rest of year
Ardell Road	53	Peak elk/foliage, peak hunting, peak snowmobile		Rest of year
Red Run Road	54	Peak Fishing		Rest of year
Lost Run Road North	55		Peak fishing, peak elk/foliage, peak hunting	Rest of year
Three Runs Road West	56		Peak elk/foliage, peak hunting	Rest of year
Three Runs Road East	57			All year
Grant Road/Trail	58		Peak hunting	Rest of year
Overnight Use Developed Sites				
Medix Run	59	Peak fishing		Rest of year
Myers Run Road	60	Peak fishing		Rest of year
North Run Road Equestrian Campsite	61	Peak holiday, peak elk/foliage		Rest of year
Yellowsnake Camping Area	62	Peak holiday, peak elk/foliage		Rest of year

Special Areas				
Quehanna Wild Area	63		All year	
Marion Brooks Natural Area	64			All year
Day Use Developed Sites				
Hoover Farm	65	Peak Elk/Foliage		Rest of the year
Beaver Run	66		Peak Elk/Foliage	Rest of year
Shagger's Inn	67	Peak fishing, non peak weekends, peak holiday	Summer weekdays	Rest of year
Brown Springs	68	Peak fishing, non peak weekends, peak holiday	Summer weekdays	Rest of year
Benezette Beach	69	Peak fishing, non peak weekends, peak holiday	Summer weekdays	Rest of year
View Corridors				
Rt. 504 – Rattlesnake Pike	70	Peak holiday, non-peak weekends, special event	Spring through fall Fri-Sun	Rest of year
Beaver Road	71			All year
Cassanova Road	72			All year
Rt. 322	73	All year		
Rt. 153	74	All year		
Rt. 555	75	Peak Elk/Foliage	Rest of year	
Quehanna Hwy.	76	Peak Elk/Foliage, Peak Hunting	Spring through Fall Fri-Sun	Rest of year

Forest Visitor Use Survey
Sampling Site Inventory: Elk State Forest

Site	Site #	Use Level Classification		
		High Use	**Medium Use**	**Low Use**
General Forest Areas				
SW Tract near Kylers Corner				
Kersey Road North/Boone Mountian Road	1			All year
Four Points (goes to Bennett Road)	2			All year
Quehanna Wild Area Tract				
Jerry Run Road North	3	Peak hunting		Rest of year
Three Runs Road West	4	Peak hunting		Rest of year
Three Runs Road East/Dutchmans Road	5	Peak hunting		Rest of year – inaccessible in winter
Lincoln Road/Red Run Road South	6		Peak hunting	Rest of year
Hoover Road	7		Peak hunting	Rest of year
Red Run Road North	8		Peak hunting	Rest of year
Benezette Tract				
Benezette Parking Lot/Trout Run	9		Peak Elk/Hunting season	Rest of year
Dents Run Road Parking Area (Elk Trail)/Dents Run East	10		Peak Elk/Hunting season	Rest of year
Dents Run Road West	11		Peak Elk/Hunting season	Rest of year
Hicks Run Road - East	12		Peak Elk/Hunting season	Rest of year
Hicks Run Road - West	13		Peak Elk/Hunting season	Rest of year
Barr Hollow Road	14		Peak Elk/Hunting season	Rest of year
Mason Hill Parking Area/Fred Woods Trail	15		Peak Elk/Hunting season	Rest of year
Mason Hill Road East	16		Peak Elk/Hunting season	Rest of year
Mason Hill Road West	17		Peak Elk/Hunting season	Rest of year
Eastern Tract				
Montour Road South	18		Peak Elk/Hunting Season	Rest of year
Montour Road North	19		Peak Elk/Hunting season	Rest of year
Sugar Camp Road	20		Peak Elk/Hunting season	Rest of year
Beaverdam Road	21		Peak Elk/Hunting season	Rest of year
Wykoff Run Road	22		Peak Elk/Hunting season	Rest of year
Rock Run Road	23		Peak Elk/Hunting season	Rest of year
Bailey Run Road	24		Peak Elk/Hunting season	Rest of year

Grove Hill Twp Road	25		Peak Elk/Hunting season	Rest of year
Phins Trail Parking Lot	26		Peak Elk/Hunting season	Rest of year
Ridge Trail Parking lot	27		Bear Season/Deer Season first two days (mainly bear)	Rest of year
Brooks Run Road	28		Peak Elk/Hunting season	Rest of year
Big Run Trail parking Lot off 120	29		Peak Elk/Hunting season	Rest of year
Stillhouse Road	30		Peak Elk/Hunting season	Rest of year
Hunts Run/Steam Mill Road	31		Peak Elk/Hunting season	Rest of year
Ridge Road/East Cowley Run Road	32		Peak Elk/Hunting season	Rest of year
East Cowley Run Road (Parking area for Bucktail Path)	33		Peak Elk/Hunting season	Rest of year
Sizerville Nature Trail Parking Lot near 155	34		Peak Elk/Hunting season	Rest of year
Marshall Farm Road/Sand Spring Trail	35		Peak Elk/Hunting season	Rest of year
Crooked Run Road	36		Peak Elk/Hunting season	Rest of year
Portage Road	37		Peak Elk/Hunting season	Rest of year
Sizer Run Road	38		Peak Elk/Hunting season	Rest of year
Four Mile Trail West/Waldy Run Road	39		Peak Elk/Hunting season	Rest of year
Elk State Park Tract				
East Branch Grade/Buck Run	40		Peak Elk/Hunting season	Rest of year
Briggs Hollow	41		Deer Hunting	Rest of Year
Boundary/Butcher/Buck Run	42		Deer Hunting	Rest of Year
South Fork Branch Road	43		Deer Hunting	Rest of year
Old Shawmut Grade Road North	44		Peak Elk/Hunting season	Rest of year
Straight Creek Road/Rich Valley Road	45		Peak Elk/Hunting Hunting season	Rest of year
Overnight Use Developed Sites				
Gas Well Equine Camping Area (5 sites)	51	Fall weekends/weekdays Peak elk/foliage	Spring weekends	Summer weekends due to heat, all other weekdays
Dark Hollow Equine Camping Area (10 sites)	52	Fall weekends/weekdays Peak elk/foliage	Spring weekends	Summer weekends due to heat, all other weekdays
Hicks Run Camping Area (15 sites, 11 RVs, 4 tents)	53	Fall week/week days, Peak elk/foliage, Spring	Weekends rest of year, (weekdays April through	

		(peak fishing) (April through October)	October)	
Special Areas				
Quehanna Wild Area	61			All year
MK Goddard/Wykoff Run Natural Area	62			All year
Lower Jerry Run Natural Area	63			All year
Bucktail State Park Natural Area	64			All year
Johnson Run Natural Area	65			All year
Squaretimber Natural Area	66			All year
Pine Tree Trail Natural Area	67			All year
Day Use Developed Sites				
Elk Country Visitor Center	71	Peak Elk/Foliage Sept/Oct, Friday through Sundays (generally evenings 3pm to dark)	Summer weekends, peak hunting	Everything else
Hicks Run Wildlife Viewing Area	72	Peak Elk/Foliage Sept/Oct, Friday through Sundays (generally evenings 3pm to dark)	Weekdays during peak elk/foliage	Everything else
View Corridors				
Rt. 555	81	Peak Elk/Foliage	Rest of year	
Rt. 872	82	Peak Hunting, Spring through Fall weekends	Rest of year	
Rt. 120	83	High all year		
Rt. 46	84	All year		
Rt. 155	85	All year		
Quehanna Hwy.	86	Peak Hunting, Elk/Foliage	Spring through Fall Friday-Sun	Rest of year

APPENDIX H
State Forest Oil and Gas Guidelines

GUIDELINES FOR ADMINISTERING OIL AND GAS ACTIVITY ON STATE FOREST LANDS

Commonwealth of Pennsylvania

Department of Conservation and Natural Resources

Bureau of Forestry

4th Edition

Revised 2016

The objective of this document is to establish and communicate a set of "guidelines" and Best Management Practices (BMPs) that provide consistent, reasonable and appropriate direction for managing oil and gas activity on State Forest lands in accordance with the Bureau's mission.

Table of Contents

1. Purpose 3
2. Key Principles 5
3. Bureau of Forestry Gas Management Team 8
4. Recreation and Public Safety 10
5. Ecosystem Management and Resource Sustainability 17
A. Seismic Surveys 22
B. Well Pad Sites 26
C. Freshwater Acquisition 31
D. Wastewater Treatment, Storage, Transportation, and Disposal 34
E. Roads 37
F. Pipelines 48
G. Compressor Stations 54
H. Native Planting and Seeding 57
I. Non-Native Invasive Plants 59
J. Site Rehabilitation 61
6. The Review and Approval Process 66
7. Gas Program Waiver Requests 68
8. Routine Field Inspections 70
9. Documentation and Right-To-Know Law 73
10. Medical Emergencies and Pollution Events 75
Appendix 83
Appendix A: Criteria for Wastewater Treatment Storage System Proposals 83
Appendix B: Planting and Seeding 86
Appendix C: Invasive Plant Management 102
Appendix D: Site Rehabilitation 116
Appendix E: Emergency Contact Information 147
Appendix F: Glossary 148

1. Purpose

The Department of Conservation and Natural Resources (DCNR), Bureau of Forestry (BOF or Bureau) manages Pennsylvania's 2.2 million-acre state forest system for a variety of resources, uses and values including scenic beauty, recreational opportunities, timber, plant and animal habitats and minerals.

The Bureau of Forestry's mission statement clearly identifies the ***environmentally sound utilization of mineral resources***, which includes oil and gas, as a key component of state forest management. Oil and gas management decisions must be based on the *mission* and work toward ensuring the long-term health, viability, and productivity of the Commonwealth's forests and to conserve native wild plants.

Mission

The mission of the Bureau of Forestry is to ensure the long-term health, viability and productivity of the Commonwealth's forests and to conserve native wild plants.

The Bureau of Forestry will accomplish this mission by:

Managing state forests under sound ecosystem management, to retain their wild character and maintain biological diversity while providing pure water, opportunities for low-density recreation, habitats for forest plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources.

Decisions, both policy and on-the-ground, are guided by many sources of information including: laws and regulations; public input; the *State Forest Resource Management Plan* (SFRMP); gas leases and contracts; and guidelines and procedures. Examples of legislation or regulations that influence decisions include:

- *Act 18 (Conservation and Natural Resources Act)*: This Act created the Department of Conservation and Natural Resources in 1995 and authorizes the department to arrange and execute contracts or leases in the name of the Commonwealth for the mining or removal of any valuable minerals that may be found in state forests.
- *State Forest Rules and Regulations*: Lawful rules and regulations provided under Act 18 for "land which is owned or leased by the Commonwealth and which is administered by the Bureau of Forestry."
- *Applicable Department of Environmental Protection statutes and regulations*, including but not limited to: Chapter 78 (Oil and Gas Wells), Chapter 102 (Erosion and Sedimentation Control), Chapter 105 (Dam Safety and Waterway Management)

The Commonwealth owns the subsurface rights for most of the 2.2 million acres within the state forest system; but approximately 15% of these rights are privately owned. These "severed" lands present a unique challenge to land managers as management of the surface lands may, at any point in time, be affected by the rights of the subsurface owner to reasonably develop their property.

The Bureau authorizes the development of oil and gas resources and/or storage of natural gas on state forest land through lease agreements. The contracts contain strong environmental provisions meant to protect the Commonwealth's interests while ensuring the conservation and management of other state forest resources, uses, and values. The primary focus of Commonwealth lessees is the production of methane or natural gas; however the formations being developed are also capable of producing natural gas liquids (i.e. propane, butane etc.) and oil depending on the extent of thermal maturation of the subsurface geology. The production of natural gas liquids is common in southwest Pennsylvania while the majority of oil production has occurred in the northwest portion of the state.

The purpose of this document is to establish and communicate a set of "guidelines" and Best Management Practices (BMPs) to Bureau staff, oil and gas operators and the public. The administration of oil and gas development is complicated by a myriad of existing ownership rights, the quantity and various vintages of existing lease agreements, the number of private operators involved and rapid advancements in oil and gas technologies. This document provides consistent, reasonable and appropriate direction for managing oil and gas activity on state forest lands in accordance with the Bureau's mission.

2. Key Principles

According to the Bureau of Forestry's *State Forest Resource Management Plan*, "Subsurface geologic resources and unique geologic features on state forest land are managed to provide long-term benefit to the citizens of the commonwealth while adhering to the principles of ecosystem management." When administering the activity, whether through the *Lease* or other agreement with a private owner, several key principles should guide management decisions:

Management of Privately Held Subsurface Rights:

The Bureau of Forestry will promote forest sustainability by managing the social and ecological impacts of oil and gas development according to lease agreements and rights afforded to private owners of subsurface oil and gas interests.

In situations where subsurface rights are owned by private interests, the Bureau of Forestry will strive to apply the principles and guidelines contained in this document by: 1) fostering a close working relationship with the private owners and operators; and 2) educating them about sound ecosystem management principles.

It is paramount that Bureau staff recognize and understand the rights of private subsurface owners while considering the *mission statement* of the Bureau of Forestry. Staff should strive to make decisions which are reasonable and in the best interest of the resource and the citizens of the Commonwealth.

The Bureau will make a reasonable attempt to secure a *Surface Use Agreement* with private subsurface interests to better manage the use of the surface during development activity so that the management goals of the Bureau may be achieved as often as possible.

Key Principles

- The Bureau of Forestry is responsible for managing and conserving the resources, uses and values of state forest lands. Multiple activities occurring in close proximity to one another may present conflicts. The Bureau strives to balance potential conflicts to ensure the long-term viability of those resources for the Commonwealth.

- The safety of workers and the general public is a very important consideration of management decisions.

- The *Lease* is a binding contract and the Bureau of Forestry is obligated to enforce the *Lease* provisions on behalf of the Commonwealth. Bureau of Forestry staff should have a detailed understanding of the applicable leases in order to successfully manage oil and gas activities on state forest lands in accordance with the Bureau's mission. Historic leases are referred to as "legacy leases."

- These guidelines provide standards and direction to aid Bureau staff in the management of oil and gas activities on state forest lands. Staff should consider the existing and future resources, uses, and values in play; recognize the associated balances and trade-offs; and exercise professional judgement to make decisions which are consistent with the Bureau's mission and protect the Commonwealth's interests now and in the future.

- The Pennsylvania Department of Environmental Resources (DEP) has jurisdictional and regulatory authority for oil and gas activities within the Commonwealth including the enforcement of Oil and Gas Wells (Chapters 78), Erosion and Sedimentation Control (Chapter 102) and Dam Safety and Waterway Management (Chapter 105).

- Bureau staff, operators, jurisdictional authorities and regulators should communicate and work cooperatively to establish constructive relationships that provide consistent, reasonable and environmentally- sound development of oil and gas resources.

- Planning is an important component of state forest management. The Bureau and operators should work together to review and discuss work plans relating to oil and gas development, production, and transmission prior to the initiation of the activity (for leased and private ownership). Planning is a mutually-beneficial tool that promotes efficiency and cost effectiveness while minimizing adverse impacts to state forest resources, uses and values.

- Bureau of Forestry staff will utilize adaptive resource management to monitor oil and gas activities on state forest lands. This approach includes the documentation of impacts – both beneficial and adverse. The knowledge and experience gained from these efforts will promote continued understanding and improvement of the guidelines, best management practices and the Bureau's ability to manage oil and gas activity. Staff should inspect and monitor active operations on a weekly basis. More frequent inspections should occur as activity and weather conditions dictate. Site inspections are considered a very high priority for all oil and gas management personnel.

- The siting of roads, pipelines, impoundments, compressor stations, well pads and associated oil and gas infrastructure should consider existing disturbances such as road networks, rights-of-way corridors or abandoned mine lands in order to minimize forest conversion and impacts to state forest lands. But it is equally important to consider aesthetics, recreational experiences, and the wild character of the forests when making these decisions.

Figure 1-1. View of the Pine Creek Valley- This valley is renowned for its recreational opportunities and experiences. Early planning efforts recognized this exceptional resource and restricted oil and gas activities within the valley.

3. Bureau of Forestry Gas Management Team

The Bureau of Forestry Gas Management Team (GMT) facilitates the management of gas exploration, development, production and transportation across State Forest lands. This team includes the majority of state forest districts and central office program staff. The management of the gas program includes all oil, gas and mineral (OGM) activity on state forest land. This includes leases issued by the Commonwealth, private ownership subject to a surface use agreement, and severed rights.

The team will be responsible for all day-to-day management of the gas program including:

- liaison to the operator's field staff and operations staff
- seismic surveys
- oil and gas infrastructure planning and siting
- freshwater acquisition and transportation
- wastewater treatment, storage, transportation and disposal
- invasive plant monitoring and management
- site reclamation and restoration
- monitoring of oil and gas activities
- community contact
- other tasks that accompany oil and gas management

GMT meetings will occur regularly and include training in oil and gas issues, problem solving, sharing lessons learned, and discussing issues regarding the activities in the various districts. The Minerals Division will be the lead in planning and facilitating these meetings.

The following sections and divisions within the Department are assigned positions within the GMT and have duties that directly relate to the management of oil and gas activity on state forest land:

Headquarters:
Includes the following offices, divisions, and sections which can be reached at: *(717)-787-2703*

Deputy Secretary's Office
Bureau of State Parks
Director's Office
Division of Resource Planning & Information
Division of Operations and Recreation
Division of Forest Fire Protection
Division of Conservation Science & Ecological Resources
Rural & Community Forestry Section
Communications Section
Silviculture Section
Minerals Division

State Forest Districts

D2 - Buchanan State Forest:
(717) 485-3148

D4 - Forbes State Forest:
(724) 238-1200

D6 - Gallitzin State Forest:
(814) 472-1862

D8 – Clear Creek State Forest:
(814) 226-1901

D9 - Moshannon State Forest**:**
(814) 765-0821

D10 - Sproul State Forest:
(570) 923-6011

D11 – Gifford Pinchot State Forest:
(570) 945-7133

D12 – Tiadaghton State Forest:
(570) 753-5409

D13 - Elk State Forest:
(814) 486-3353

D14 – Cornplanter State Forest**:**
(814) 723-0262

D15 - Susquehannock State Forest:
(814) 274-3600

D16 - Tioga State Forest:
(570) 724-2868

D19 – Delaware State Forest:
(570) 895-4000

D20 - Loyalsock State Forest:
(570) 946-4049

Additional contact information is available upon request. Please contact a state forest district or the central office.

4. Recreation and Public Safety

Figure 4-1. Public recreation, such as primitive backpacking, is a primary use of state forest lands.

Public lands comprise 30% of the 17 million acres of forestland in Pennsylvania. State forest land alone encompasses nearly 2.2 million acres. The Commonwealth's citizens have a rich and long-standing outdoor heritage which is intrinsic to these public lands.

State forests provide unique opportunities for outdoor recreation due to their large, contiguous land area. Generations of Pennsylvanians have been drawn to the wild, undeveloped character of the state forests and millions more are attracted annually. Public recreation is one of the primary uses of the state forest system and it continues to grow. The Bureau encourages low-density dispersed recreation and strives to promote and enhance these types of activities. State forest visitors should be assured of a high quality outdoor experience. Recreational opportunities on state forest lands are focused on compatibility with the forest ecosystem or forms of recreation not represented by other land uses.

Today there are many state forest users whose activities and views sometimes conflict. Some visitors prefer more traditional forms of recreation, such as scenic driving sight-seeing, hiking, hunting, fishing, horse-back riding, and cross-country skiing; while others utilize the same area for less traditional recreational activities, such as riding ATVs, snowmobiles, mountain bikes, hang gliders, and dog sleds. The Bureau of Forestry will follow ecosystem and multiple-resource management practices for all gas-related activities to minimize conflicts and adverse impacts to these diverse recreation activities.

Oil and gas development is a highly industrialized activity which starkly contrasts with the expectations and experiences of state forest users. Gas development activities dramatically increase the potential for adverse impacts and conflict through: increased traffic volumes; elevated noise levels; and adverse aesthetic impacts. These potential impacts are dependent upon a visitor's location, activity and anticipated recreational experience within the state forest.

New leases and rights-of-way will be prohibited on designated state forest wild and natural areas. Rights-of-Way expansions will be considered on an individual basis and only when the activity will not harm the feature for which the area was designated and is justified as the alternative that will result in the least overall ecological damage to state forest lands. The Bureau has designated 60 state forest natural areas and 18 state forest wild areas which account for 11% of state forest lands. Other areas excluded from surface activity include State Parks where the Commonwealth owns the subsurface rights.

State forests provide unique opportunities for dispersed, low-density outdoor recreation that can be obtained only through large blocks of forest. Natural gas activities are incompatible with the user's anticipated recreational experiences within primitive and semi-primitive non-motorized zones as identified through the Recreation Opportunity Spectrum (ROS) inventory and planning tool. Planning efforts should strive to maintain the integrity and extent of existing primitive and semi-primitive non-motorized zones.

Recent lease offerings delineated areas within the tract that restrict gas development activity. Designated *Non-Development Areas* preclude surface disturbance or development of any nature. *Areas of Special Consideration* require additional coordination and pre-planning of all exploration and development activities with the Forest District Manager to prevent unnecessary impacts to a specific use or resource. Aesthetic values, recreational uses and amenities, and primitive and semi-primitive non-motorized ROS zones were among the resources, uses and values considered when these areas were delineated.

Aesthetic buffers are established to avoid or minimize potential impacts to recreational resources, uses or values, and all waivers will be considered on a case-by-case basis. In some instances, placing infrastructure in buffer zones along roads results in less surface disturbance and overall reduced environmental impact. Operators are expected to fully consider aesthetic and wild character impacts in their waiver proposals. (See Setbacks)

Organized Tours of State Forest Lands

Shale gas drilling activity has generated significant interest from a variety of stakeholders, organizations, educational institutions, government agencies and other groups for organized tours of state forest lands. These tours, conducted by both the Bureau and the operators, offer valuable opportunities to demonstrate how natural gas activity is conducted and managed on public lands. State Forest Rules and Regulations regarding group activities apply. It is the Bureau's policy to take a coordinated approach with public outreach tours and prior permission is required. The Bureau will contact operators for tours on their leases and it is expected that the operators will contact the Bureau for tours they plan to conduct. All tour participants shall be provided with and required to wear personal protective equipment including hard hats, protective eye wear and appropriate footwear. Fire retardant (FR) outerwear must be worn on all well pads where live gas is present. The Communications Section will be the primary contact.

Public Safety

The intensity and industrial nature of gas development has created new challenges regarding public access and safety. Historically, there were very few areas within the forest where public access was restricted. Shale gas development is a new and unique activity on state forest land which tends to increase the curiosity of some visitors. Active gas development areas (i.e., well pads, impoundments, wastewater treatment sites and critical infrastructure) can be hazardous and are unsuitable for public access. The safety of the public and gas operators is paramount. As such, public access may be restricted in areas by posting signage, gating and/or fencing to provide for public safety and protection. The posting of a restricted area should be approved by the Forest District Manager. The public should respect restricted areas and abide by the posted conditions.

The use of explosives to assist in the excavation of bedrock is sometimes necessary during construction activities. The PA DEP is responsible for regulating the storage, handling and use of explosives in the commonwealth. Blasting conducted within Pennsylvania regulatory limits will not damage state forest land. Public access may be temporarily limited during these activities. The use of explosives for any construction activities should be discussed with the Forest

District Manager during the planning and approval process. District personnel should be provided notice two weeks in advance of planned blasting activities in an effort to avoid impacts to planned stakeholder activities.

Access Roads

Roads constructed by the operator for accessing well pad sites are considered administrative roads and they may be used for official company business only. Although public vehicular access is restricted, non-vehicular public access is permitted so long as the road is not coincident to a restricted area. Gas operators or subcontractors which are not engaged in official company business will be considered members of the general public. Individuals violating restricted access areas may be cited as set forth in the State Forest Rules and Regulations.

Speed Limits

Posted speed limits should always be observed. The speed limit for un-posted state forest roads is 25 miles per hour. Posting more restrictive speed limits on public use roads must be approved by and coordinated through the Forest District Manager. Speeding is unsafe, potentially deadly, and displays negligence and disregard towards others that rely on these same roads as a means to access state forests.

Fencing

Fencing may be warranted for facilities associated with natural gas production due to security regulations or public safety concerns. Operators should consider potential aesthetic impacts to state forest land and minimize the use of fencing to the greatest extent possible. Fencing options should be consistent with the level of security required. Operators should proactively discuss fencing requirements and options with the Forest District Manager prior to installation. For example, Forest District Managers may prefer the use of woven wire over chain link in certain situations. Vegetative screening may be required in areas where aesthetics are a primary consideration. Proper signage should also be considered as a potential alternative to fencing.

Note:

All state forest land is open to the public except for active restricted areas; therefore, checkpoints should foster an environment focused on safety rather than security. Safety personnel or other employees that may interact with members of the public should be courteous and cordial.

Figure 4-2. Example of a typical safety checkpoint station.

Safety Check Points The safety and security of onsite gas operations and infrastructure are the responsibility of the operator. Numerous companies utilize private security firms to oversee active operations within areas typically posted as "restricted". Safety personnel are typically posted 24 hours a day at safety check points (i.e., guard shacks, gates) to the entrances of active drilling operations. The installation of safety check points requires written authorization from the Forest District Manager and operators are strongly encouraged to consult with this individual regarding suitable siting locations. The Bureau prefers that these check points are placed as close to well pads as possible. The use of security

cameras by operators is permissible. Cameras should only be placed to monitor infrastructure within areas posted and restricted from public access. Electronic traffic control equipment may be used at the discretion of the Forest District Manager. Operators must provide written notice at least two weeks prior to its intended use.

Signage

Signage is necessary to inform the public, provide direction and maintain public safety. State forest signage should be minimized, well planned, consistent and discreet in order to blend with the landscape and perpetuate expectations of wild character. To aid in this endeavour, the Bureau developed an internal document to guide and standardize the use of signage. Most of the signage used in state forests are created by hand. The primary sign shop is located at Penn Nursery and several satellite shops are embedded within the districts. Several new signs have been developed to facilitate state forest administration where gas development is occurring. These signs are available through the sign shop. Only Bureau approved signage should be utilized on state forest lands.

Reporting Law Enforcement Incidents

Bureau of Forestry law enforcement personnel have the authority to conduct criminal investigations on state forest lands. It is imperative that the Forest District Manager is apprised of any incidents in a timely manner. Safety personnel should focus on the safety and security of lease operations and associated equipment.

Gas operators, safety personnel or other employees may:

- Request identification from any individual wanting access to a restricted area
- Request that an individual without proper authorization exit a restricted area
- Provide a description of the individual and/or vehicle to the appropriate Forest District Manager who will assign a DCNR Ranger to pursue an investigation as necessary

Note:

Actions which exceed an Individuals authority could result in criminal or civil charges being filed against the employee, contractor and/or the gas company.

Gas operators, safety personnel or other employees should not:

- Enforce laws and/or state forest regulations on state forest lands
- Investigate unlawful activities on state forest lands
- Perform patrols or traffic stops
- Approach a member of the public or the Bureau without proper cause
- Hold anyone against his/her will
- Block the exit of anyone that decides to comply with the request to leave
- Acquire or attempt to acquire identification information through vehicle registrations or permits or leases administered by the Bureau (i.e. camp lease, fuelwood, etc.)

Safety Zones and Wildlife

Hunting is permitted on state forest land surrounding active drilling sites, however; hunters must observe Pennsylvania Game Commission safety zone regulations which prohibit hunting within 150 yards of an occupied residence, camp, industrial or commercial building. Operators or associated personnel should secure their food and garbage such that it does not attract animals to their site.

Figure 4-3. Hunting is an important recreational use of state forest lands.

The following should be considered with respect to recreation and public safety:

A. The safety of the public and gas operators is paramount. Temporary closures of roads or trails should be considered where conflict is inevitable and no reasonable compromise exists.

B. Public access to dangerous surface structures or equipment (primarily during active drilling and completion operations) should be restricted. Operators are responsible for onsite security. Posting, gating, and/or fencing to provide for public safety and protection should be coordinated and approved by the Forest District Manager. The operator should post a copy of State Forest Rules and Regulations at the entrance to operations (i.e. well pad).

C. Consider the full extent of recreational activities and the seasons in which they occur when planning natural gas exploration or development.

D. Avoid areas of concentrated recreational activity and developed recreational sites when locating natural gas related infrastructure

E. Preserve the integrity and current extent of semi-primitive non-motorized and primitive ROS zones

F. Coordinate the timing of oil and gas activities with the operator to avoid public conflict and to minimize potential damage to state forest roads. Forest District Managers should consider suspending activities requiring heavy trucking during:
   - Periods of heavy public use
   - Weather conditions that make the roads impassable
   - Traditionally wet periods when road damage is most probable
   - Spring frost breakup

   Trucking should be closely monitored during high-use and wet periods if it is not possible to suspend activities.

G. Protect the integrity and connectivity of existing trail systems. Provide temporary trail re-routes when gas activity adversely impacts the recreational experience or substantial conflict exists. Original trail segments

can be re-opened once the conflict no longer exists. Necessary new connector segments will be planned, permitted and constructed at the operator's expense under the direction of the Forest District Manager.

H. Co-locate recreational trails within rights-of-way corridors only where appropriate. Gas operators are encouraged to utilize existing disturbances, such as road networks, when siting infrastructure, however some activities may not be suitable within newly widened corridors.

I. Maintain or improve aesthetics and recreational use of trails when gas infrastructure parallels or intersects a trail corridor. Stage materials and equipment out of sight from the trail. Consider alternative construction techniques that maintain aesthetic character when intersecting a trail. Minimize the removal of vegetation and replant as appropriate. Utilize trail assurance markings per established guidelines.

J. For reasons of safety, the Forest District Manager should temporarily remove joint-use roads used by the operator from the snowmobile trail system during periods of heavy use. If the roads are not removed from the joint-use system, plowing will be prohibited unless the operator has the specific written permission from the Forest District Manager. Relocating snowmobile trail segments onto rights-of-way corridors allows both activities to occur with minimal impact to the other user.

K. In situations where state forest resources or public-use facilities are impacted; gas operators will provide necessary security, safety, and signage measures (as approved by the Bureau) during operations at no cost to the Bureau. The gas operator must notify the Bureau in writing when work is expected to begin in the area and the anticipated operational period. The operator will provide notices of temporary closures to the Bureau who will notify the umbrella user groups, other impacted lessees, rights-of-way interests and local media.

L. Security cameras should only be placed to monitor infrastructure within areas posted and restricted from public access.

M. Permanent exterior lighting should not be used on operator infrastructure. When exterior lights are needed, use downward-directed fixtures, advanced lighting technologies, and on/off switches or motion detectors that activate light only when needed.

N. Oil and gas operators should provide a minimum of 10 days' notice to the Forest District Manager when flaring activities are anticipated. This is exceptionally important in proximity to designated dark sky areas around Cherry Springs State Park. The Forest District Manager should encourage the operator to modify the flaring activity when it directly conflicts with special events planned on the state forest or state park lands or periods of high fire danger. Whenever feasible, the operator should secure functional pipeline rights-of-ways prior to gas production so that unnecessary flaring is avoided.

O. During the following holidays and high visitor use periods there should be no heavy hauling (i.e., rig moves, water trucking, sand trucking, etc.) blasting or seismic activity or seismic activity, to protect public safety and prevent large scale recreational impacts. The district should provide gas operators with a list of high conflict dates on an annual basis to aid in the planning and scheduling of activities.

Holidays:

- Memorial Day weekend
- Fourth of July holiday or weekend
- Labor Day weekend

Hunting & Fishing Seasons:

- Opening weekend of trout season
- Opening weekend of youth spring gobbler season
- Opening weekend of spring gobbler season
- Opening weekend of the early muzzleloader
- Regular bear season
- A portion of regular firearms deer season

> *Note:*
>
> *The Bureau will consider minor truck traffic on state forest roads between the hours of 2200 and 0400 hours, only for daily or essential needs (e.g., cuttings removal, drinking water delivery, sanitation, cement) during periods of heavy hauling restrictions.*

Other Activities: The Forest District Manager may determine that restrictions on hauling and seismic restrictions are necessary to protect public safety during the following activities:

- Special activities and events on state forest land or adjacent state park
- Morning hours of spring turkey
- Opening day of deer archery season
- Opening day of youth/special use hunting
- Opening day of general small game

P. Operators must abide by the *State Forest Rules and Regulations.*

5. Ecosystem Management and Resource Sustainability

The Bureau of Forestry holds itself to a high standard of land management excellence and balances ecological, social and economic considerations on state forest lands. This often complex practice is referred to as ecosystem management. Ecosystem management is a key principle of the Bureau of Forestry's mission which ensures that forests retain their wild character and maintain biological diversity while providing pure water, opportunities for low density recreation, habitats for forest plants and animals, sustainable yields of quality timber and environmentally sound utilization of mineral resources.

Responsible oil and gas development assumes a shared responsibility to ensure that state forest resources and ecosystems are sustained. This chapter outlines several practices and methods the Bureau employs to balance our resources and energy extraction. There is no "one size fits all" approach, but rather the Bureau works case-by-case with operators and consultants to determine the best possible course of action to address all concerns. The Bureau recognizes the variability of subsurface ownership but applies the same review process and considerations for each one, providing consistency. The application of management is often unique and depends on specific resources and values involved.

Practices

On state forest lands, oil and gas exploration and development is conducted in a manner that minimizes impacts to water, soil, flora, and fauna resources while being compatible with other uses of state forest land such as timber management, watershed protection and recreational activities. As with other development on state forest lands, the Bureau uses the general approach of avoidance, minimization, mitigation, and monitoring to manage any undesirable effects of natural gas development.

Strategies provided in this section should be considered when negotiating gas activities on state forest lands. Where sensitive areas or existing infrastructure are found (including wetlands, habitat, or other district-identified important areas such as deer fences), avoidance will always be the first option to be considered. However, the Bureau understands that avoidance will not always be possible or the best option. When all avoidance options have been evaluated and rejected, the Bureau and operators will work together to identify minimization techniques. In cases where avoidance and minimization still do not eliminate all impacts to resources or values, the Bureau and operators will work to identify ways to mitigate these impacts. These efforts will be monitored by Bureau staff to further inform and refine our management practices, and it is suggested that companies monitor the effectiveness of these practices as well. In certain specific situations the operator may be required to monitor, such as for the presence of invasive plants.

In order to effectively conduct ecosystem management for responsible oil and gas extraction, the Bureau prefers to evaluate plans at a landscape-level scale to better understand cumulative impacts. This entails review of an entire tract-level development plan. Oil and gas ownership boundaries on state forest lands are divided into tracts, and ownership of each tract is taken into consideration. By managing at a tract-level, the Bureau and operators will focus on landscape-level planning rather than a piecemeal approach, such as a well-pad-by-well-pad basis. Through early planning, the Bureau obtains a landscape-level perspective, facilitating the placement and location of infrastructure that avoids sensitive areas. Comprehensive site plans may be dynamic, but they afford the opportunity to consider potential impacts from a landscape perspective.

The following materials can aid the Bureau of Forestry when reviewing landscape-level plans:

- Original conceptual development plans (includes pads, roads, pipelines, compression needs, laterals, and pad infrastructure and placement when possible)
- Water sourcing, storage, handling and disposal plan
- Erosion and sedimentation plans for all facilities as they become available
- Completed ecological surveys
- Permit applications
- Geological or seismic data

A. Avoidance

Operators are expected to utilize early planning to avoid impacting important resources on state forest lands. Below are some commonly used strategies that may help avoid impacts to surface resources.

Note:

Requests to encroach upon the identified setbacks may be considered on a case-by-case basis. The Bureau considers granting waivers when the waiver provides greater protection for environmental or social values and is determined to be in the best interest of the Commonwealth. Waiver applications for these instances must be submitted in writing and will require State Forester (or their designee) approval. Please see the Gas Program Waiver Requests section for more information.

Existing Disturbed Areas:

Operators and the Bureau may consider maximizing the use of existing disturbed areas, such as road networks or rights-of-way corridors, for the placement of oil and gas development and associated infrastructure in order to minimize disturbance on state forest lands. For example, in cases where public safety, recreation, aesthetics, and ecological resources are not affected, pipelines may be considered for placement along or within existing roads or right-of-way corridors, thereby minimizing additional land conversion. By working with the Bureau, operators will be able to identify suitable sites of existing areas of disturbance for development.

Non-Development Sites or Exclusion Areas:

The Bureau can provide maps to the operator that delineate known areas of ecological, forest management, recreational importance or other sensitive or important areas on leased or severed rights tracts. These maps of non-development sites, or exclusion areas, can provide a starting point for the known important resources in an area. As further review of the information and site takes place, additional surveys may be requested and other important areas may be identified. It is expected that surface disturbances will be prohibited or strictly limited in these areas. Surface disturbances associated with oil and gas development will be prohibited within all state forest wild and natural areas and state parks where fee-simple mineral rights exist. Waivers will not be considered for such instances.

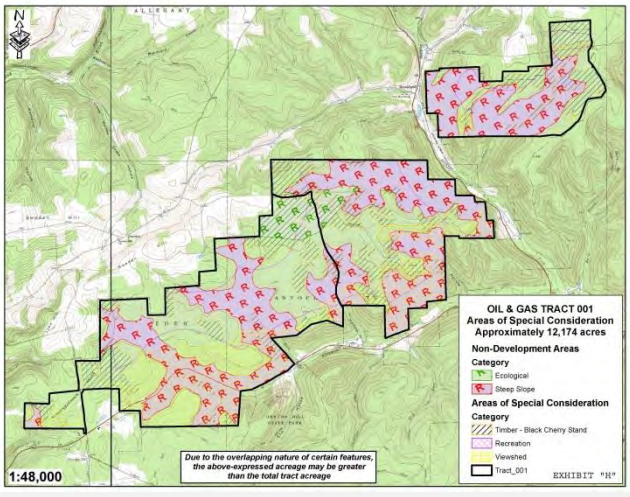


Figure 5-1. Lease tract map illustrating non-development areas and areas of special consideration.

B. Minimization

When it is not possible to avoid impacts to sensitive or important resources, activity on state forest lands goes through a review process to identify and minimize impacts. Bureau of Forestry staff will work to minimize potential adverse impacts to resources and values by applying appropriate setbacks or incorporating techniques such as timing restrictions or reducing ROW widths. The Bureau reviews oil and gas development in a consistent manner, while recognizing ownerships and lease requirements. The Bureau's goal for the ecosystem management process is that each tract will be managed in the most appropriate manner, utilizing the best techniques. Bureau staff and operators should work together to incorporate new guidance into legacy lease requirements whenever possible.

Setbacks:

In order to protect unique resources, important features and experiences, the Bureau of Forestry has developed a list of standardized setbacks for use when siting activities on state forest, including oil and gas development. The different ownerships of state forest land tracts (leased and severed lands) have different contractual agreements and provisions, including setbacks, which direct development. Standardized setbacks provide consistency across the different varieties of mineral tract ownership on state forest lands, and in cases where contractual agreements or provisions differ from setbacks listed below, the Bureau will work with the operator to determine the most appropriate course of action.

Note:

It is important to begin thinking about long-term restoration goals early in the planning process. Often, these goals aid or influence decisions regarding the placement of natural gas related infrastructure upon the landscape. Additional guidance is provided under Site Rehabilitation.

These setbacks represent the minimum distance from land disturbance that the Bureau has deemed is appropriate for each feature or situation. The Bureau and operators should weigh all resources and values involved in a situation and make decisions based on the best available information.

1. 500 feet from leased camp site buildings and state forest-owned buildings.
2. 200 feet from any stream, wetland, vernal pool, spring seep, other wet areas or any other body of water
3. 300 feet from a wetland, vernal pool, spring seep or other wet areas with threatened and endangered species and species of special concern
4. 300 feet from any Exceptional Value (EV) or High Quality (HQ) stream or body of water (as defined by Pennsylvania's Environmental Quality Board (EQB))
5. 300 feet of any trail or road
6. 300 feet of the state forest land boundary line
7. 600 feet of the boundary line of state park lands, designated state forest wild and natural areas, designated picnic areas, and designated state forest camping areas

Figure 5-2. Impacts to important resources, including wetlands, are avoided using established setbacks.

8. Any requirements or guidance requested by another jurisdictional agency (DCNR, PGC, PFBC, USFWS, DEP, ACOE, PHMC) for species or resources of concern, areas of historical importance or otherwise required by regulation
9. Any additional setback restrictions based on local features important in a state forest district (e.g., steep slopes, high recreation areas, viewshed, fire tower, vista, or other significant conditions).

C. Mitigation

Despite the Bureau's and operators' best efforts to avoid and minimize, it may not possible or fully adequate in all situations to prevent impacts to resources, uses and values. After disturbance activities conclude, mitigation will be necessary to alleviate adverse effects of development. Mitigation opportunities include but are not limited to: reforestation, ecological restoration, species habitat enhancement, or removal of pre-existing populations of invasive species.

State wide, certain provisions exist regarding well site restoration and site stabilization. Operators are required to restore the area disturbed in siting, drilling, completing and producing a well per the Oil and Gas Act. Site restoration includes implementation of erosion and sedimentation control measures and the removal of all drilling supplies and equipment not needed for production. DEP's erosion and sedimentation control regulations define stabilization as the proper placing, grading and covering of soil, rock or earth to ensure their resistance to erosion. Stabilization is categorized as permanent or temporary. Permanent stabilization is achieved when the disturbed areas have been revegetated to a minimum uniform 70% perennial vegetative cover or a permanent best management practice has been employed to minimize accelerated erosion and sedimentation. However, revegetation of disturbed areas is considered the only acceptable practice to achieve permanent stabilization on state forest lands.

Please note that the Bureau makes a distinction between state-required erosion and sedimentation well site restoration activities ("stabilization" or "revegetation") and "reclamation" or "restoration." While site stabilization is necessary or mandated by law, it is not equivalent to mitigation of adverse impacts, nor reclamation or restoration of forest ecosystems. Mitigation is an action that takes place in addition to site stabilization, in order to compensate for a resource, use or value that has been impacted or lost when avoidance is not possible. Restoration, as defined by the Bureau, is the return of a disturbed site to its original functioning ecosystem state prior to disturbance, and often cannot be accomplished until after the site is no longer in use. However site reclamation projects—that reduce the overall size of the disturbed area by using native forbs, shrubs, and trees to begin to rebuild organic topsoil, improve native plant diversity, and encourage site use by native insects and early successional wildlife— are often the first step towards restoration.

Figure 5-3. Monitoring is essential to detect the changes, both beneficial and adverse, associated with oil and gas development.

D. Monitoring

The Bureau has established a monitoring program to track activities, detect changes and monitor impacts that may be occurring on state forest land in conjunction with oil and gas activity. The program is focused on evaluating changes in plant and animal communities, infrastructure, and water resources, as well as changes in social and

recreational values. Updates to the Bureau of Forestry *Shale Gas Monitoring Report* will summarize and communicate any changes to state forest land and facilitate adaptive management strategies that address these findings. These updates can be found on the Bureau of Forestry website.

Implementing Ecosystem Management and Resource Sustainability

The Bureau's gas management approach of avoidance, minimization, mitigation and monitoring strives to promote environmentally-sound gas exploration that maintains contiguous forests, conserves wetlands, protects threatened and endangered plants and animals, upholds water quality, maintains the forest's wild character, and provides high quality recreation.

The following sections were developed to specifically address the overarching goal of ecosystem management and resource sustainability in consideration of the different facets of oil and gas development and production on state forest lands. Each section identifies and prescribes practices consistent with goals and objectives described in this document and in the *State Forest Resource Management Plan*.

A. Seismic Surveys

Seismic data facilitates the successful exploration and development of oil and natural gas reservoirs in Pennsylvania by providing an opportunity to view the underlying geology of an area prior to a well being drilled. Seismic data is produced when an energy wave travels through the subsurface and the variation in the rock properties of each formation causes a portion of this energy wave to be reflected back to the surface. A device on the surface called a geophone records the amount of time it takes for each energy wave to be reflected back to the surface. By processing the data recorded on each geophone, an image can be created of the subsurface underlying a given area.

Energy waves can be produced in a variety of ways. On land, the most commonly used sources to generate energy waves are small explosive charges buried within a previously drilled borehole, or from a heavy truck-mounted vibrating plate (commonly called vibroseis). Each seismic survey may employ one or both types of energy sources depending on the survey parameters and the land features within the survey.

Explosive charges require the drilling of a borehole tens of feet deep in which the charge is placed. The drilling of boreholes is typically conducted by either a small track mounted drill, or a helicopter delivered heli-portable drill. This flexibility allows for the use of explosive charges to be used in a wide variety of applications, whereas vibroseis typically requires the use of a pre-existing road network due to the size of the equipment. The use of explosive charges in most seismic surveys is undetectable at the surface.

Seismic data is typically acquired in two-dimensional (2-D) or three-dimensional (3-D) form as indicated by the image produced of the subsurface:

2-D surveys: Require an energy source that is in line with the receiver to produce a vertical profile of the subsurface. 2-D surveys consist of one or more seismic lines acquired individually. Each line will produce an image in a single vertical plane.

3-D surveys: Require a multitude of geophones that collect the reflection signals from points outside the plane of the energy source to produce a “cube-like” profile of the subsurface. Multiple receiver lines collecting data simultaneously are required to produce a three dimensional image. 3-D surveys are more complex, labor intensive; and more land-base is required.

Figure 5A-1. Track mounted drill buggy completing a seismic borehole.

The following is the Bureau process to review seismic survey requests on state forest land:

1. Company submits their application to the Bureau:
   If interested in acquiring seismic data on state forest lands, the seismic operator or an appropriate contractor must notify the Bureau of the proposed project either through the applicable State Forest District Office or through the Minerals Division. Following the Bureau's notification, the seismic operator must submit the following:
   - Location (i.e., boundaries of project)
   - Acres affected
   - Narrative and justification for project
   - Proposed methodology of acquisition

2. Bureau performs preliminary review of project and decides if its justification is warranted.

3. If the project is accepted, the operator will submit an operational seismic survey plan to the Bureau. The operational plan will include:
   - Map depicting the preliminary location of source and receiver points
   - Standard operating procedures for working in and around sensitive areas
   - Communication protocol for notifying field crews of exclusion areas
   - Descriptive methodology to be used for placing shot holes and receivers

4. Bureau reviews the operational plan and identifies exclusion areas and the basis for their designation. Exclusion areas may include:
   - Wetlands, streams, vernal pools, spring seeps
   - Invasive plant populations
   - Known or potential habitat for threatened and endangered species
   - Recreational resources and aesthetically sensitive areas
   - Other sensitive areas identified by the state forest district

5. The Bureau will provide the seismic operator with the following information prior to the initiation of any field work:
   - Geospatial data of any known exclusion areas delineated as polygons
   - A list of suspected sensitive resources and their anticipated location
   - A list of operational restrictions and/or avoidance measures pertaining to each exclusion area

6. Agreement:
   The Seismic Agreement will clearly define the number and extent of exclusion areas, buffer areas, and operational restrictions. These items will be emphasized and reiterated to the company prior to the commencement of any activity.

7. Pre-Activity Meeting:
   The company will meet with the Bureau prior to commencing construction/seismic activity. The Bureau will discuss the terms and conditions of the seismic agreement with the operator, contractor, and employees that will be engaged in the fieldwork.

Note:

The contractor should enlist the services of a qualified professional to walk all planned shot lines (ahead of the seismic field crews) and locate suspected sensitive resources. If these resources are encountered, they will be delineated in the field, mapped and added to the list of exclusion areas.

8. Monitoring and Inspection:
   Bureau will monitor and inspect seismic activity throughout the survey to ensure compliance with the standards of the agreement and other agreed upon best management practices. Deficiencies must be brought to the seismic operator's attention as soon as possible in order to limit environmental impact and conflicts with other state forest users.

9. Post-Survey Inspection:
   Following the seismic survey, Bureau staff will conduct a post-survey inspection of the area to ensure that all areas disturbed have been properly reclaimed and all equipment has been removed. The Bureau will also continue to monitor the area of the survey for the propagation of any invasive species in order to determine control and treatment of any invasive populations found.

The following should be considered to protect forest growth with seismic surveys:

- The use of mulching machines to clear vegetation or to lay cables should be avoided. The Bureau may consider the use of this equipment on state forest under limited certain circumstances. Written requests and justification of need should be submitted to the Forest District Manager. If approved for use, guidance on "no mulch" buffers and other operational restrictions will be provided.
- The tying back of vegetation should be used in favor of cutting. Vegetation should be cut or removed only when no other alternative is feasible.
- The seismic operator should use its best efforts and practices in maneuvering equipment in such a manner as to prevent damage to forest growth not intended to be removed.

The following should be considered for seismic survey equipment:

- Wireless receivers aid in avoiding conflicts with state forest users and should be utilized whenever possible
- The use of all-terrain vehicles should be avoided. Equipment should instead be placed by personnel on foot. If it is absolutely necessary for the seismic operator to utilize all-terrain vehicles, prior written authorization must be granted by the Forest District Manager
- The use of existing roads, motorized trails and clearing should be used to the greatest extent possible during the placement of equipment
- When wire receivers are used, caution should be taken when cables are strung across trails and roads. Cables should be secured tightly to the ground with anchors so that hazards are not created to hikers, bikers and horseback riders

The following should be considered regarding the use of drill buggies:

- Avoid all sensitive and wet areas
- Use rubber tracks in lieu of metal whenever possible
- Utilize portable GPS units with the capability of displaying exclusion areas

- Avoid travelling along non-motorized trails when moving between source points
- Avoid drilling holes within the running surface of trails and roads

The following should be considered to protect exclusion areas:

- Exclusion areas containing sensitive resources should be clearly delineated in the field and seismic crews should be fully aware of operational restrictions and/or avoidance measures. In some cases it may be necessary for the operator to have environmental consultants direct field staff and ensure that sensitive features will be avoided
- Seismic activity should adhere to requested setbacks and established buffers (hyperlink to setbacks) Note: Vibroseis trucks and helicopters (with portable drills) minimize surface disturbance and may be preferred in sensitive ecological areas. However, these techniques may cause temporary adverse impacts to local aesthetics and recreational experiences

The following time restrictions should be considered with seismic surveys:

- Operations should be planned and scheduled appropriately to avoid unnecessary conflict including:
  - High visitor use periods (i.e., hunting seasons, special events and holiday weekends). Please see the Recreation Section for timing restrictions.
  - Critical wildlife mating or nesting seasons.
  - Wet periods when impacts to infrastructure, soils, water and vegetation are likely
  - Periods of high/extreme wildfire danger

The following should be considered for invasive species prevention with seismic surveys:

- All equipment utilized during the survey should be cleaned prior to entering state forest lands to ensure the removal of any invasive species that may be present. Equipment should be cleaned in a manner consistent with the U.S. Department of Interior's Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species.

B. Well Pad Sites

There are many aspects to planning well pad development on state forest lands. These considerations include: understanding the pad placement within the landscape and tract; siting and constructing the pad appropriately given the resources in the area; efficiently organizing infrastructure on the pad; signage and spill safety. Operators should work cooperatively with the Bureau to minimize impacts to state forest resources, uses, and values.

Well Pad Placement

Existing landscape conditions and characteristics associated with potential pad locations should be evaluated and documented prior to construction, to provide baseline data and facilitate restoration. Limiting forest fragmentation, avoiding sensitive areas and decreasing aesthetic impacts are some characteristics that are considered.

The following principles should be considered with well pad placement:

- Where fragmentation is the primary concern, well pads should be co-located with existing disturbances to reduce additional impacts to core forested areas where applicable.
- In aesthetically sensitive areas, locations should be selected that provide for vegetative and topographic screening. Consider supplemental plantings of conifers to establish or enhance vegetative screening or leaving a buffer.
- Well pads should be designed to fit within the landscape and minimize excessive cut and fill construction practices. In many cases, it may be appropriate to design well sites in an irregular shape (i.e., non-rectangular).
- The operators should limit fragmentation and aesthetic impacts by minimizing pad and infrastructure development within the tract, while maximizing the efficiency of the gas extraction. For example, increasing the number of wells per pad or horizontal bore distance may result in fewer pads and less fragmentation and aesthetic impacts. The Bureau recognizes that economic, technological, and geologic constraints may influence the size and number of pads.

Figure 5B-1. Example of a recently constructed well pad.

Figure 5B-2. During active development, the well pad is completely utilized by necessary ancillary infrastructure.

The operator has agreed to drill wells as reasonably prudent as possible; however, not all leases have disturbance thresholds. Some leases limit the number of well pad locations or acres disturbed within a lease tract. Other leases hold operators to a maximum number of well pad locations, or total disturbance of a predefined acreage, whichever occurs first (see tract lease for specific limitations). If an operator wishes to deviate from the well pad numbers or acreage, a waiver and State Forester approval will be required in accordance with the lease. In legacy lease areas or areas without a lease, Bureau staff will work with the

Note:

When determining the placement of a pad within a landscape, it is important to consider occasions where goals of limiting fragmentation and aesthetic impacts may contradict.

operators in planning and identifying opportunities to limit conversion and fragmentation to state forest lands.

Well Pad Construction

Well pads are constructed to accommodate all components of drilling and completion which determines their size. A typical shale gas well pad can be several acres in size and can host many individual wells. Pads are constructed to be solid, relatively level and soil compacted in order to adequately support the weight and maneuverability needs of modern drill rigs and the facilities needed for completion and production. During the hydraulic fracturing (i.e., fracing) and completion process, nearly every square inch of the pad is occupied. Pipeline rights-of-way and access roads are not considered part of the well pad.

Traditional well pad construction may include:

- Removing and stockpiling the topsoil
- Developing a suitable sub-base using one of the following methods:
  - amending the upper subsoil with a stabilizing medium (e.g., portland cement, lime, fly ash) and then lining with geotextile
  - lining the subsoil with geotextile and covering with several thousand tons of larger diameter stone
- Top-coating the base with smaller diameter stone and compacting to extreme tolerances, assuring a consistently flat surface allowing the rig to "walk" or "skid" from one well to the next

Figure 5B-3. Lining of a graded and compacted well pad site with geotextile. Stone will be added to this surface and compacted to provide a stable base for well development.

The Bureau encourages reduction of stone volume used for well pad construction.

The use of large volumes of stone can present challenges. Removal of material will increase truck traffic and it also will create more intensive reclamation. Other techniques are available that limit the amount of stone used for well pad construction, such as timber mats, composite mats (rig mats), or cellular confinement systems.

Cellular confinement systems, also known as geocells, are widely used for load distribution, base stabilization and strength, surface stabilization, and erosion control. Geocells enhance load-bearing capacity while reducing the amount of aggregate material required. This can simultaneously reduce the usage of haul equipment, which in turn reduces fuel usage, pollution and the carbon footprint, and minimize on-site disruption from dust, erosion and runoff. As a composite system, cellular confinement strengthens the aggregate fill, thereby enabling the use of poorly graded inferior material (local native soils, quarry waste, recycled materials, etc.) The perforations in the cells can reduce post construction storm water by increasing permeability.

Any topsoil (i.e., O and A horizons) removed during pad construction should be stored on site and segregated from subsurface materials to avoid mixing during construction, storage and partial restoration. Topsoil stockpiles should be vegetated with a native seed mix to minimize erosion and maximize reclamation potential. In addition, topsoil should not be stored under plastic because it greatly reduces the viability of the seedbank in the soil. Rocks, stumps, tops or slash should be pushed to the edge of the opening and used for wildlife habitat enhancement, when feasible. In those instances where vegetative debris cannot be incorporated, guidance will be provided on other beneficial uses (e.g., chipping, stockpiling).

Well pads are considered impermeable, and as such, may require post construction stormwater controls. During the planning stages the Bureau encourages operators to be creative in design of storm water controls. This reduces the need for large scale clearing of vegetation and requires less long term maintenance. For this reason, large scale infiltration basins such as those used in other types of residential or commercial development are not preferred. The Bureau prefers techniques such as infiltration berms which can be constructed adjacent to the pad.

During the development phase, equipment such as the drill rig, drill pipe and casing, containers for rock cutting and trailers to house personnel are on location. Drilling mud and other materials removed from the bore hole are captured in a series of steel tanks referred to as a closed-loop system that facilitates the recycling of drilling fluids and the separation of rock cuttings. Cuttings are disposed of at DEP-approved landfills.

Once the well is drilled and casing is set the drill rig is disassembled and other equipment needed for drilling is removed from the site and the pad is prepped for well completion (hydraulic fracturing and flow back). During completion operations the majority of the well pad surface is occupied with equipment which ultimately influences the size of the pad needed.

Facility Organization on Pad Sites

Well pads are sized to accommodate all components of drilling and completion. Certain infrastructure will be required on the well pad for the life of the well (i.e., production phase), and site plans should distinguish these areas from those that are only needed during the short term (i.e., development phase). Areas needed for the development phase of the well pad should be rehabilitated once they are not necessary and those utilized for the production phase will be rehabilitated once the well is no longer economical to maintain. This is also a Marcellus Shale Coalition Recommended Practice.

Production infrastructure on the well pad should be clustered and centralized to the maximum extent possible without jeopardizing the safety of operators, Bureau personnel or the public. Each pad should also have the maximum number of well bores possible without endangering safety or reliability.

Spill Safety

Operators should strive to eliminate all spills on state forest land. However, operators should develop and employ techniques and strategies to minimize, contain and mitigate spills if they occur. Consider the following guidance during planning stages:

- Use closed loop systems and tanks with secondary containment for collecting wastewater

- Wherever possible, store chemicals and liquids inside storage trailers. If feasible, the storage facility should employ secondary containment controls and should be underlain with impervious geotextile
- Product and hazard labels should be legible at all times and replaced as necessary
- Install concrete sump collection boxes down slope of all secondary containment controls to facilitate containment and pumping of spills

Please see Medical Emergencies and Pollution Events for more information.

Signage

The use of signage on state forest lands is generally minimized to ensure consistency with its undeveloped character. However, signs are necessary for operators to convey information to personnel, Bureau employees, regulatory authorities, and emergency responders during the development and production phases of shale gas. The following guidelines are intended to minimize aesthetic impacts and ensure consistency in accordance with regulations:

PA Chapter 78 and Act 9

On January 26, 2013, Act 9 amended Pennsylvania's Chapter 78 regulations to include emergency response planning at unconventional well sites. The new regulations require the installation of specific emergency response signage at the entrances to well sites (i.e., well pads). The regulations further prescribe specific sign composition and color schemes based on administrative versus public roads. Bureau of Forestry access roads are administrative roads constructed and maintained primarily for the purpose of fire protection, administration, and utilization of state lands and/or facilities. These roads are open to the public to provide access to the state forest for outdoor recreation opportunities and can be closed by the Bureau at any time, thus are not considered "public highways."

As set forth in the regulations, the signs must be installed at the "entrance" to the well pad, being the intersection of the access road and the nearest road with an address range. Emergency response signage should be installed as close as possible to pad locations. A name and address range should be established for access roads when: 1) the pad is not visible from a designated road, and 2) the road provides access to multiple pads and is un-named. The Bureau will work cooperatively with operators and the proper authorities to ensure that names and addresses are assigned as efficiently as possible. Signage for newly named roads should be consistent with Bureau road sign standards, as well as those prescribed in the amended Chapter 78 regulations. These solutions will be beneficial to emergency responders and will minimize sign pollution in the state forest.

Figures 5B-4 and 5B-5. Examples of Act 9 signage

Information Boards

Operators often require additional space to post other required permits or to relay important information to employees and the public about safety hazards, requirements and general information about the pad and surrounding area. An information board may be installed to accommodate such needs at the discretion of the Forest District Manager. The construction, material and color scheme for informational boards should be consistent with Bureau sign standards and shall not exceed a width of four feet and a height of eight feet.

Figure 5B-6. Example of an information board

C. Freshwater Acquisition

The water intensive nature of the shale gas development requires extensive advanced planning. A conceptual site plan that includes water acquisition, transportation, storage and disposal should be submitted to the Bureau for review and approval before the initiation of construction activities on state forest lands. The Pennsylvania Department of Environmental Protection (DEP) and corresponding interstate River Basin Commissions have jurisdictional oversight of surface water resources and associated water withdrawal requests.

The development of a single shale gas well requires approximately four million gallons of water for the completion process (i.e., hydraulic fracturing). This quantity of water must be readily available to the well site throughout this process. Centralized fresh water storage facilities and temporary pipelines for transporting water may be preferred over the traditional method of housing multiple storage tanks on the well pad and filling them via truck depending on the situation. Centralized freshwater facilities reduce high volumes of truck traffic and decrease total acreage disturbance.

Note:

The Bureau of Forestry was established in 1895, in part, to acquire forest lands and protect headwaters and streams. This remains part of the Bureau's mission today.

Water Acquisition

Water needed for shale gas development is acquired through:

- Surface water withdrawals
- Groundwater well withdrawals, although not preferred

When reviewing requests for water acquisition, the Bureau takes into consideration potential impacts to watersheds, headwater streams, wetlands and adjacent ecological resources.

The following should be considered when determining water sources for shale gas development:

- The terms for surface and groundwater withdrawals on fee simple state forest lands are set forth in the lease agreement.
- The terms for surface and groundwater withdrawals on severed state forest lands are customarily contained in a surface use agreement.
- Surface water withdrawals, utilizing temporary freshwater pipelines, are preferred over trucking water to the site or ground water withdrawals.
    - Surface water withdrawals are readily monitored, provide high yields, and can be controlled during low flow conditions.
    - Trucking water is expensive, increases traffic volumes, may necessitate road improvements, induces potential conflict with state forest visitors and requires additional land disturbances when stored on well pads in frac tanks.
- Groundwater wells are strongly discouraged on state forest land due to the inherent uncertainty that exists regarding potential impacts to other resources. All groundwater well requests will be will be subject to a multi-discipline review process. The review includes determining the hydrologic and hydrogeologic characteristics of the area (both surface and groundwater), assessing the potential for ecological impacts

due to the resulting cone of depression and local water table lowering, and assessing the suitability of a proposed location based on its proximity to recreation, roadways, riparian areas, etc.

- Siting ground water wells in close proximity to headwater streams should be avoided. These streams support multiple ecological roles, are highly sensitive to changes in land use or flow and are often intimately connected to springs and wetlands.
- Excessive groundwater pumping in headwater watersheds may result in adverse impacts to wetlands and stream quantity, quality and ecological and aquatic community structure and function.

Water Transportation

Whenever feasible, freshwater should be moved from centralized storage facilities to the well pads via pipeline, significantly reducing heavy hauling, minimizing vehicular conflicts and decreasing air and dust pollution. These pipelines may incorporate above-ground or buried water pipeline networks, or a combination of the two. Above-ground pipelines should be placed in a manner to reduce aesthetic impacts, vegetation damage and the potential for vandalism. Below ground pipelines should be co-located with existing pipelines, buried within the ditchline or vegetated berm or trenched and buried beneath the running surface of the road in order to minimize earth disturbance and forest conversion.

Water Storage

There are several options for water storage, depending on the specific needs of the project:

- Earthen Impoundments: non-portable, open pit that may involve significant construction operations; typically 5-14 acres in size and can serve many well pads, thereby reducing the overall disturbance. Constructed dam breasts over 15 feet high require DEP permitting.
- PortaDams: semi-portable, above-ground impoundment consisting of heavy duty liners on a steel framework; perimeter can be surrounded with frac tanks for screening and additional storage capacity
- Above-ground Storage Tanks: semi-portable, bolt together, cylindrical tanks that are often set on concrete pads
- Frac Tanks: portable, fixed-axle tanks which can be transported by tractor; capacity is generally 500 barrels (21,000 gallons)

Figure 5C-1. Freshwater impoundment with safety fencing.

Figure 5C-2. Portable fixed-axle frac tanks on a well pad.

The following should be considered when determining water storage needs:

- Place freshwater storage facilities within existing non-forested openings, reducing new landscape disturbances.
- Utilize impoundment liners of sufficient thickness to minimize potential leaks. Thicker liners are more resistant to tears during construction and pumping.
- Use a manifold/dry-hydrant system to alleviate the need for the "loose hose" method of filling/emptying. This system should also contain the appropriate metering scheme for water accounting.
- Prevent stored fresh water from becoming septic by installing aeration systems.
- Install sufficient exclusionary fencing to keep wildlife from falling into the impoundments. Incorporate deterrents when the fences alone are not consistently successful.
- Facilitate animal movement by lifting sections of above ground pipelines or mounding topsoil.
- Install jute matting along the top, inside edge of an impoundment to enable amphibians and small mammals to exit the slippery plastic-lined impoundments.
- Freshwater impoundments must maintain adequate freeboard. The discharge of surplus water is regulated by DEP. Further information and requirements can be found at http://www.pacode.com/secure/data/025/chapter78/chap78toc.html.

D. Wastewater Treatment, Storage, Transportation, and Disposal

Figure 5D-1. Above ground steel storage tanks with secondary containment measures

Unconventional gas wells require several million gallons of water for hydraulic fracturing operations. After hydraulic fracturing is complete, approximately 10 to 30 percent of this water returns to the surface during initial flowback. Variability in the volume of recovered flowback is dependent on geologic conditions and the completion techniques utilized. Additionally, most wells will continue to produce water, found in the pores of the rock formation, for the life of the well. This is often referred to as produced water. Flowback and produced water, collectively referred to as wastewater, contain dissolved salts, metals and chemicals as well as fragments of rocks and minerals which must be properly disposed of or treated before reuse in subsequent completion operations.

In 2011, the PA Department of Environmental Protection asked natural gas drilling operators to voluntarily stop disposing wastewater at municipal and commercial treatment plants because of the high concentrations of bromides and other dissolved solids being discharged into rivers and streams used for public drinking water sources. Operators currently strive to recycle 100% of their wastewater through minimal treatment, blending with fresh water for future well completions and other practices. The Bureau supports the recycling of wastewater and reducing the overall amount of freshwater consumed for shale gas operations.

Permitting:

DEP's OG-071 authorization allows the treatment of waste streams from a well site under certain conditions. This authorization is also required when modular, open air tanks will be used to store wastewater. All wastewater storage on state forest lands must be closed and self-contained. While OG-71 authorization does not require landowner notification, prudent and responsible operators are highly encouraged to notify and communicate all OG-071 authorization activities with the Forest District Manager.

In accordance with the DEP policy known as the "100% rule", operators may transport the total volume of wastewater generated from one well site directly to another well site, or multiple well sites, where it must be completely reused. Wastewater treatment may occur at the site where it is generated or the site(s) where it will be reused.

Centralized storage, centralized treatment and multiple transfers of oil and gas waste streams are administered through the DEP Waste Management Program under the WMGR-123 permit. The WMGR-123 permit provides the operators

with additional flexibility to treat and store flowback wastewater, requires landowner consent and bonding, and entails a thorough review of the proposed facility

The following guidance should be considered when managing wastewater:

1. Storage of wastewater in lined, open pits or modular, open air tanks is not permitted on state forest land.
2. Wastewater storage must utilize closed and self-contained tanks. Tanks should accommodate anticipated wastewater volumes and employ adequate secondary containment measures.
3. All wastewater infrastructure, such as valves, tanks, and piping, should be tested frequently for connectivity and seal integrity. Frequent inspections should be performed to ensure the continued integrity of the operation during blending operations.
4. All wastewater operations and infrastructure should utilize adequate secondary containment measures. This containment should be frequently inspected.
5. In addition to mandatory reporting to DEP, all spills should be reported to the Bureau, promptly per the Medical Emergency and Pollution Incidents guidelines.

Potential Future Operations

Centralized wastewater treatment and storage operations are neither covered under the provisions of DCNR's oil and gas lease nor inherent in the rights afforded to subsurface owners. These operations require additional justification, review, and agreements with oil and gas operators, including those operating on both leased lands and lands with severed rights.

While the Bureau generally is not in favor of additional infrastructure on the state forest, in certain situations, providing options for alternative methods and flexibility to handle oil and gas wastewater may be in the best interest of the Commonwealth.

The Bureau of Forestry has developed an approach for considering centralized wastewater treatment and storage system proposals on state forest land. Operators are required to submit a detailed proposal justifying their project and providing information such as: system and equipment specifications, safety protocols, chemical storage, spill prevention and response protocols, transportation analyses, and the reasons the project would be in the best interest of the Commonwealth (please refer to Appendix: Criteria for Wastewater Treatment Storage System Proposals). After Bureau review and approval, the provisions for managing the wastewater facilities and activities on state forest land are customarily contained in a *Surface Use Agreement* between the operator and the Bureau. This *Surface Use Agreement* would apply strictly to the project area hosting the wastewater activity.

The Bureau will consider all proposals; however, the Bureau does not support large-scale, for-profit wastewater projects on state forest lands. Wastewater operations should be considered temporary in nature and should be operational only so long as it serves oil and gas operations on state forest land. Proposals for storing, treating, or transporting wastewater associated with a non-Commonwealth issued oil and gas lease operation will need to present a clear benefit to the Commonwealth.

The use of fresh water, and the reuse and treatment of flowback waters, are subject to continuously changing technology. This information represents current best management practices and will be revised as necessary to

accommodate changes in technology and advances in best management practices which perpetuates environmental quality and minimizes impacts to state forest land.

E. Roads

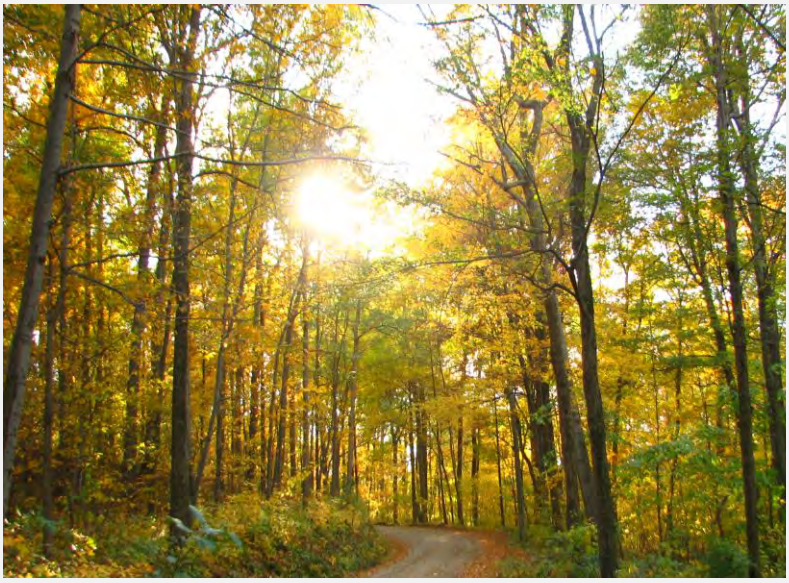


Figure 5E-1. Traditional narrow, winding state forest road with canopy connectivity.

An efficient, sustainable, and environmentally sound road system is critical to the administration and management of Pennsylvania's state forest system. Roads provide necessary administrative access as well as recreational opportunities for the general public. State forest roads are typical of most rural road systems-they are generally narrow, gravel, uncongested, and rather inconspicuous within the landscape. Many of these roads were constructed by the Civilian Conservation Corp during the height of the Great Depression or converted from abandoned railroad grades once used to remove timber. State forest roads are minimized to the extent that they satisfy operational needs while maintaining the primitive, scenic and undeveloped character of state forest land.

State forest roads are not public roads in the sense of other federal, state, or municipal roads. Rather, they are considered administrative roads that are open to public travel unless gated or posted closed. These roads are shared-use in the sense that they may be utilized by the public for multiple recreational experiences such as mountain biking, hiking, horseback riding and scenic driving. Many of these roads are also considered *"joint-use"* wherein they are open for travel by licensed motor vehicles and are also managed as part of the snowmobile trail system during the winter riding season. The Bureau does not perform winter maintenance activities on these roadways such as plowing snow or the application of anti-skid materials and melting agents.

Shale gas development is a highly industrialized activity that requires intensive heavy truck traffic on state forest roads. Although temporary in nature, the volume and frequency of truck traffic is a stark contrast to the public's intrinsic expectations and experiences of state forest lands. In addition, roads may require modification and widening to accommodate the scale and weight of the activity. Heavy truck traffic increases social and environmental concerns related to noise, dust, access limitations, public safety, user experience, and also increases operational concerns associated with road conditions, maintenance and rehabilitation.

The sound environmental utilization of mineral resources is part of the Bureau's mission-but the activity must be consistent with the other resources, uses and values for which state forest land is managed.

The following principles should be considered regarding the use, construction, modification, maintenance and rehabilitation of state forest roads:

- Public safety is always the first priority. Hazardous and unsafe conditions will not be created or sustained.
- Consideration must be given to all users of state forest roads. Restrictions may be necessary and warranted to promote public safety. State forest roads must accommodate the safe passage of two-wheel drive vehicles as weather conditions permit.
- Construction, modification and maintenance practices, techniques and materials must be compatible with the Bureau's specifications. Consistency is expected within and between state forest districts.
- Nonstandard construction or maintenance practices, overbuilt roads, or the use of substandard materials will dramatically affect future maintenance activities and cost.
- Environmentally sound maintenance techniques should be utilized on state forest land.

Planning/Siting

An adequate road network is necessary to facilitate the responsible development of natural gas resources. Access needs should be planned at a landscape level and alternatives should be investigated. Sustainable road use should accommodate the development needs of the operator in a manner that is consistent with the expectations and needs of the Bureau of Forestry. Lessees and subsurface owners have the right of ingress, egress and regress to their subsurface estates which includes the right to construct new roads as necessary. New road construction is costly and burdensome. The Bureau discourages this practice and favors the responsible use of existing state forest road in these instances. If new construction is unavoidable, proper road location is the most important consideration in reducing impacts to the forest recreational users and ecosystem functions. Private use of state forest roads is considered a privilege and the activity is administered through a road use agreement which prescribes annual rental fees and substantial bonding requirements.

Many state forest roads were built upon old tram roads and trails that follow streams. The current existence of a road may not mean it is properly located. Operators should work with districts and identify problem areas that may need to be mitigated prior to construction activities. A need may exist to relocate the road to a more desirable location. The operator should also work with DEP to account for the improved condition as a water credit toward the new road.

The following principles should be considered with road planning and siting:

- Maintain connectivity between important habitats such as wetlands and avoid the fragmentation of large blocks of core forest
- Co-locate with existing disturbances and keep corridors as narrow as possible. Maintain connectivity of mid and overstory tree canopies over the corridor.
- Avoid long linear segments. Bends in roads reduce aesthetic and wildlife impacts and help to maintain reduced vehicle speeds.
- Road corridors should accommodate other uses and needs. Pipeline placement should be considered and incorporated into road modification or construction plans. Place pipelines in the road shoulders to reduce conversion and fragmentation impacts. Both gathering lines and distribution lines have been successfully installed in road shoulders with appropriate consideration.

- Identify unsustainable road segments or problem areas during landscape level planning and seek long term solutions which are consistent with Bureau protocols and expectations. Consider rerouting such segments, rehabilitating the old road and returning it to its natural state.
- Seasonal timing of construction activities is important to reduce E&S concerns. Operators should avoid construction activities during spring thaw or during periods of heavy rain when soils are saturated and increased erosion risk is a potential.
- Minimize the amount of drainage area intercepted for surface water/storm water drainage through proper road siting

Figure 5E-2. Examples of distribution pipelines placed within the road shoulders to reduce clearing width and fragmentation effects.

Road Use Agreements

The commercial use of state forest roads is prohibited without first obtaining a *Road Use Agreement* per *State Forest Rules and Regulations*. A *Road Use Agreement* is required for all lessees and private subsurface owners using state forest roads. Road Use Agreements identify the criteria, bonding and rentals required for the use, modification and maintenance of the given road. Lessees do not incur annual rental fees or additional performance bonding beyond that mandated in the lease. Operators are responsible for all upgrades, maintenance needs and damages incurred for the roads they utilize. Agreements for roads that are accessed across forest district boundaries must include all affected forest districts.

Current and Conflicting Uses:

Shared Use Roads

State forest roads are shared-use roads that accommodate vehicular access and numerous recreational activities. The safety of all users is a paramount concern. Road uses should be identified and managed for in the planning stages of development and use to avoid potential negative effects. The Bureau restricts heavy hauling and seismic surveys during periods of high recreational activity including holidays and hunting and fishing seasons.

Aesthetics, anticipated user experiences and the wild character of the forest are important values to consider when planning for operational needs. Setbacks from recreational features, including roads and trails, have been

established to maintain and perpetuate these values. Planning efforts must consider all resources, uses and values in play as part of the decision making process and strive to achieve a balanced solution amongst these competing interests. Additional information on avoiding conflicts can be found in the recreation and public safety and ecosystem management and resource sustainability sections of this document.

Joint-Use Roads and the State Forest Snowmobile Trail System

State forest roads constitute a significant portion of the snowmobile trail system. State forest roads that are open to motor vehicles and snowmobiles at the same time are called joint-use roads. The Bureau's snowmobile trail system opens the day after the last day of Pennsylvania's regular or extended rifle deer season and closes by April 1 each year.

Figure 5E-3. Snowmobiles utilizing a public use road as a joint use snowmobile trail.

Advance planning should strive to identify potential user conflicts with joint-use road impacts, such as snow plowing, and develop sustainable long term solutions. Alternative trail segments should be developed when joint-use roads are impacted, with an emphasis on maintaining the integrity of the trail loop system. The operator will assume all responsibility and expense incurred for planning, permitting, and constructing these alternative trail segments, which should be operational prior to plowing or closing any joint-use roads. The objective should be to maintain the integrity of the system and promote public safety while minimizing conflict.

Traffic Control and Road Closures

Traffic control may be necessary for safety concerns such as narrow roads with steep embankments, sharp turns that limit turning ability of large trailers or temporary road closures. Creating a temporary one way flow pattern may be permissible for short periods where heavy hauling creates a safety concern. Safety checkpoints, or automated traffic control devices may also be utilized with the Forest District Manager's approval. Operators must provide written notice prior to the intended use and districts should post the information on the advisories tab of their respective website. *See also the* Recreation and Public Safety *chapter of this document.*

Road Modification and New Road Construction:

Construction & Modification Practices

The Bureau of Forestry has a cooperative partnership with the Penn State University Center for Dirt and Gravel Road Studies (http://www.dirtandgravel.psu.edu/) to identify and apply best practices for dirt and gravel roads. The Center has developed technical bulletins and the Environmentally Sound Maintenance Practices course to address common construction and maintenance issues with dirt and gravel roads. The Bureau has been implementing these practices on its roads whenever improvements are needed. New construction by operators should be consistent with these practices to the greatest extent possible.

Modification versus Construction

The differences between road modification and construction have significant ramifications regarding permitting and regulations. Modification or maintenance is defined as disturbance activities which occur between the top of the cut slope and the toe of the fill slope of a pre-existing roadway. Any disturbance activity occurring beyond this area is considered new construction. Construction activities must develop approved erosion and sedimentation plans that address post construction stormwater management (PCSM). All previous disturbances, including historical log skid roads and tractor paths can be considered as pre-existing impervious area. Only new disturbance outside of the existing disturbance needs to encompass water calculations for PCSM features. As such, it is imperative that the extent of pre-existing roadways are well documented prior to the initiation of any disturbance activities for plan and permit purposes.

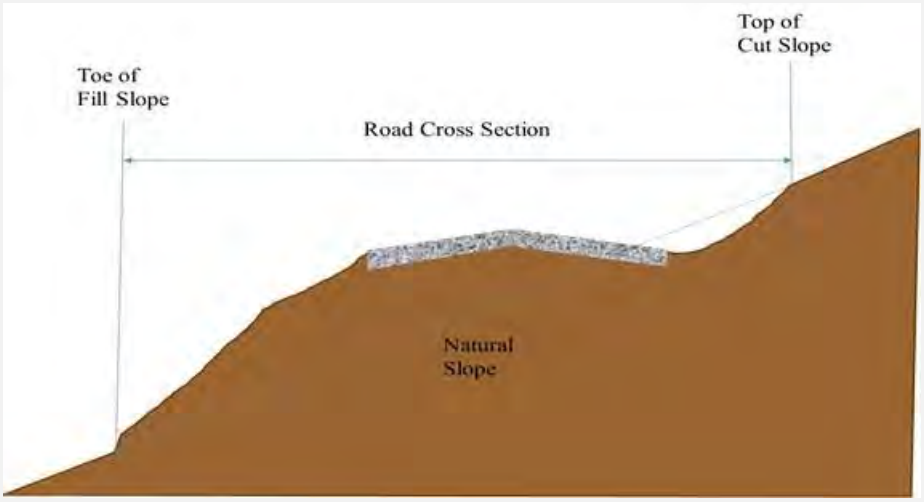


Figure 5E-4. Illustration depicting the limits of pre-existing disturbance within a road profile.

Width

Any new access road or modification of a road outside of the existing cut and fill profile is considered new construction. Typical state forest road running surfaces range from 12-16 feet in width. This width lowers maintenance costs, promotes tree canopy connectivity, reduces environmental impacts and maintains the wild character while permitting safe vehicle passage. The large trucks and equipment trailers that are utilized for well pad construction, drilling and completion operations may require a wider road width to accommodate safe travel. Road running widths should not exceed the maximum 16 foot running surface. If needed, pull offs coupled with staggered or staged traffic patterns, drivable ditches or temporary one way traffic patterns may be used. Tree clearing should be minimized during any road construction or modification to the greatest extent feasible and utilized as a Best Management Practice (BMP) for DEP storm water management.

Material

The materials used to construct new roads will vary depending on geographic location, geology, topography and commercial availability of aggregates. Some state forest districts lack sources of quality surface aggregate, while others have abundant commercial sources of crushed limestone and/or sandstone. Operators should strive to utilize *the most appropriate and highest quality* materials available. The Forest District Manager can advise operators on the location and availability of the most optimal materials available locally.

Road Base

The road base is arguably one of the most important components to the road itself. Without an adequate base the road is prone to repeated failure. All drainage and structural support issues should be addressed at the base level. The base itself should be sufficient to hold the anticipated traffic weight. Prior to the placement of surface running aggregate, the base should be crowned or cross-sloped to the same desired surface profile. 4-minus stone is the preferred road base material. This aggregate is adequate for heavy loads and is easily manipulated to achieve the desired road crown.

Soil stabilization:

Soil stabilization techniques (e.g., cement modified soil) may be utilized for road base construction or full depth reclamation (FDR). However, these techniques are not explicitly approved for all roads and the Bureau will review each proposal on an individual basis. These techniques should not be seen as stop-gap measures for repairing improperly constructed, maintained, or damaged roads. The soil stabilized layer also cannot be used as the final running surface of the road. There should be a suitable running surface such as 2A or DSA placed over the modified road base to a depth of 8 to 12 inches. Exposed soil cement (i.e. plowed free of aggregate) during freeze thaw cycles is easily broken down and can cause sedimentation issues.

It is important that all drainage features for the road are functioning properly prior to initiating soil stabilization, and that there is enough surface material covering drainage pipes to allow heavy machinery to cross.

If soil stabilization techniques are used for road base construction or FDR, road widths must not be wider than the post construction or reclamation widths approved on the ESCGP-2 permit. An operator wishing to utilize soil stabilization techniques for road construction should submit a written request to the appropriate forest district and division of operations and recreation including the following information:

- A soil analysis for the proposed area
- The composition and ratio of stabilization additives proposed (e.g., lime, fly ash, Portland cement, chemical additives)
- A description of the existing road profile and predicted road profile post-construction
- A succinct description of the process being proposed, including but not limited to what equipment will be used; how, when, and what amount of materials will be added; and curing time for the project area before traffic may utilize the road

Road Surface

The preferred running surface aggregate on public use roads is Driving Surface Aggregate (DSA). DSA is a specific driving surface aggregate that does not contain clay and silt particles and is designed to bind together mechanically. The lack of clay and silt particles reduces the likelihood of pumping or rutting during wet periods and generates less dust during dry periods. If DSA is not locally available, 2A (also known as 2A modified) can provide satisfactory performance if it is processed and placed correctly. 2RC aggregate often includes significantly higher percentages of clay and silt, which is not the most suitable material. 2A can be substituted for DSA on public use roads during heavy hauling operations. However, DSA should be applied as the final running surface aggregate when the well drilling and completion operations are complete. 2A is adequate as the final running surface aggregate for gated administrative roads not open to the public or where anticipated future traffic levels are very low.

Road Drainage

When possible, horizontal sheet flow to a natural vegetative filter strip (forest) is the preferred drainage and infiltration method when establishing new roads or managing surface drainage on existing roads. This is accomplished by eliminating drainage ditches that are parallel to the road surface on flat or slight slopes. The water is instead infiltrated immediately rather than being concentrated and moved off site. On steep side cut roads, or roads with sustained grade where obtaining sheet flow is not practical or possible, a ditch or ditches constructed parallel to the roadbed are essential for proper drainage.

Stormwater Management

Recent changes in the ESCGP-2 permitting requirements for PCSM practices are creating new and unanticipated impacts for dirt and gravel roads that are inconsistent with desired forest conditions. Infiltration basins and bio-retention ponds are not acceptable stormwater controls for state forest roads. Structural systems create wider corridors and reduce sheetflow that is important for adjacent forest ecological processes. They also collect water and can easily become a sink to important amphibians or invertebrates. Structural systems are also very costly to maintain and reduce the wild character of the forest. All available non-structural BMPs should be considered for credits in equations and the project should be broken down into drainage segments that allow for adequate volume and rate reductions.

Figure 5E-5. Example of undesirable post construction stormwater structures for a road improved for gas activities.

The following principles should be considered regarding stormwater management:

- Avoid the use of structural PCSM devices, particularly those that concentrate or hold water
- Utilize all water credits with tree retention as a primary focus
- Calculate a water budget for the site to create realistic expectations for infiltration, evaporation and transpiration
- When calculating PCSM needs, break down projects into the smallest drainages achievable to reduce the volume of water being managed
- Incorporate numerous dispersed infiltration techniques
- Follow contours to reduce cut and fill slopes and overall corridor width to aid in water management.
- When crossing contours at 90 degree angles the road should follow the highest ground possible to improve the ability to shed water from the road surface quickly and reduce erosion risk
- Avoid concentrating water in ditches and conveying it to another location wherever possible

  - Shallow, vegetated and parabolic shaped ditches are the first preference for ditch protection for slopes less than 5 percent
  - Avoid the use of rip-rap armouring as it is difficult to maintain, can be unsightly and may cause safety issues for motorists leaving the running surface
- Consider pull-offs when designing the road system that incorporate underground tanks that contain stormwater and release it slowly over time. The surface of the pull offs can also be designed as a permeable surface that further reduces runoff from the site.
- Raise cross pipes to ground level and utilize grade breaks to shed water from the road surface

Head and Tail Walls

Head and tail walls act as a retaining wall that supports the road edge at drainage cross pipe locations. These structures prevent road material sediment from washing or collapsing into the watercourse. As such, all cross pipes should have a headwall and tail wall installed.

The following principles should be considered regarding head and tail walls:

- Use natural materials that blend with the landscape
- Dry stack stone is the preferred method of building head and tail walls as it is easily repaired and replaced. Palleted stone can be easily purchased and installed.
- Pre-cast concrete may be acceptable option depending on the application and resemblance to natural materials. This option may hamper future replacement of cross pipes.
- Plastic material should not be used as it is fragile and easily damaged

Figure 5E-6. Palleted stone for drystacking head and tail walls.

Stream Crossings

Proper planning and construction of stream crossings are imperative to maintain stream habitat conditions and ecosystem function. Stream crossings should be avoided when possible and minimized when necessary. Structures such as culvert pipes, tiles or box culverts can significantly disturb the stream bed, disrupt continuity of streambed aggregate and become perched (outlet above the streambed), creating a physical barrier to the movement of aquatic organisms.

The following principles should be considered regarding stream crossings:

- The use of open bottomed structures such as arches, bottomless pipes or bridges that avoid streambed disturbance is preferred
    - When a culvert is necessitated, use a single squash pipe less than 36 inches in diameter. At least 20% of the pipe's height should be embedded into the streambed so it can fill in with natural substrate material. The pipe should be oversized to account for the 20% volume loss that is embedded and should also be wider than the bank full width.
- Structures should span the entire bank full width of the stream and allow for aquatic and terrestrial passage
- Structures should be placed at a 90 degree angle to the stream channel
- Structures should only cross streams where a uniform bank exists. Braided stream channels and bends in the stream should be avoided
- Keep structures as narrow as possible to minimize disturbance, sun exposure, effects of thermal pollution and the potential for invasive plant establishment.
- Use native material placed in a natural manner when protecting streambanks from scour.

The exposed façade of bridges or arches on public use roads should be comprised of, or made to resemble, natural materials to blend with the surrounding landscape. Visible steel superstructure components are acceptable for use on gated administrative roads provided they are temporary in nature. DEP defines temporary as 1 year or less under GP-8 permitting; however, on state forest land temporary is defined as being less than 5 years in duration. Structures intended to be in place for a longer time period should employ natural materials as outlined above. Steel substructure is acceptable for use in all bridges or arches. Steel guiderails are considered acceptable if they are constructed of self-weathering steel.

Road Maintenance:

The Bureau is responsible for the expense of road materials and maintenance on its own roads. Maintenance activities are performed at the district level by a staff of skilled employees. Roads and drainage features are regularly assessed and rehabilitated to maintain a proper crown or cross slope and minimize environmental impacts. The Bureau works closely with the Pennsylvania State University's Center for Dirt and Gravel Road Studies to develop and implement best practices for road construction and maintenance. These environmentally sound practices and techniques maximize the efficiency of operations while minimizing costs. Technical bulletins have been established and can be found at http://www.dirtandgravel.psu.edu/ .

Operator maintenance responsibilities

Operators utilizing state forest roads for commercial purposes are responsible for road maintenance and stormwater control devices. *Road Use Agreements* should outline maintenance responsibilities and expectations on an annual basis. Inspections should be conducted on a regular basis and after each storm event by the operator and district staff to determine maintenance needs and response. Potholing and rutting that affect the ability of the road surface to shed water are priorities that require immediate mitigation per the discretion of the Forest District Manager.

Winter Maintenance

The Bureau does not perform winter maintenance on its roads. Exceptions to this rule are permitted when public safety is a concern. Plowing snow, or applying anti-skid, or snow melting materials to state forest roads without prior authorization is prohibited per *State Forest Rules and Regulations*. Permission for plowing joint-use roads requires a *Letter of Authorization* or *Road Use Agreement*. Snow plows should be equipped with plow shoes set high enough that the cutting edge does not scrape or remove any aggregate from the road surface. If anti-skid is to be applied it should be comprised of crushed stone or gravel only. Examples of appropriate anti-skids are as follows: Type 2; Type 3; 6S or AS4 materials as outlined in Penn DOT form 408 and LTAP technical sheet #167. Suppliers of these materials can be found in Penn DOT Bulletin 14.

Dust suppression:

Comprehensive dust control programs are typically not utilized by the Bureau because of a lack of traffic volume. With the significant increase in traffic produced by shale gas extraction, dust has begun to affect traditional users and has created environmental and safety concerns. Dust suppressants themselves may create environmental impacts and often times increase maintenance issues and costs.

The following principles should be considered regarding dust control on state forest roads:

- Reduce speeds on state forest roads to minimize dust. *State Forest Rules and Regulations* prohibit speeds in excess of 25mph.
- Avoid convoys and stagger truck traffic to allow dust to settle when visibility and safety are concerns
- Apply only untreated fresh water as a dust suppressant
    - Potable water can retain chemicals that injure plant and aquatic life
    - Non-potable water effectively suppresses dust, but may require multiple applications daily during dry periods
- Do not apply brine or other produced fluids to state forest roads
- Manage shade appropriately within high impact and ecologically sensitive areas. Maintaining shade on the road surface will result is less dust, decrease aggregate replacement needs, and reduce large canopy breaks in interior forests.
- Apply a running surface with minimal fine clay particles such as DSA

Chemical Dust Suppressants:

The use of chemical dust suppressants should only be considered if the previously identified measures are unable to provide effective dust control. The benefits of chemical dust suppressants usually do not outweigh potential maintenance and ecological concerns associated with their use. Mineral and synthetic oil based products may show potential however more testing and observation is needed before the Bureau adopts the use of these products. The use of asphalt cutbacks (i.e., petroleum emulsions), chlorides (e.g., magnesium chloride, sodium chloride, calcium chloride), soy oils, paraffin dissolved in mineral oil, and produced fluids from well drilling and completion operations will not be permitted by the Bureau.

Any request to use chemical dust suppressants on state forest land should adhere to the following process:

1. The request should be submitted to the state forest district. The district will determine if all other alternatives have been exhausted and the project has merit.
2. The state forest district then submits an electronic Dust Suppressant Notification Form to the Recreation Section at least three days prior to the chemical application.
3. The Bureau will review the request and provide written authorization for use.
4. Beneficial and adverse impacts will be documented by the Bureau and influence future decision making.

Rehabilitation:

All state forest roads shall be restored to equal or better profile and condition than existed previously (i.e., pre-gas). The Forest District Manager will determine what restoration or rehabilitation efforts are required and if the restoration results are acceptable. Roads that are no longer used for well drilling operations should be returned to a 12-16 foot running width. Reducing the impervious area will reduce the extent of required PCSM structures for which the operator is responsible for maintaining. It is vital that final restoration is compatible and consistent with the Bureau's maintenance practices and expectations.

F. Pipelines

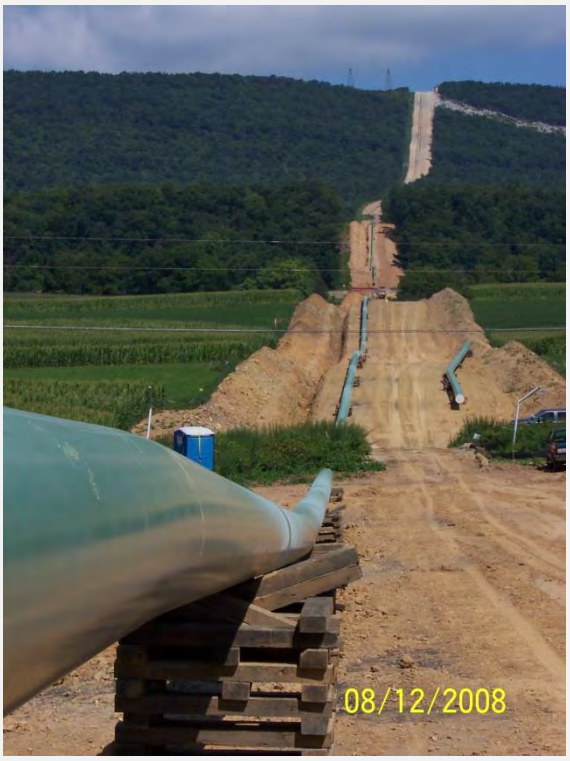


Figure 5F-1. Transmission pipeline under construction.

The development of oil and gas resources requires the construction of pipelines and compressors for delivering the product to market. Moving produced gas from the well to the marketplace requires significant planning, engineering and infrastructure development. Gathering pipelines move natural gas from multiple well pads to transmission pipelines. Transmission pipelines receive large volumes of gas from multiple gathering lines and transport it to a distribution center or storage field. Transmission pipelines are regulated. The Federal Energy Regulatory Commission (FERC) maintains oversight of interstate lines and those tied to storage fields; and the Pennsylvania Public Utility Commission (PUC) is responsible for intrastate transmission lines. Distribution pipelines move gas from the transmission system directly to the customer.

Existing pipeline infrastructure and capacity is inadequate for current and anticipated gas production needs. Operators generally prefer flexibility in designing, constructing and controlling their own pipeline gathering systems rather than relying on independent pipelines. However, independent pipelines accommodate the needs of multiple operators, reduce the need for additional rights-of-ways, decrease costs and minimize unnecessary impacts. Well planned rights-of-way corridors are necessary for the efficient transportation of natural gas resources and minimization of adverse impacts.

The impacts associated with rights-of-way corridors may be far reaching if not managed properly. Pipeline corridors cause forest conversion, disrupt landscape connectivity, encourage the establishment of invasive plant species, fragment core forest blocks and alter the existing habitats of many plant and animal communities. In addition, the corridors can promote unauthorized vehicular access and negatively impact important social values such as aesthetics, wild character and recreational use.

However, rights-of-way corridors can be managed to provide multiple benefits. The vegetation along the linear openings can be feathered to promote vertical and structural diversity and early successional habitat for a wide variety of plants and animals. Construction debris such as rock and tree tops can be utilized within the corridor to enhance structural habitat for a wide variety of small mammals and reptiles. Thoughtful design, construction and timing techniques can minimize impacts to wild character and promote opportunities for healthful outdoor recreation on pipeline rights-of-way.

Pipeline Siting

Strategic and tactical pipeline planning should occur early in the oil and gas development process. A strategic landscape approach is required to consider, evaluate and plan potential routes for rights-of-way corridors. Landscape planning considers land management techniques and site specific values and needs that promote and balance social, economic

and environmental objectives amongst competing land uses. The location of rights-of-way should accommodate operational needs while maximizing pipeline efficiency, be compatible with current land use, employ avoidance or minimization techniques as appropriate and avoid duplication of infrastructure. The objective of strategic planning is to assure the pipeline is located in the most appropriate place, and with the least amount of conversion, within the landscape.

Tactical planning efforts must also extend to pipeline construction and infrastructure placement within the corridor. Items to consider include: safety; temporary workspace and permanent rights-of-way widths; pipeline materials and capacity; pipe spacing and placement within the corridor; burial depth in relation to surface use and supportable loads; integrity protection; future maintenance; waterbody crossings and operator needs. The objective of tactical planning is to assure the pipeline is sited appropriately within the corridor and in a manner that is consistent with the existing resources, uses and values.

The following principles should be considered when planning and siting rights-of-way corridors on state forest lands:

- Identify areas that are incompatible with rights-of-way development and preclude development
- Identify areas that don't preclude development, but require additional consideration due to significant ecological, cultural or recreational resources.
- Establish a clear need for the rights-of-way and investigate alternative routes. The location of the preferred route should be justified.
- Work within the constraints of existing corridors to maximize pipeline capacity. "Lift and lay" replacement of pipelines that increase capacity are preferred over the addition of a new line.
- Employ long term planning and consider infrastructure capacity that accommodates current and future needs
- Avoid the creation of new corridors when opportunities exist for incorporating rights-of-way into existing disturbances
- Minimize fragmentation by co-locating infrastructure with existing disturbances such as roads and other rights-of-way corridors
- Minimize permanent and temporary rights-of-way widths and maximize infrastructure capacity within the corridor to the extent that workability and safety are not jeopardized
- Consider alternative construction techniques that minimize the construction footprint (i.e. trenchers). Utilize roads or adjacent rights-of-way for temporary workspace.
- Consider burying pipelines within the road footprint when maintenance needs and safety can be maintained
- Encourage companies with adjacent rights-of-way interests to work cooperatively in the use, management and siting of infrastructure
- Encourage proposals that accommodate the needs of multiple operators and avoid duplication of infrastructure on the landscape
- Bury pipelines deep enough to accommodate anticipated surface activities
- Apply setbacks where forest connectivity, recreation and aesthetics are the primary values. Work within topographical constraints to minimize aesthetic impacts and 'hide' infrastructure. Use 'dog-legs' to break up the visual effects of long linear corridors.
- Coordinate the timing of pipeline installation and construction activities to avoid conflict with recreation during periods of heavy use. Consider restricting operator activity during high conflict dates or develop alternatives as applicable.

- Consider opportunities for enhancement of existing recreation and co-locate low impact recreational trails within rights-of-way corridors where appropriate
- Minimize probable conflict with the unauthorized use of rights-of-way corridors by off road vehicles
- Consider appropriate signage measures.

Pipeline Materials

Attention should be given to the type of materials used when constructing the pipeline. Material selection is an up-front activity that considers operational needs, cost, availability, flexibility, performance and benefits afforded with each material. Available pipeline materials include steel, flexible steel and High Density Polyethylene (HPDE).

High Density Polyethylene (HDPE) is corrosion resistant and has many decades of successful use in low pressure oil and gas service. Because of its low friction characteristics, HDPE has a higher flow rate than steel pipe of comparable diameters. HDPE does not require cathodic protection to maintain the integrity of the pipeline. However, HDPE is pressure and temperature limited. HPDE is commonly used to transport water and low pressure gas.

Flexible steel, spoolable composite or bonded reinforced thermoplastic pipe consists of two layers of HDPE pipe sandwiched around a reinforcing steel layer. It is a ductile product with an average bending radius of three to five feet. Flexible steel is corrosion resistant, does not require cathodic protection, provides superior flow characteristics, accommodates high pressures and is produced in long lengths which minimizes the number of connections and welds. The pipe can be installed above or below grade and requires less equipment to do so thereby reducing the operational footprint. It is well suited for trenchless installation, such as directional boring, and can be sleeved through existing pipes for rehabilitation purposes. While flexible steel pipe offers numerous benefits, currently capacity is limited to pipe diameters ranging from two to eight inches. Flexible steel pipe is commonly used to transport water and high pressure gas.

Given the limited pressure tolerance of HDPE and size restrictions of flexible steel, the vast majority of natural gas transmission lines are made of high strength steel. Steel, when not otherwise protected, can corrode resulting in a loss of pressure-carrying capacity. These pipelines must be properly coated and have cathodic protection systems to maintain integrity. The use of cathodic protection systems requires additional spacing between co-located pipelines within the rights-of-way corridors resulting in an increased operational footprint.

The following principles should be considered regarding pipeline materials:

- Consider pipeline materials that promote the minimization of necessary safety offsets (i.e. flexible steel versus steel)
- Consider pipeline materials with coatings that are consistent with the re-establishment of vegetative habitat, tolerant of woody roots and maintain pipeline integrity

Pipeline Stream Crossings

Stream habitat is abundant across DCNR lands and provides habitat for an entire community of organisms. This includes, but is not limited to, invertebrates, reptiles, amphibians, and fish. Riparian areas are critical to stream health as they provide stream bank stability, shade for the stream, filter capabilities of runoff, food input to stream ecosystem

(foliage and terrestrial insect input), nesting habitat for songbirds, food for wildlife (mast/berries), and a visual screen. Care must be taken when considering a stream crossing to minimize impacts to the aquatic community. The following practices will help ensure aquatic ecological integrity.

The following principles should be considered to minimize disturbance during stream crossings:

- Crossings should be perpendicular to the stream
- Stream crossings should focus on straight sections of the stream
- Narrower stream sections are preferred over wide stream sections for crossing
- The number of stream crossings should be minimized

The following principles should be considered during construction of stream crossings:

- Minimize ROW width within the riparian corridor
- Install trench plugs on both sides of the stream
- Bury the pipeline at a sufficient depth to prevent erosion from impacting the pipe
- Screen pump intakes to minimize fish mortality
- Trap and transfer fish that are isolated during the dewatering process
- Place sediment filter bags at least 100 feet away from the stream if possible to allow sediment to settle out before water returns to the stream
- Avoid impacts to spring and fall breeding organisms in cold water streams by constructing between June 15th and Sept 30th
- Minimize potential erosion and sedimentation issue by avoiding disturbance within 50 feet of the stream until construction of the crossing is imminent.

Note:

BMP Avoidance Measures Based on Aquatic Resources Present:

Resource	*Avoidance Period*
Naturally Reproducing Wild Trout Streams	*October 1- December 31*
Class A Wild Trout Streams	*October 1-April 1*
Stocked Trout Streams	*March 1- June 15*

The following principles should be considered regarding restoration of stream crossings:

- Stabilize stream banks and restore the streambed within 24 hours of construction activities and before returning flow
- Use biodegradable material for erosion control to reduce risk of wildlife entrapment
- Revegetate the disturbed areas 100 feet on either side of the stream as soon as possible
- Revegetate the 50 foot riparian area on either side of the stream with vegetation similar to adjacent undisturbed lands. No trees should grow within 15 feet of the pipeline
- Limit vegetation maintenance in the riparian area to the greatest extent possible. A 10 foot native herbaceous corridor may be managed over the pipeline
- Retain stumps in the temporary work space in riparian areas to promote sprouting. Native trees should be replanted if this is not possible.
- Install slope breakers across the ROW on slopes greater than 5 percent

- Utilize Anti-degradation Best Available Combination of Technologies (ABACT) referenced in Chapter 17 of DEP Erosion and Sediment Pollution Control Manual

Vegetation Management and Corridor Rehabilitation

The Bureau of Forestry prefers and supports an Integrated Vegetation Management (IVM) approach to vegetation management within rights-of-way. IVM promotes a sustainable, low-growing vegetation community that provides quality wildlife habitat while remaining compatible with corridor use. In this scenario, only undesirable vegetation with the potential to interfere with pipeline integrity is treated using a combination of chemical, cultural, biological, mechanical or manual techniques. IVM separates the corridor into two distinct management zones (Figure 5F-2). A low-growing herbaceous community is encouraged within the pipe zone. Herbaceous vegetation will not obscure visual inspection of the pipeline and the roots systems are shallow enough to avoid contact with the pipe and potentially jeopardize integrity. The border zone functions as a transition between the high canopy of the existing forest and the herbaceous vegetation in the pipe zone. Shrub species are encouraged in the border zone to feather or soften the hard edge of the corridor. The application of IVM dramatically enhances wildlife habitat by providing a diversified food source and increased escape cover. IVM has a proven track record of maintaining transmission reliability, reducing long-term vegetation maintenance costs, improving aesthetics, and minimizing the establishment of invasive plant species.

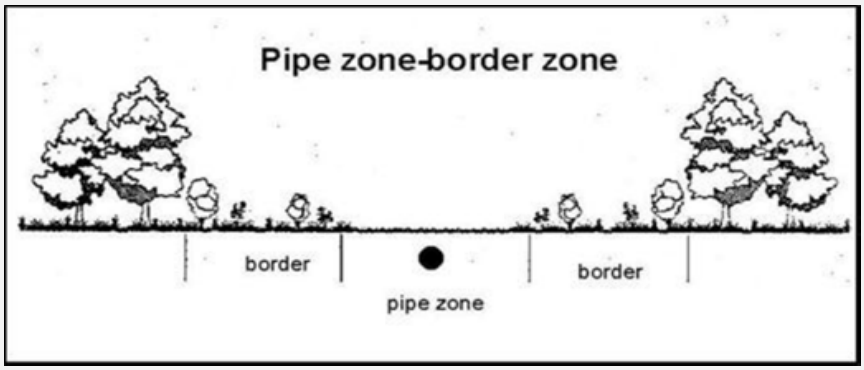


Figure 5F-2. Illustration of pipe zone-border zone.

The following principles should be considered for vegetation management and corridor rehabilitation on state forest lands:

- Maintain the pipe zone in an herbaceous state using native plant species. Mowing may be required every 3-5 years.
- Plant a variety of native shrubs, grasses and forbs in border zone to create vertical and structural diversity. Supplemental plantings can be incorporated within the border zone of existing rights-of-way.
- Feather vegetation in the border zone by leaving vertical structure between the pipeline and the undisturbed forest
- Retain stumps in temporary workspaces to promote re-sprouting of vegetation. Supplement with native plantings as necessary.
- Treat vegetation when it threatens pipeline integrity or encroaches on the pipe zone
- Minimize rights-of-way widths within riparian areas and retain stumps and vegetative cover. Supplement with plantings of native grasses, forbs, shrubs and trees. Plan waterbody crossing proactively and consider directional drilling or boring techniques when appropriate.

- Incorporate downed woody debris within the corridor and along above-ground temporary pipelines to facilitate wildlife crossings
- Improve habitat for threatened and endangered species near confirmed locations. Activities could include rock piling, shrub planting or establishing crossings with escape cover.
- Maintain soil productivity during construction and rip the soil to mitigate compaction where feasible

Rights-of-Way Requests

Lessees or subsurface owners have the right to construct pipelines to transport oil and gas produced on state forest land. These rights are specific to the lands described in the lease agreement or recorded reservation. To construct a pipeline on state forest lands for which they do not hold such rights, the owners/lessees must obtain a *License for Right-of-Way*. The Bureau has developed a formal process to administer such requests. Central office, in cooperation with the affected state forest district, will administer right-of-way requests that meet any of the following thresholds:

1. The project is under the jurisdiction of Federal Energy Regulatory Commission (FERC) or the Pennsylvania Utilities Commission (PUC)
2. The disturbance footprint is equal to or greater than 25 acres
3. Projects that cross Bureau management boundaries (i.e. forest districts)
4. Other right-of-way requests as determined by the Forest District Manager or central office staff

The local state forest district will administer all other right-of-way requests.

G. Compressor Stations

Compressor stations are commonly used in association with gas production and pipelines. Compression is needed to maintain transportation of natural gas between two points due to declining reservoir pressure, differential pressures in pipeline systems, and/or friction loss resulting from topography, fluids, or pipeline materials. Compressor stations utilize turbines, motors, or engines powered by electricity, diesel fuel or natural gas to reduce the volume of gas and increase pressure to move it from one location to another.

Figure 5G-1. Newly constructed compressor station.

During production, compressors regulate the pressure of gas to facilitate production. Additional compression may be necessary depending on the length of the gathering line, to increase pressure as the gas enters larger transmission lines.

The specific needs of each development area dictates the design, configuration, and specifications of each compressor station. Numerous compressor engines are often required at a site to generate the desired level of compression which may change over time. These sites may also include gas related infrasture such as separators which capture undesirable particle or liquids which may condense out of the gas stream as it flows through the pipeline. This function maintains integrity and extends the life of the pipeline system. Compressors are generally housed within a structure and under roof. Pipelines, fans, the volume and pressure of gas, and other ancillary infrastructure may contribute to the noise level of compressor stations.

There are two strategies for locating the compression necessary for successful gas production:

Distributed:
The compressors are co-located on the established well pad and service all the producing wells within that pad. Compressors are smaller, generate less horsepower and are more numerous than those associated with centralized compression. The configuration is dynamic and compression is moved and adjusted as necessary.

Centralized:
The compression is strategically located within the development field to service gas produced from multiple well pads and dozens of individual wells. Centralized compression often requires multiple large units which produce considerable horsepower. These facilities typically require the development of an additional pad site to accommodate the necessary infrastructure.

Because of the size of the land base, state forests provide a unique opportunity for dispersed low-density outdoor recreation that cannot be obtained from small forest areas or from private ownership. The undeveloped wild character of state forests offers peace, solitude and a feeling of remoteness for many users. Compressor stations are industrial in nature, employ artificial lighting, and produce continuous noise-all of which can dramatically affect a user's recreational experience and generate conflict. Most sources of potential noise conflicts on state forest land are temporary in nature; however, compressor stations produce continuous noise and have the potential to impact nearby residents, the recreating public, wildlife, and wild character. Thus, compressor stations are considered predominately incompatible with state forest resources, uses and values. Alternatives that avoid siting on state forest lands should be pursued where possible. The Bureau's objective is to maintain and perpetuate a visitor's anticipated recreational experience on state forest lands.

When no suitable alternatives exist and a compressor station must be sited on state forest lands, consider the following:

- Compressor stations are inconsistent with primitive and semi-primitive non-motorized Recreational Opportunity Spectrum (ROS) classes and will not be located in these zones
- The operating noise level of the compressor station should not exceed a L_{dn} of 55 db(A) at any distance greater than 300 feet from the compressor building
- Setback distances from ecological, recreational or other important resources should be upheld
- Siting location within the landscape, topography, vegetation and prevailing wind direction is attenuation that can dramatically influence noise. Siting considerations include the following:
    - Employ landscape level planning when siting compressor stations and other infrastructure to minimize potential impacts to state forest resources, uses and values
    - Co-locate compressors with other infrastructure or roads to decrease conversion and fragmentation in core forest areas. Increase setback distances when recreational resources or social concerns exist.
    - Use "dog-legged" access roads to reduce sound propagation and aesthetic impacts
    - The safety and security of both personnel and infrastructure are primary concerns for operators
- Vegetative screening should be promoted or developed around compressor stations to minimize aesthetic and noise impacts. Studies have shown that vegetation may reduce noise levels by 3 – 8 dB (A).
    - Utilize existing vegetation and enhance with a diversity of conifer and shrub species to create vertical stratification that reduces visual and noise impacts
    - Vegetative screenings should be located as close as practical to the noise source. Wider and denser plantings that block the line of sight are preferred.
- Cluster with existing infrastructure and development, limiting the size of the footprint to what is necessary
- Recommended colors for the facades of all buildings include forest green, brown, gray, black or natural stain
- Permanent outdoor lighting of compressor stations should be avoided and security cameras should only monitor infrastructure within areas posted and restricted from public access
- Field observations suggest that electric compressors may generate less noise than those powered by other means. These compressors require three-phase electrical power, which may not be readily available. Bringing electric power to the site may require additional rights-of-way and be cost prohibitive.

Operators are strongly encouraged to quantify the existing ambient noise level at the proposed location during “leaf off” conditions before construction of the compressor station. A minimum of 24 consecutive hours is recommended to quantify the existing ambient noise level of the location.

H. Native Planting and Seeding

A portion of the Bureau of Forestry's mission is to ensure the long-term health, viability, and productivity of the Commonwealth's forests and to conserve native wild plants. As the jurisdictional authority over plants in the Commonwealth (i.e., the Wild Plant Program) we encourage the use of native plant species for rehabilitation projects on state forest land. Native species provide enhanced wildlife habitat and forage, increase the biodiversity value of disturbed sites, and improve ecosystem integrity across landscapes. Native species are particularly important in areas that support populations of species of concern, contain wetlands or have a pristine character.

Supplemental planting, reclamation, and restoration are common practices on state forest lands after timber harvesting, right-of-way creation and gas development activities. Native plant species are preferred but at times non-native plant species may also be utilized. Seed mixes including non-native plants should be carefully chosen to ensure that these species are eventually replaced or succeeded by the preferred native plant species and have no known potential to become invasive.

For specific guidance on planting and seeding with native species, and for lists of species prohibited on state forest lands, refer to the Appendix: Planting and Seeding

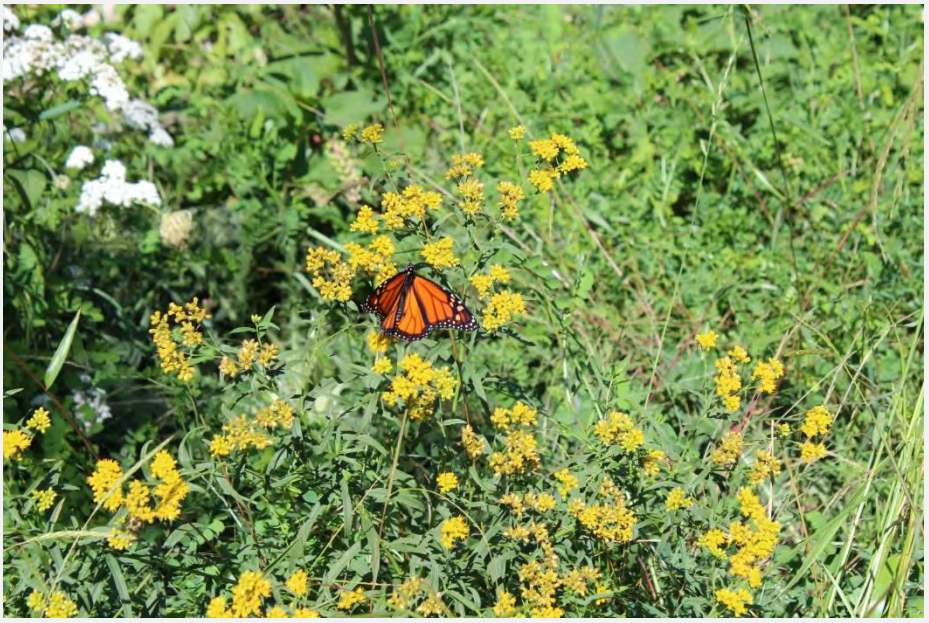


Figure 5H-1. Native plant species support a wide diversity of fauna.

The following should be considered when planting on state forest lands:

- Native grass, legume and wildflower mixes for cover and stabilization should be used within all disturbed construction areas unless otherwise noted by the Forest District Manager
- The seed mix used should provide for immediate stabilization and reduce the chance of invasive plant species establishment. A cover crop must always be planted with a native grass and/or herbaceous seed mix (e.g., oats or barley for spring plantings, wheat or cereal rye for fall plantings).
- A cover crop must always be planted with a native grass and/or herbaceous seed mix (e.g., oats or barley for spring plantings, wheat or cereal rye for fall plantings)
- Native wildflower species can be added to native warm season grass seed mixes to increase diversity and attract native pollinator species
- Native species seed mixes should be planted from late April through May to assure successful establishment. When there is a need to plant outside this recommended window, utilize an annual cover crop to stabilize soils and overseed with a native seed mix the following spring.

- Native warm season grasses, legumes, and wildflowers do not need an addition of fertilizer or lime to be used when planting, except in cases of extreme lack of topsoil (i.e. mine spoil piles), in which case only fertilizer should be used
- After seeding, all seed mix tags should be collected from the seed bags and provided to Bureau of Forestry staff to be included in the permanent tract file
- Species with rare, threatened, or endangered status (see the PA Natural Heritage Program (PNHP) website) should not be planted unless approved by the Wild Plant Program as part of a Species Recovery Plan
- Native plant (including tree and shrub) species with no state or federal-listing status may be planted. Pennsylvania-originated growing stock or seeds and PA Ecotypes of certain grass species should be used whenever feasible. Care should be taken to plant native species within their natural geographic range.
- Justification and stringent monitoring will be required for use of non-native planting stock or seed including cultivars and hybrids on state forest land. Please refer to the Non-native Assessment Document.
- Conifers can be used as a visual or acoustic screen to reduce edge effect into the forest and provide cover for wildlife
- Planning is essential when ordering seedlings. For instance, Penn Nursery requires an advance notice before seedlings will be available.

I. Non-Native Invasive Plants

Figure 5I-1. The establishment of non-native invasive plants, such as reed canary grass, can cause significant environmental and economic impacts to state forest lands.

Non-native, invasive plants are one of the largest threats to natural ecosystems in Pennsylvania. These plants grow quickly and aggressively, displacing or outcompeting native plants. Invasive plants are usually introduced into a region far from their native habitat. In the new location, there may not be any natural enemies, pests, or diseases to keep the invasive plant population under control in Pennsylvania. Invasive plants can severely degrade forests, wetland and riparian habitats and reduce ecosystem function.

Bureau of Forestry vegetation monitoring has shown that invasive plant species are colonizing disturbed areas around natural gas infrastructure on state forest lands. Construction activities associated with oil and gas development (e.g., well pads, pipelines, roads) create new disturbances and pathways which provide opportunities for non-native, invasive plants to establish and spread. Invasive plant seeds can be moved by equipment, vehicles and the use of infested soil and fill material.

Please refer to Appendix: Non-native Invasive Plant Management for specific best management practices regarding non-native invasive plant management.

Prevention

The phrase “an ounce of prevention is worth a pound of cure” is the epitome of non-native invasive plant species management. It is more efficient to prevent the plants from becoming established than treat them once established. Methods that aid in prevention include:

- Utilizing previously impacted areas and applying construction methods that reduce disturbance, limiting the acreage available for colonization by invasive plants
- Cleaning equipment appropriately prior to moving it to a new site reduces the likelihood of seeds or other plant parts being inadvertently carried into previously uncontaminated areas
- Utilizing weed-free material (i.e., seed, soil, gravel, mulch)
- Pre-treating pre-existing populations prior to disturbance reduces potential spread during and after construction

Detection

On-going early detection following disturbance can identify new occurrences when they are easier to manage and will facilitate the implementation of rapid control measures that increases the effectiveness of treatment while reducing costs. Identification of new populations early in the development phase promotes the effectiveness of a comprehensive management control plan. A pre-construction inventory is recommended to determine if invasive plants are already present**;** however this is not currently required for development on state forest lands. Initial surveillance for invasive plants should take place while surveying for infrastructure placement.

Figure 5I-2. Japanese knotweed establishing along the edge of a well pad.

Following construction, routine botanical monitoring for invasive plants is essential to minimize control costs and increase effectiveness of treatments. Initially, this monitoring will detect species that have established as a result of being brought in on equipment or in fill material. However, as the construction phase ends and the production phase proceeds, invasive plant monitoring will detect plants that were brought to the site by wildlife, namely birds, and have colonized the unreclaimed edges of the infrastructure.

Control

The operator should implement management and control measures for all new infestations discovered. The Bureau of Forestry is responsible for providing specific treatment and control prescriptions for any invasive plant populations that are to be treated on state forest lands. Management and control should be species specific and may require continuous treatments to be effective. In some situations, it may be best to wait another growing season to assess the extent of spread before implementing management techniques.

State forest lands are certified by the Forest Stewardship Council (FSC). The use of any chemical or herbicide must adhere to the standards of FSC, and be tracked and reported. All management plans should be coordinated and approved by the Bureau.

Please refer to Appendix C: Non-native Invasive Plant Management *for the complete guidelines.*

J. Site Rehabilitation

Oil and gas development and associated drilling activities disturb and fragment state forest land. The Bureau's goal is to reduce the impact of fragmentation on forest habitat by restoring sites to their full ecological function prior to disturbance, or reclaiming sites to a state that is consistent and advantageous for state forest purposes. With effective site rehabilitation planning and implementation, suitable habitat can be created for many species of plants and wildlife during interim reclamation and final restoration of gas-related sites.

Site rehabilitation should be considered a process with many phases, such as: stabilization for erosion and sedimentation control; interim reclamation; habitat enhancement; reforestation; and/or full complete forest restoration. Whatever form rehabilitation projects take, the objective is to stabilize the site following disturbance and re-establish ecosystem function. The Bureau of Forestry, in contrast to current DEP regulations, does not consider stabilization for erosion and sedimentation control to be the final step in site rehabilitation.

Figure 5J-1. Recently rehabilitated pipeline corridor. Shrub plantings are protected from herbivory by fencing.

Explanation of Terms

The terms revegetation, reclamation, restoration and rehabilitation are often used interchangeably but have different meanings to the Bureau of Forestry. The definitions become important when determining final goals for a site and for clarification of expected outcomes. The word restoration is used throughout this document, but often in the short term, interim reclamation is taking place in the field, with final restoration to be completed in the future. The terms are clarified below. A full ecological restoration project often involves all steps defined below.

Rehabilitation: Rehabilitation refers to the overarching act of mitigating some type of land-use change or disturbance, which may involve tree cutting, vegetation removal, soil disturbance, and/or loss of ecosystem function. Rehabilitation is a sliding scale, with required stabilization at the "low" end and complete ecological restoration at the "high" end. Rehabilitation projects often seek to stabilize soils, increase plant and wildlife diversity and/or improve ecosystem functions. Additional considerations for planning all types of rehabilitation projects are given in Appendix D.

> ***Passive rehabilitation***: Passive rehabilitation is an activity where the degradation causes are identified and removed and the area recovers without further assistance to a more desirable condition. This activity is often appropriate for communities that have only been slightly impaired. This often involves opportunistic forb, shrub and tree species colonizing the site without human aid.
>
> ***Active rehabilitation:*** Active rehabilitation in highly disturbed communities or degraded sites includes the application of management techniques such as soil stabilization, grass establishment, invasive plant control and

shrub or tree planting. These applications are undertaken with a desired final landscape in mind. All forms of rehabilitation that involve site preparation, soil remediation, or stabilization and planting are active rehabilitation projects.

Revegetation: Revegetation refers to planting grasses and legumes over a disturbed site or bare soils. This is the site stabilization required by DEP regulations to protect exposed soils at the site from accelerated erosion and sedimentation. The Bureau of Forestry considers this only the starting point for expected site rehabilitation**.** The Bureau's Planting and Seeding Guidelines (Appendix B) provide additional considerations for revegetation projects.

Reclamation: Reclamation reduces the overall size of the disturbed area by using native forbs, shrubs, and trees to begin to rebuild organic topsoil, improve native plant diversity, and encourage site use by native insects and early successional wildlife. Reclamation projects often seek to re-establish the original form of the vegetation community at the site and begin the process of rebuilding full ecological function. Aside from ecological reclamation, disturbed sites could also be used for other state forest purposes, such as trailheads. Additional considerations specific to reclamation projects are given in Appendix F.

Interim Reclamation: Interim reclamation refers to minimizing the original disturbance footprint by rehabilitating all portions of the site not needed for immediate production operations, while also maintaining safety and space for safe operation of active portions of the site. For example, interim reclamation is possible when temporary workspace for a right-of-way is no longer needed, or when the size of a pad can be reduced to only that which is necessary for operation and maintenance.

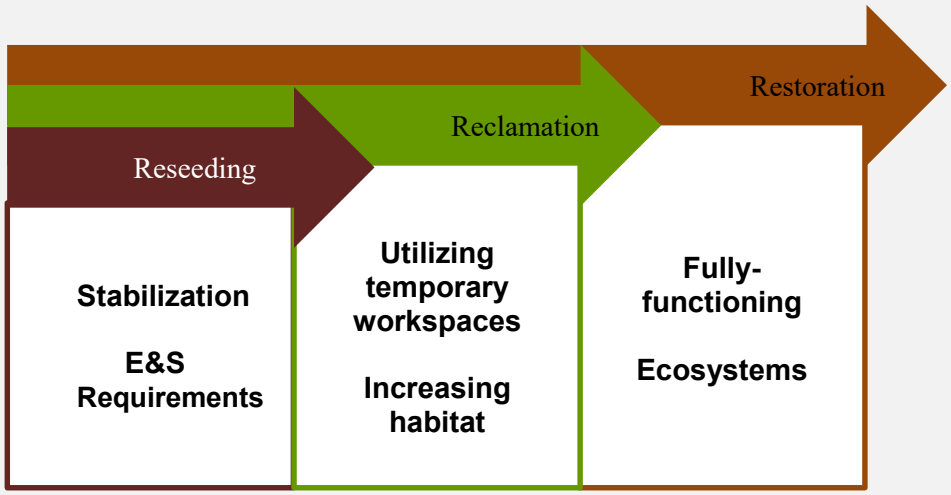
Final Reclamation: Final reclamation refers to the practice of reclaiming a majority or the entire disturbed site by removing infrastructure, fencing and aggregate material; spreading topsoil and re-contouring the site; and planting native grasses, shrubs and trees. Final reclamation is, in essence, the beginning of restoration. At this point, the site can proceed through natural processes toward the final restoration of all ecosystem functions that existed prior to the initial disturbance.

Figure 5J-2. Reclamation often includes the re-establishment of a tree and shrub community.

Restoration: The Bureau of Forestry defines restoration as the return of a disturbed site to the functioning ecosystem state prior to disturbance. Ideally, this functioning state would be the same as what existed at the site prior to disturbance; however, depending on ecological conditions, this may not always be possible. In these cases, the Bureau may seek to provide similar ecosystem functions towards a completely restored state. This type of rehabilitation accelerates the recovery of an ecosystem's health and sustainability, and provides the appropriate pathways for ecosystem functions to become self-sustaining. Merely recreating the landscape without ecosystem functions does not constitute restoration. Additional considerations for restoration projects are provided in Appendix D.

Rehabilitation Timeline

Rehabilitation actions at a site often rely on natural processes to fully achieve project goals. The concepts of the stages of site reclamation are fully appreciated when considered in the context of time. Often these natural processes happen slowly, resulting in the following timeline for rehabilitation activities:



Years Following Disturbance

1 year	**Revegetation** – Site stabilization, to meet DEP E&S requirements
	Reclamation
5-10 years	***Interim reclamation*** – Temporary workspaces seeded with native grasses and wildflowers and trees and shrubs planted at edges.
10-30 years	***Final reclamation*** – Ecosystem function has been returned to the entire site; but the site has not reverted to the pre-disturbance state (i.e, conifer plantation, wildlife habitat opening)
30-100 years	**Restoration** – Pre-disturbance ecosystem functions have become self-sustaining

Rehabilitation Planning

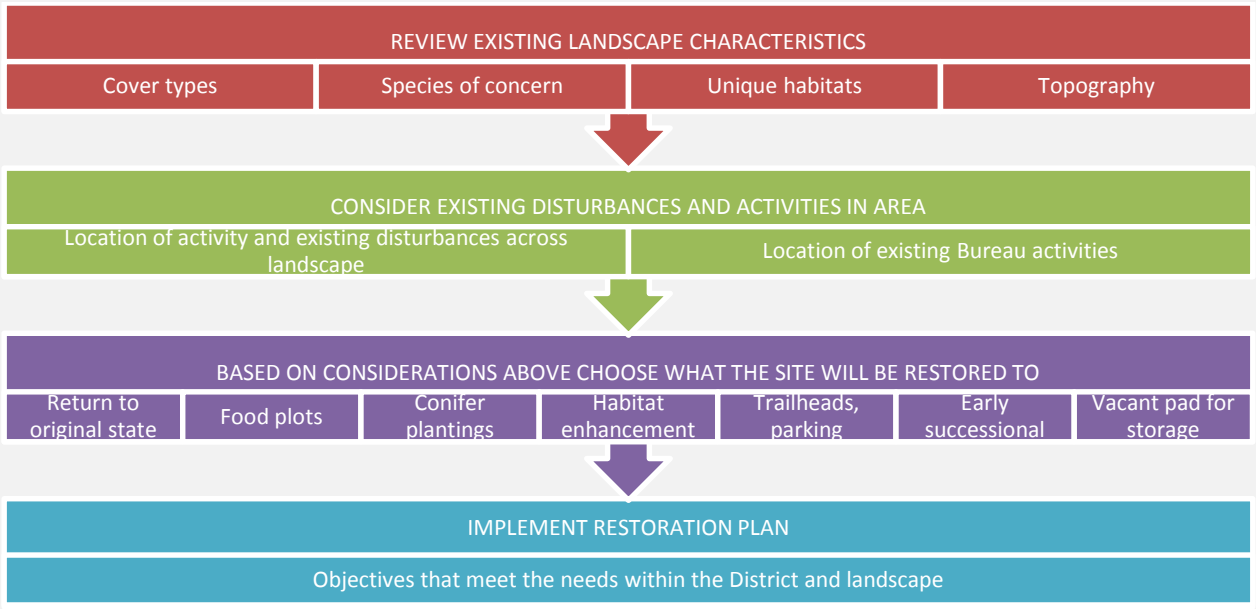
Long term rehabilitation goals should be developed early in the site planning process. Goals are the ideal states and conditions that site rehabilitation attempts to achieve. Objectives are specific actions undertaken to achieve the goal. Objectives for site restoration should be formulated based on an assessment of the site's quality, soil function, community type, natural features and plant and wildlife species present. Landscape-scale assessments and the site's surrounding habitat and natural community types should also be considered. The Bureau will identify rehabilitation goals and objectives for the entire development area and communicate those to the operator early in the planning process. Written goals and objectives provide the foundation for rehabilitation activities and clearly identify the Bureau's expectations for site reclamation and/or restoration to operators.

Starting points for developing goals and objectives for the site or tract:

Establish a baseline inventory of existing conditions including: soil quality; water quality; plants and wildlife using the site; and any other information that may be pertinent for reclamation and restoration. This information is especially important if the site is different or unique from the surrounding landscape.

Consider the extent of potential impacts to each site and identify conditions that will need to be improved following disturbance activities. Soil compaction, erosion and sedimentation and vegetation removal will adversely impact the site at varying scales. The level of rehabilitation should be commensurate with the degree of impact to the site.

When developing goals and objectives for the site or tract, consider these points:



Opportunities for habitat enhancement should be utilized whenever possible throughout the interim reclamation and final restoration continuum. Examples of habitat enhancement include:

- Incorporating brush and rock piles at forest, stream and wetland edges near the site to enhance wildlife habitat
- Using native warm season grasses, legumes and wildflowers to create grassland habitat and provide food sources for native pollinators
- Feathering the edges of the site by gradually blending the opening to the adjacent forest. This can be done by adding several rows of shrubs between the site and the forested cover or by leaving stumps cut low to the ground in the temporary workspace to re-sprout.
- Creating nesting opportunities for raptors and other birds using artificial nest structures such as platforms
- Planting at least two types of trees on site to provide soil stability, species diversity and opportunities for early-successional wildlife
- Leaving/placing down woody debris benefits reptiles and amphibians by providing refugia

Interim Reclamation Planning

Figure 5J-3. Ripping compacted soils is critical to successful rehabilitation and long term restoration.

After well completion and stimulation activities have concluded a significant portion of the well pad may no longer be necessary. Interim reclamation can begin with the transition into the production phase. It is important that the Bureau and operators communicate full site rehabilitation plans at the interim reclamation stage to facilitate cooperation towards achieving long term rehabilitation goals.

Materials used to surface the well pad should be removed in all areas no longer needed for production. In many cases, is it imperative that planning where the stone pad paving material will be taken as reclamation commences is done when the infrastructure is constructed. Following removal of pad surface material, the subsoil should be ripped at least 8 inches (deeper ripping is preferred). Efforts should be made to recreate the original contours of the site that existed pre-disturbance. Following ripping of subsoils, topsoil should be re-spread over areas to be reclaimed. Stockpiled topsoil should be redistributed and graded with minimal compaction or "dumping" techniques as recommended by the Appalachian Restoration and Reclamation Initiative (ARRI). It is essential that the final grade leaves the soil loose and rough, creating an optimal rooting medium for seed and planted vegetation. Vegetation should be monitored to ensure that it is successful and free of invasive plant species.

Final Restoration Planning

Final restoration will begin when the production phase ceases for a well or it is no longer economical to maintain. At this point in time the well shall be plugged and all remaining infrastructure and site improvements can be removed. The determination that a site is reaching or has reached final restoration will be made by the Bureau of Forestry. Sites will then be evaluated for success at meeting restoration objectives and routinely monitored to ensure long term goals are met.

Please refer to Appendix F: Site Rehabilitation for the complete guidelin

6. The Review and Approval Process

The Bureau extensively reviews all gas activities and infrastructure proposed by the operator. Projects are first evaluated from a landscape or tract level perspective. To facilitate this portion, the Bureau should be provided with the operator's unconstrained conceptual site plan as early in the development process as possible. The Bureau will evaluate the tract level plan and identify known areas of concern or potential conflicts. Staff will then coordinate with the operator to develop an infrastructure layout that satisfies the needs of both parties and serves as the framework for future tract development.

The second portion of the review focuses on the siting of individual infrastructure components. These comprehensive reviews are performed by the state forest district in consultation with central office program areas. The objectives of this review include: minimizing potential adverse impacts; balancing competing and sometimes conflicting state forest resources, uses and values; confirming that well sites are geologically sound and in compliance with lease terms; and assuring the efficient extraction of gas resources . The process for the review of individual infrastructure components is outlined and described below.

Review and Approval Process

A. *Submissions:*

At a minimum, the operator should submit the following to the Bureau for review:

- Map delineating the planned activity in hardcopy along with ESRI ArcGIS compatible shape files or feature classes
- Narrative of the project, including the type of activity being performed, timing and areas impacted
- Any available correspondence or documentation related to PNDI, PHMC or ecological surveys
- Waiver requests and justifications as applicable

B. Desktop Review:

A desktop review is performed by the state forest district prior to a field visit with the operator. The district will function as the lead during the desktop review and will consult and collaborate with central office program staff. This review determines if the planned gas activity is in conflict with recognized state forest resources, uses, values and operations. The review includes:

- Non-development areas as specified by lease
- Areas of special concern as specified by lease
- Required setbacks
- Potential sensitive resources as identified through aerial imagery
- PNDI review of rare, threatened and endangered plants, animals, communities and invertebrates
- Water course designation (e.g. HQ, EV, WTS)
- Wetlands and other water resources
- Known cultural resources as identified by PHMC

- Recreational trails, trailheads, high-use areas and ROS zones
- Viewsheds, vistas and aesthetics
- Landscape plans (review landscape narrative and inventory info)
- Timber harvest plans
- Soil surveys
- Well spacing and technical compliance with the lease

The desktop review will define areas requiring additional investigation in the field.

> *Note:*
>
> *Projects involving water withdrawal requests will be reviewed by central office staff and forwarded to the Bureau of Topographic and Geologic Survey for sustainability review.*

C. *Field Review:*

Following the desktop review, a field review may be necessary to discuss location details with the operator and to investigate and substantiate those resources which may be impacted by the activity. The field review is comprised of the items below and will be performed by district staff with assistance from applicable central office program areas, as necessary.

Based on the outcome of the desktop review, the presence of the following resources will be assessed in the field review:

- Wetlands, vernal pools and spring seeps
- Cultural resources
- Ecologically sensitive habitat or potential habitat for rare, threatened and endangered species
- Current or potential timber value
- Other unique or ecologically significant features
- Recreational and aesthetic resources

> *Note:*
>
> *Field reviews should be conducted during the appropriate time of year for the target species or resource.*
>
> *A single field review should be sufficient at evaluating sites, although there are instances when multiple field visits are necessary*

Operators should not submit permit applications until the field review and all necessary surveys have been completed. This practice improves efficiency and eliminates the need to modify permits due to unanticipated survey results.

D. *Final Approval*:

Minerals Division staff will confirm that all approvals, permits and review requirements have been satisfied for the proposed activity and provide final approval. Final approval letters will be issued for all proposed infrastructure. Commencement of construction and installation of proposed infrastructure is authorized upon receipt of final approval from the Minerals Division.

7. Gas Program Waiver Requests

The Bureau conducts a comprehensive review of all oil and gas activities and infrastructure proposals prior to issuing approval. Any deviation from terms specified in leases or other agreements requires an approved waiver. Waivers are granted when the proposed deviation affords greater resource protection, resolves conflict between competing uses and values, minimizes overall impact to the forest and is considered to be in the best interest of the Commonwealth. Each waiver will be reviewed on a case-by-case basis. The State Forester has final approval authority for all waiver requests. The waiver process provides a useful approach for discussing and updating the guidelines and ensuring that activities on state forest land conserve multiple resources, uses and values.

Waiver of Lease Drilling Restrictions Process

A. Waiver Request Submission
The operator can submit a request to deviate from conditions specified in leases or agreements. Waivers requests should be submitted in writing to the Forest District Manager and include:

- Identification of the specific condition for which a waiver is sought
- Description of the proposed deviation and resulting minimization of forest impact
- Justification of the need to deviate from the identified condition
- Identification of alternatives considered and investigated
- Any necessary mapping including GIS data where applicable

B. Bureau Review
The district will review the waiver request to determine:
- If it reduces impacts to the state forest resources, uses and values
- If it is in the best interest of the Commonwealth
- If it is consistent with local management objectives. Suggested modifications should be provided to the operator.

The Minerals Division will review the waiver for completeness and circulate amongst central office program areas. Comments will be collected and documented, and there will be an attempt to resolve outstanding concerns.

Note:

Surface disturbance activities associated with oil and gas activities will not be waivered within state forest wild areas, natural areas, and state parks where the Commonwealth owns the subsurface rights.

C. State Forester Review
Requests that do not reduce impacts to the state forest resources, uses and values, and are not in the best interest of the Commonwealth will be denied. The State Forester (or his/her designee) will review the waiver request and provide an approval or denial. The operator will be provided with written notification of the waiver decision. Some waivers

may be conditionally approved and subject to additional provisions. In the case of a denial, if the operator intends to move forward with the request, the dispute resolution process would be used.

8. Routine Field Inspections

It is critical that each state forest district consistently inspect all active construction sites. Early detection of issues may significantly reduce potential effects and facilitate management of any problems while they are easier to control. An effective field inspection will evaluate site access and safety, proper permit and information posting, infrastructure and environmental impacts and any site protections in place.

The following guidance will be followed when conducting routine field inspections:

A. Forest District Managers should conduct weekly (if possible) inspections during any active construction unless problems or weather conditions dictate otherwise. Inspection of the final site restoration is imperative. Site inspections are considered a very high priority for the district.

B. The Bureau of Forestry should maintain a cooperative relationship with the DEP's Office of Oil and Gas Management. State forest district offices should coordinate field inspection activities with DEP-Regional Offices, when feasible.

C. A current emergency contact list should be maintained by the district and the operator.

Note:

State forest district staff is not responsible for enforcing DEP regulations, state or federal laws governing the impacts to the environment. Staff should observe, document and report any activity which results in pollution or damage to the environment to the proper authority.

D. Forest District Managers should become familiar with and follow *DEP Oil and Gas Management Program's Safety Standard Operating Procedures* when inspecting active oil and gas operations. Forest District Managers have the authority to perform site inspections unannounced.

E. The Forest District Manager should also incorporate video or photo documentation of any problems, to aid in describing the issue to operators, Minerals Division staff and DEP. Routine inspections may be coordinated with the operator's staff as a courtesy.

The following "Field Inspection Form for Oil and Gas Operations" is to be used for conducting field inspections. A separate form should be established and maintained for each facility (i.e., well pad, new road segment construction, water impoundment, compressor station, staging area and pipeline project). A copy of all field notes should be attached and the files kept in perpetuity until the lease tract is surrendered to the Commonwealth.

Commonwealth of Pennsylvania
Department of Conservation and Natural Resources: Bureau of Forestry
Field Inspection Form for Oil and Gas Operations (Page 1 of 2)

Operator Name			Tract Number
Facility ID	Latitude		Longitude
District	County	Township	

Inspect each item listed below. Mark "**V**" if satisfactory. Mark "**X**" if unsatisfactory and explain on the back of this form. Mark "-" if not inspected that visit. Mark "**NA**" if activities completed and site restoration approved.

		Inspected by (initials)						
Date earth disturbance or construction activities began:								
		Dates Inspected						
Access and Safety	1. Public-use roads safe for public travel							
	2. Access roads good, passable condition							
	3. Gates appropriately opened or closed							
	4. Dangerous equipment posted/fenced							
	5. Dangerous chemicals/waste posted/fenced							
	6. Dangerous areas posted/fenced							
	7. Other potential safety hazards							
Permits and Information	8. DEP Well Permit/Well ID posted on site							
	9. ESCGP Permit posted on site							
	10. E & S Control Plan posted on site							
	11. PPC Plan posted on site							
	12. Consumptive Water Use Permit posted							
	13. MSDS Sheets available on site							
	14. Emergency contact info posted							
	15. Other							
Environmental Control	16. Public-use road drainage / E & S conditions							
	17. Access road drainage / E & S conditions							
	18. Well-pad conditions							
	19. Water storage conditions tanks/ponds							
	20. Pipeline ROW conditions							
	21. Logging and/or skidding operations							
	22. Water conditions (streams)							
	23. Other E & S problems							
	24. Noticeable wildlife habitat impacts							
	25. Noticeable vegetative/forest impacts							
	26. Noticeable invasive plant infestation							
	27. Indication of leak or spill (pad, road, etc.)							
	28. Other environmental impacts							
Property Protection	29. Damage to infrastructure							
	30. Sanitation of site(s)							
	31. Other damages or problems							

Commonwealth of Pennsylvania Department of Conservation and Natural Resources: Bureau of Forestry Field Inspection Form for Oil and Gas Operations (Page 2 of 2)		
Date	Item Number	Provide explanation: a. Description of unsatisfactory conditions and corrective action taken (from p.1) b. Work completed and site restoration satisfactory c. Survey for non-native invasive plants conducted and actions needed

Signature - Inspecting Forester _____

Signature - Supervisor _____

9. Documentation and Right-To-Know Law

Bureau of Forestry staff should maintain accurate records and documentation of internal and external communications for all phases of oil and gas development on state forest lands. The public may request and obtain copies of public records that are maintained by the Bureau of Forestry through either an informal request or a formal request pursuant to the Pennsylvania Right-to-Know Law.

File maintenance protocols

A permanent file with legible copies of all documents and records will be maintained for every phase of oil and gas development on State Forest lands (typically on a tract basis) and include:

1. Copies of correspondence, as maintained according to the Department's Document Retention Policy.
2. Copies of documents showing proof of ownership/title to the oil and gas.
3. A copy of the fully-executed Oil and Gas Lease or Surface Use Agreement.
4. Plans submitted by operators:
    - Seismic Survey/ Seismic Survey Agreements
    - Pipelines
    - Roads
    - Well pad development plan
    - Erosion and sedimentation (E&S) plan
    - Water sourcing and waste handling plan
    - Site restoration plan
    - Material Safety Data Sheets (MSDS) for all chemicals stored and used on state forest lands
5. Other maps or drawings.
6. Pennsylvania Natural Diversity Inventory (PNDI) report(s).
7. Current contact information for routine and emergency situations should be maintained by the district at all times.

The above-referenced documents may be maintained in the Bureau's file; however, public disclosure of these records is controlled by the Pennsylvania Right-to-Know Law.

Pennsylvania Right-to-Know Law

The Department is committed to making public records easily accessible. Public records relating to oil and gas activities on State Forest lands may be obtained:

- Informally - by following the DCNR Procedure for Informal Requests for Records
- Formally - by following the DCNR Policy for Responding to Right-To-Know Law Requests

A requester may incur fees for both the informal and formal requests for public records, as stated in those policies.

Confidential Proprietary Information

Lessees or operators routinely provide plans and other documents to the Bureau of Forestry to facilitate the administration of oil and gas development on state forest lands. Lessees or operators also consider these items to be confidential and proprietary and expect the Bureau to not share the provided information without the lessee or operator's express permission. Information, records, and data that are provided to the Bureau by a lessee or operator will be treated as confidential and proprietary when stamped as "confidential" by the lessee or operator. However, marking documents as "confidential" does not guarantee that such items will not have to be released to the public. Whether information, records or data is public information is not a decision made by the Bureau, but is made by the Commonwealth's Office of Open Records and is governed by that office's interpretation and application of the Pennsylvania Right-to-Know Law. It will always be the lessee or operator's responsibility to establish the confidential and propriety nature of the stamped documents when the Bureau receives a request for the confidential information.

Any questions regarding the Right-to-Know Law should be directed to the Office of Chief Counsel.

10. Medical Emergencies and Pollution Events

It is anticipated that oil and gas operators will strive to maintain the highest level of safety and environmental standards while operating on state forest lands. However, the Bureau must be prepared to respond to medical emergencies and pollution incidents that may occur. Bureau staff will function primarily in a supporting role for the operator, emergency response personnel, or agencies with jurisdictional authority.

Management of Medical Emergencies

In the event that district staff is called out to a medical emergency at a construction site, it is imperative that staff have immediate access to local emergency contact lists to quickly summon necessary assistance. Each district should have an up-to-date Emergency Action Plan and make sure all staff is intimately familiar with it. Training should also be provided to district staff for handling emergency situations as well as accessing the emergency contact database. A copy of the district Emergency Action Plan should be kept in all vehicles for quick reference for Bureau staff.

The operator will assume the lead role in medical emergencies at the drill sites, construction sites and facility sites. DEP and OSHA require operators to have emergency plans on site and provide their employees with training for emergency situations. In the instance that Bureau staff is present during a medical emergency, emergency phone contacts should be offered to operator personnel to summon the necessary help.

The district should take the lead in directing the emergency flight to the nearest safe landing zone and coordinating an emergency route to the site. Numerous landing zones have been identified in the districts and the locations should be part of the district Emergency Action Plan. Do not attempt to access the well site in the event of a major fire or other hazardous situation. Assessments should be conducted a safe distance from the incident. Gas well fires are unpredictable and may flare. Operators and first responders should be the primary leads in these incidents. Bureau staff should provide support as necessary.

Operators should provide and maintain an emergency contact phone list with the Bureau. This would be used in the event that an operator or contractor personnel is found injured or in danger on state forest land or a pollution incident is discovered by Bureau personnel.

Management of Pollution Events

Pollution incidents may vary in nature and severity, but are generally defined by the Bureau as the unintended release of hazardous, regulated, or other substances with the potential to cause negative environmental effects. Examples of such substances are diesel fuel and other petroleum products, hydraulic fracturing fluid prepared prior to well injection (frac fluid), chemical additives for preparing frac fluid, flowback water recovered from the drilling process, other brine waters used during drilling operations, and drill cuttings. Pollution incidents may occur at a pad site or at some ancillary feature related to gas development, such as a compressor station, meter site, roadway, or pipeline.

Inadvertent returns are also considered pollution incidents by the Bureau. An inadvertent return is the unintentional discharge of drilling mud (primarily water and bentonite) during horizontal direction drilling, which is often employed to underdrill a stream or wetland for pipeline crossings.

Major failures of erosion and sedimentation control measures, which pollute or imminently threaten to pollute a water body, also are considered pollution incidents by the Bureau.

Bureau staff and operators should be alert at all times for pollution incidents. The public has an expectation that pollution incidents be identified, documented, and managed appropriately, in order to safeguard public health and the environment. If a pollution incident is discovered, the first concern should be for the safety of all involved and the public. Appropriate notifications should proceed as described in the sections below. The Bureau's decisions regarding pollution incidents will be made by a team of central office and district staff, in coordination with operators and DEP. DEP is the jurisdictional agency for response and remediation of pollution incidents. In its role as the land manager, the Bureau will coordinate with DEP to provide input such that the management responsibilities of the Bureau and values of its stakeholders may be reflected in DEP's response. Guidelines for the Bureau's documentation and management of pollution incidents are provided in the sections below.

Operator Roles and Responsibilities

It is expected that operators promptly report pollution incidents to the Bureau regardless of whether the pollution incident is due to the actions of the operator, its subcontractors, or other entities. The Bureau expects that operators report all pollution incidents they observe without immediate concern for who is the responsible party. To report a pollution incident, operators should first notify DEP and, if appropriate, emergency response personnel. These notifications should be performed in compliance with the DEP policy for addressing spills and releases at oil and gas well sites (Document Number: 550-5000-001) (a.k.a., the DEP Spill Policy). Second operators should call the Bureau's Notification Hotline (855-378-6629). The Bureau requests that this notification occur within two hours after the pollution incident is detected or discovered. The Bureau should be notified of pollution incidents regardless of the volume of pollution spilled or released to the ground. The Notification Hotline should also be used to report inadvertent returns and major failures of erosion and sedimentation control measures.

Site characterization or remediation activities planned by the operator (or its designated subcontractor) should be coordinated with the applicable DEP office and the Bureau. Although DEP will direct the site characterization and remediation activities as the jurisdictional agency, the Bureau may provide input to the process to ensure that state forest resources and values are considered as these activities occur.

At the time of notification of the pollution incident, the responsible operator also will be asked to provide a description of any interim remedial actions that are planned, initiated, or completed. The responsible operator should then follow the remediation requirements of the DEP Spill Policy. With respect to the DEP's Land Recycling Program regulations (a.k.a. Act 2 regulations) it is the Bureau's expectation that the residential statewide health standard (assuming a used aquifer with total dissolved solids less than 2500 mg/L) be applied to state forest lands. State forest lands generally do not meet the Act 2 definition of "non-residential" lands and should be afforded the highest possible level of protection. In the event that a statewide health standard has not been established for a particular polluting substance, then the background standard under Act 2 may be used for that particular substance. Use of an alternative process or site-specific standard for remediation should only occur in accordance with the DEP's Spill Policy. Provision of notices and reports related to remediation

should occur as described in the DEP Spill Policy. The Bureau expects that operators provide copies of such notices and reports at the same time the information is submitted to DEP.

Areas impacted by a pollution incident should be restored in a timely manner. DEP's Spill Policy requires areas affected by a pollution incident, which are not on a well pad, be restored and revegetated as soon as possible during the growing season. The policy further provides that a restored site should be capable of supporting the same vegetation community that was present before the pollution incident.

Bureau of Forestry Staff Roles and Responsibilities

Notification

Bureau staff should be alert at all times for unintentional spills, substance releases, inadvertent returns, and failures of erosion and sediment control measures (i.e., pollution incidents). If a pollution incident is discovered by Bureau staff, their first concern should be for their safety and the safety of others. Bureau staff should not act as first responders for pollution incidents. If in doubt as to the safety of a site, Bureau staff should make the notification calls described below and remain at a safe distance from the site. If a pollution incident causes an imminent safety threat, Bureau staff should not enter the incident area until given proper clearance by authorized public safety or DEP personnel.

Upon discovering a pollution incident, Bureau staff should promptly notify emergency response officials and/or rangers (if public safety is a concern) and DEP. If the operator is not already aware of the pollution incident, Bureau staff should immediately notify the operator as well. If there is an imminent threat to waters of the Commonwealth, Bureau staff also should notify the PA Fish and Boat Commission. Contact information for these entities will be kept in all Bureau vehicles that operate within gas development areas.

In addition, Bureau staff discovering a pollution incident should notify a district point-of-contact. The district point-of-contact will relay the information to the Assistant State Forester of Forest Resources, who will inform other Bureau staff, as appropriate. A list of district points-of-contact for pollution incidents will be maintained by the Minerals Division and distributed to district staff, the Gas Monitoring Team and DEP. The district point-of-contact should mobilize appropriate district staff to assist DEP or emergency response personnel. This may include the temporary closure of trails or roads in the vicinity of the pollution incident.

The following flow chart illustrates the Bureau's notification process:

Initial Documentation

The following procedures should be adhered to by Bureau staff to document a pollution incident after the above notification calls are placed. If a pollution incident causes an imminent safety threat, Bureau staff should not enter the incident area until given proper clearance by authorized public safety or DEP personnel. If the pollution incident is minimal and not a threat to the environment (e.g., a small spill that is entirely controlled by secondary containment), a site visit may not be necessary. However, if the pollution incident poses a threat to the environment, a site visit will be necessary for proper documentation.

1. If no imminent safety danger exists, access the site and confirm a pollution incident has occurred.
2. Photo-document the pollution incident, including evidence of the incident and any interim remedial measures being taken.
3. Use the "Pollution Incident Documentation Form" to document the incident. See Appendix #.
4. Obtain contact information for all other entities involved at the site, such as the operator, subcontractors, DEP, or other agencies.
5. Coordinate with the operator and/or DEP to obtain copies of any sampling plans and/or remedial plans related to the pollution incident. If DEP has issued a Notice of Violation or completed an Inspection Report, request that a copy be sent to the Bureau.
6. If warranted, make plans to return to the site for documentation of remedial measures.

Pollution Incident Management

In response to a pollution incident, central office staff and district staff may need to make a number of critical decisions regarding the documentation and management of the incident. The Bureau may have responsibilities for traffic control on roads and trails, posting of warning signs, and public notification. In addition, the Bureau may engage staff in the incident's management to assist or complement DEP's or operator's efforts. The Bureau may help to coordinate meetings with the operator to discuss the pollution incident as well as the progress of remediation.

The section below lists a number of potential issues that the Bureau may address regarding a pollution incident. Below each issue, a list of important considerations is provided. This list of issues and considerations is not definitive or final, but rather it is meant to provide guidance for the decision-making process. Each pollution incident is unique, such that additional issues and considerations may be relevant in a given situation.

1. Coordination with DEP

    A. DEP is the jurisdictional agency for pollution incidents, and all recommendations or concerns regarding site characterization or remediation should flow through DEP.

    B. Some pollution incidents may be minor and pose no threat to human health or the environment. In such cases, the Bureau may not be involved except to document occurrence of the incident and notify DEP.

    C. Some pollution incidents may affect values or stakeholders specific to state forest land. For example, a release to a stream may occur adjacent to a popular hiking trail, or soil contamination may occur in proximity to an active campsite. In these instances, the Bureau may request that DEP alter the sampling plan or remedial plan to better address these state forest values.

    D. The gas forester should endeavor to maintain close contact with the DEP inspector involved in the pollution incident, so that the gas forester can relay information related to the incident back to other Bureau staff.

    E. In the long-term, coordination with DEP will depend on the extent and duration of environmental sampling and remedial measures. For major pollution incidents that require extensive remediation and follow-up sampling, the Bureau may continue coordination with DEP until the situation is resolved.

2. Press Releases and Public Notice

    A. Any public notifications or statements to the press should be conducted by the communications or press staff.

B. Even in cases where DEP has determined that no adverse effects exist or are expected, the Bureau may consider a public notification to alleviate public concern.

C. Bureau staff should post notification signs only in coordination with DEP and after receiving approval from central office.

D. If questioned in the field by the public or press, Bureau staff may describe what they are doing (e.g., photo-documenting the incident) but should not attempt to describe the remedial investigation or actions that DEP is overseeing. Sampling results require appropriate quality assurance and analysis prior to public disclosure. Questions regarding these efforts should be directed to DEP and/or the Bureau's communications or press staff.

3. Sampling by Bureau Staff

A. For the immediate incident response, involvement of Bureau staff in environmental sampling will depend on whether DEP requests assistance. Bureau staff, in coordination with DEP, may collect environmental samples in a joint or supplemental manner.

B. In the long-term, Bureau staff may be involved to examine potential long-term effects of the pollution incident. This may include follow-up soil sampling, water sampling, and/or assessment of vegetation and wildlife habitat. Potentially, such long-term assessment will occur beyond the scope of the DEP investigation, as the Bureau has a responsibility to ensure the long-term health and productivity of state forest lands.

Incident Tracking and Record Management

Completed *Pollution Event Documentation Forms* will be filed in the district offices and with the Minerals Division. Any *Notices of Violation* or *Inspection Reports* obtained from DEP, as well as any reports on sampling or remediation, will be filed along with the *Pollution Event Documentation For*ms.

At present, a record of pollution incidents is being tracked in a spreadsheet by the Minerals Division. The tracking spreadsheet includes the following information:

- Date and time of the incident
- Tract, county, and forest district of the incident
- Operator responsible for the incident
- Incident details, such as substance released, volume, and reason for pollution
- Date and time that remediation was completed
- Other pertinent comments or notes

In the future, the location and other information about pollution events will be entered into the Oil and Gas Infrastructure Tracking (OGIT) system.

POLLUTION EVENT DOCUMENTATION FORM			
Name:		**Date & Time:**	
GENERAL INFORMATION:			
Date and Time of Incident (or when first discovered/reported):			
Infrastructure or Activity involved			
☐	gas drilling or well pad site	☐	other (please describe in box below)
☐	gas pipeline / pipeline installation		
☐	timbering (ex. fuel spill from truck)		
☐	vehicular accident (ex. fuel spill)		
District Name:		Tract No. (if applicable):	
Operator or Contractor Responsible (if known):			
County:		Township:	
Nearest Road/Intersection Name:			
GPS Coordinates:			
***TAKE PHOTOGRAPHS TO DOCUMENT INCIDENT.			
SPILL DETAILS:			
Type of substance:			
Volume spilled (gallons or barrels):			
Duration of spill (time frame, instantaneous, ongoing):			
POTENTIAL TRANSPORT AND RECEPTORS:			
Fate or transport of substance (overland flow, infiltration):			
Nearby drinking water sources (name, distance, direction):			
Nearby campsite leases (name, distance, direction):			
Nearby wetlands or streams (name, distance, direction):			
Nearby wildlife habitat (type, distance, direction):			
CLEANUP:			
Has any cleanup been performed already, describe if so:			
Is any cleanup presently planned, describe if so:			
BRIEF DESCRIPTION OF INCIDENT: *(how it occurred, critical dates/times, additional details)*			

SKETCH OF INCIDENT: *(include features such as location of release, pad boundary, remedial measures, ditches, roads, streams)*

SAMPLING:

Sample Location	GPS Coordinates	Bottles Collected and ID

Sample Location	GPS Coordinates	Temp (C)	pH	Spec. Cond (uS)

NOTIFICATIONS or OTHER AGENCIES ONSITE:

Make note of the entities you have contacted and people at the site.

		Date	Time	Individual Contacted/Onsite
☐	911 (only if an absolute emergency)			
☐	DCNR Ranger			
☐	District Point-of-Contact (see contact list)			
☐	DEP General Emergency Line: 800-541-2050			
☐	DEP Regional Office Emergency Line (#s below)			
Williamsport: 570-327-3636, Meadville: 800-373-3398, Pittsburgh: 412-442-4000,				
Wilkes-Barre: 570-826-2511, Harrisburg: 877-333-1904, Norristown: 484-250-5900				
☐	Responsible Operator/Contractor (if known)			
☐	PA F&BC: 855-347-4545 (if threat to surface water)			
☐	Others (list names)			

Appendix

Appendix A: Criteria for Wastewater Treatment Storage System Proposals

Operators should submit proposals for wastewater treatment, storage, and transportation projects to the Bureau of Forestry as early as possible to facilitate efficient review. The timeline for decision-making could be weeks to months depending on the complexity of the project.

Operators should submit proposals containing the following information:

1. General description of the facility(s), including:
    a. Justification and need
    b. Alternatives considered and why this proposal is in the best interest of the Commonwealth
    c. Environmental benefits of proposed project
    d. Relationship of this proposal to adjacent/nearby operations (both state forest land and other land, and other operators); opportunities for coordination with other adjacent COP lessees
    e. Permits required by DEP
    f. Duration of operation
    g. Contractor(s) and relationships if operated by third party

2. Maps and GIS data
    a. Location of treatment facility(s)
    b. Location of storage facility(s)
    c. Location/route (i.e., schematic drawing) of wastewater pipelines
    d. Location of all existing and planned oil and gas infrastructure on the tract
    e. Submit to DCNR per spatial data protocol

3. Detailed description of treatment/storage/transportation systems including:
    a. Description of treatment methodology
    b. Equipment/infrastructure required
    c. Capacity (volumes of water; treated, untreated, stored, etc.)
    d. Chemicals needed and plans for storage, containment, and transportation
    e. Tank specifications (capacity, construction material, containment, recommended maintenance schedule)
    f. Pipe and pipeline specifications (above-ground, below-ground, diameter, length, metering, auto shut-off, leak detection, pipe material and construction specifications)
    g. Energy needs (electric, gas, diesel, etc.)
    h. Permits required

4. Detailed description of operations
    a. Duration of operations

b. Wells/pads servicing; source(s) of wastewater
c. Detailed, tract-level transportation plans
    i. Freshwater, untreated wastewater, treated wastewater
    ii. Detailed trucking analysis, included
        1. Anticipated decreases or increases in amount of trucking
        2. Duration
        3. Routes
        4. Timing, frequency, and size of trucks
        5. Seasonal variation
        6. Impacts to nearby communities
        7. Consideration of high public use periods such as fishing and hunting seasons and holidays
        8. Consideration for Joint Use Roads with snowmobile traffic
    iii. Wastewater pipeline routes
d. Description of periodic (daily, weekly, etc) monitoring and inspection of equipment
e. Overall site containment and spill prevention and clean-up measures
f. Plan/methods to communicate status of operations to BOF (start-up, shut-down, flow/treatment of water, etc)
g. Approximate number of personnel needed to operate on daily basis
h. Plan for disposal of waste generated, including solids management, filter cakes, etc.
i. Emergency response plan
j. Plans/need for future expansion
k. Site restoration plans
l. Method of cleaning/emptying pipes – if by pigging, where will pig launchers be placed, size needed, etc.
m. Security of the site and provisions for public safety

5. Detailed description of site construction requirements and materials
    a. Area of earth disturbance, including description of the current land use/conditions
    b. Pad construction (aggregate used, concrete, etc.)
    c. Access road
    d. Erosion and sedimentation control measures
    e. Lighting requirements for night operations

6. Analysis of potential impacts to state forest resources and values, including avoidance or mitigation measures
    a. Area of forest cleared
    b. Plant communities
    c. Animal communities
    d. Water resources including nearby surface waters, groundwater and aquatic resources
    e. Geologic considerations
    f. Air quality

g. Noise levels
h. Recreation facilities and uses (public use roads, trails, picnic areas, vistas, etc.)
i. Aesthetics
j. Archeologic resources
k. Invasive species

Appendix B: Planting and Seeding

Bureau of Forestry Planting and Seeding Guidelines 2016

1. Key Principles

Supplemental planting on State Forest lands is a common practice for activities such as re-vegetating a log landing after harvest, erosion and sedimentation control, forage and cover habitat in wildlife openings, and reclamation and restoration in gas development areas. The Bureau of Forestry utilizes native species in supplemental plantings whenever possible; however, there are occasions when native species do not fully support the purpose of the planting and non-native species may be justified. This document provides guidance on how best to plant native grasses, forbs, shrubs and trees on state forest lands, as well as information regarding non-native species that can be planted with caution on state forest lands. This document also provides information on general seed mixes recommended by the Ecological Services Section and alterations for specific need. Any non-native species planted on state forest lands are to be monitored following planting and is subject to review as per the "Assessment and Justification for the Use of Non-Native Plantings" process.

The Bureau of Forestry has researched many species being considered for planting on state forest lands and have determined that the species fit into three categories:

1. **Invasive:** Deemed invasive. Do not plant.
2. **Potentially Invasive:** Avoid planting, except in special situations (after Ecological Services consultation).
3. **Non-invasive**: Native species deemed non-aggressive and non-native species found not to be invasive.

These categories are discussed in greater detail in Sections 2 (herbaceous species) and Section 3 (tree and shrubs), including recommended species and seed mixes.

1. Invasive: Deemed Invasive: Do Not Plant

Any plant classified as a **noxious weed** by the PA of Agriculture is barred for use on State Forest lands. It is illegal to cultivate, sell, transport, or plant any species classified as a noxious weed in PA.

Plants on DCNR Invasive Plant List are prohibited from use on State Forest lands, according to principles set forth in the State Forest Resource Management Plan and the Bureau of Forestry's Invasive Plant Strategy. Some of these species may have been planted on State Forest lands in the past. However, current standards do not allow the use of these plants on State Forest lands. This includes species on DCNR's 'Invasive Plant Watch List.'

2. Potentially Invasive: Avoid planting except in special circumstances or situations

Some species may have invasive potential, depending on conditions, or as noted by other states. In addition, some non-native species do not provide quality wildlife habitat/forage and may not be compatible with planted tree seedlings during reforestation activities. There may be special circumstances or situations that require the use of these species, such as unique erosion control needs or limited availability of native seed. The species mentioned in this category **should be avoided** whenever possible in favor of more acceptable native alternatives. Consultation with Ecological Services is required prior to the use of these species, and monitoring may be required following planting. New Bureau of Forestry policies also require research into the ecological benefits or impacts of the use of non-native species. Please reference the "Assessment and Justification for the Use of Non-Native Plantings" document for further information.

Non-invasive: Native and non-native species recommended for use on State Forest lands.

There are many species to choose for seed mixes and planting on State Forest lands, both native and not native to Pennsylvania. For the species listed in this document, there is little to no evidence to suggest that any of these non-native species will have invasive tendencies, or the listed native species will have aggressive tendencies. These are the species recommended for use on State Forest lands. Other species native to Pennsylvania may be used at the District's discretion; however, other non-native species should be discussed with Ecological Services prior to their use.

Non-native Plantings Monitoring

Non-native plant species listed under category 2 (potentially invasive) WILL require monitoring. Category 3 (non-invasive) species may require monitoring after consultation with Ecological Services. This monitoring should take place once within 5 years of planting and should be completed by district staff, with help from Ecological Services. If requested, Ecological Services will be available to assist with plant identification. Species in Category 1 (invasive) should not be planted. If they have been planted in the past, treatment and/or removal is recommended.

2. Planting Guidance for Grasses and Herbaceous Plants

The sowing of grass seed mixes is a long-standing practice used on state forest lands to stabilize soils following disturbance. While the Bureau has traditionally used grass seed mixes to retire log landings and timber sale haul roads, there has been an increased use of native grasses for permanent herbaceous openings for wildlife and for reclamation practices in areas surrounding energy and right-of-way development. Combining native wildflowers and forbs to native warm season grass seed mixes increase the ecological value of restoration practices, attracting pollinators and other insects which then builds a more diverse food web and provides additional food sources for wildlife. Plantings of native warm season grasses allow for natural succession, which over time will limit the establishment of invasive plant species.

When undertaking a seeding project please consider the following:

Pre-planning:

- Anticipate ordering seed 6 months in advance to ensure seed availability. The best time to purchase native seed is in fall to be sure the supplier has enough in stock for spring plantings. Be sure to specify **PLS (pure live seed)** when ordering native seed. PLS factors in germination rates to ensure the amount of seed of an individual species is used to achieve adequate cover.
- State-listed or PA Species of Concern may not be planted unless a species recovery plan has been developed and local genetic stock is available. If a district is interested in planting state-listed species, please consult with Ecological Services.
- Seeding rates listed below may be changed when a higher density is desired for erosion control or other purposes.
- When choosing species for a seed mix, attempt to use species representative of the area and consider the management objectives (wildlife opening, road corridor, log landing revegetation, recreational use) for the site. Any mix should have both warm-season and cool-season growing species. Plan ahead for long-term maintenance of the species selected.

Soil and Site Preparation:

- In activities that cause excessive soil compaction, such as log landings or gas development, the **topsoil and subsoil should be segregated and piled** before disturbance and returned to original contour with as little compaction as possible before seeding. Ripping the soil sublayer prior to spreading topsoil is recommended to lessen compaction and increase infiltration.
- **Lime and fertilizer are not generally recommended for native seed mixes.** If lime and fertilizer are used, be sure to **reduce the nitrogen content** (first number in the N-P-K ratio), as this will promote weedy plants or invasives and can potentially kill or inhibit the germination of native seed.
- Seed may be lightly worked into the soil using a rake or bedsprings, but disking will likely bury the seeds too deep and may not be successful. Disking should only be conducted prior to spreading seed.
- If the site to be planted with native warm season grasses is currently occupied by cool season turf grasses, an herbicide application is recommended in the fall prior to spring planting.

Disking should follow once the turf grass has been killed to allow the new seed to have contact with mineral soil.

Planting:

- Use straw, **not hay**, to reduce the potential for introduction of weed seed. Hay should only be used if the cost or availability of straw is prohibitive. Invasive seed can also be introduced from contaminated fill material or seeders. Be sure seeding equipment is clean and free of any seed used previously whether on or off State Forest lands.

- Temporary cover crops should be added to all mixes to improve soil stabilization and increase the chance of establishment. Cover crops can be applied before the desired mix if waiting for the optimum time to plant native seed. When using in combination with another mix, they should be applied at a rate of 1 bushel (~30lbs) per acre. If used alone on a site, they should be applied at 2 bushels (~60lbs) per acre.
  Spring oats (*Avena fatua*) if seeding prior to August 15th
  Winter rye (*Secale cereale*) if seeding after August 15th
  **Annual rye (*Lollium multiflorum*) may be used instead of oats or winter rye

- Observations of warm season grass plantings suggest **April through mid-May is the optimum time for planting and establishing native species** in the first growing season. Fall seeding may be successful (late October through late April), but make sure the seed will not lie wet in winter. If initial reseeding must take place in mid-summer, plant a cover crop of Oats for stabilization and plant native grasses the following April.

- For spring plantings, some native warm season grasses and native wildflowers will germinate the first year with most germinating the second year. For late fall/early winter plantings, native warm season grasses and wildflowers could experience dormancy conditions, but many can germinate well the first full growing season after planting.

- Broadcast and hand spreading of native seed equally across the site is acceptable. However, also consider planting single species from the mix in strips across an herbaceous opening to establish varying vertical structure. Another option is to spread some of the warm season grass seed in "patches" to create openings for wildlife between tufts of grass. Some seed, like that of little bluestem, that is "fluffier" can clog a seeder and should be spread separately from the rest of the mix.

Ecological Considerations:

- The use of synthetic matting is prohibited on state forest lands. If matting is to be used for erosion and sedimentation control, it should be made of biodegradable, Jute material. Synthetic matting is made of a stiff, microfilament netting that may entangle and cause injury or mortality to wildlife.

- When the objective is long-term restoration, rather than temporary cover, it may be important that stock is from local genetic material. Seed companies may provide the genetic origin or offer species collected from different stock. When available, select PA Ecotypes.

- For wildlife habitat, it is important to provide varied structure with good interspersion of bare ground, beneath a shaded canopy which allows small mammals and birds to move freely at

ground level, search for seeds, insects and roosting cover. In other cases, on steep slopes or poorer sites, higher rates may be necessary to achieve desired conditions.

- During the first and second year of growth, native warm season grasses typically invest more initial resources in root growth rather than vegetative growth during the first growing season. This enhanced root growth improves soil retention to alleviate erosion and sedimentation issues; however, this enhanced root growth cannot always be confirmed by the quantity of aboveground, green vegetative growth.

Maintenance to Sustain Native Herbaceous and Grass Plantings or Permanent Herbaceous Openings:

- Typically, mowing of native grasses should take place for the first time on the 3rd year following initial planting and then on a 3-5 year cycle as needed. The ideal time to cut native grasses is very early spring (March or April), after snow melt. Mowing can also take place following the first frosts in November, but native grasses are ideal winter shelter for small mammals so this is only encouraged if Spring mowing is not feasible.
- In the second and subsequent growing seasons, the site should be checked for problematic weeds or invasive plants and spot treated.
- These grasses should be cut back to 8" in height by a brush-hog or similar piece of equipment. **Cutting lower than 4" may harm the development of the native grass seedlings**.
- Prescribed fire provides the best maintenance of warm season grass openings; however, is areas such as rights-of-way, this may not be practical.
- Disking could also be considered to break-up and create more space between grass clumps, break up root mats, and to provide better habitat for wildlife. This treatment should be conducted from November 1st to April 1st. It is likely that disking may only be necessary every 5-10 years.
- For more information on sustaining openings, see the Permanent Herbaceous Openings and the Maintaining ROWs for Wildlife documents.

Grasses and Herbaceous Species Lists:

1. Invasive: Deemed Invasive: Do Not Plant

A number of grasses and forbs are considered invasive by DCNR. Plants on DCNR Invasive Plant List are prohibited from use on State Forest lands, according to principles set forth in the State Forest Resource Management Plan. Please carefully review this list prior to making seeding or planting selections.

2. Potentially Invasive: Avoid planting except in special circumstances or situations

The use of the species listed below should be limited in most circumstances. This list was created through examining neighboring states' invasive plant lists, communications with foresters, specialists and resource managers, and research on species behavior. Native and non-native alternatives to these species are provided within Category 3. This list is revised periodically based on field observations and literature review.

Cool Season Grasses			
Kentucky bluegrass	*Poa pratensis*	Creeping red fescue	*Festuca rubra*
Non-native bluegrasses	*Poa species*	Redtop grass	*Agrostis gicantea*
Orchard grass	*Dactylis glomerata*		

Legumes			
Yellow sweet-clover	*Melilotus officinalis*	White sweet-clover	*Melilotus alba*

3. Non-invasive: Recommended native and non-native grasses and herbaceous species.

There are many species to choose for seed mixes and planting on State Forest lands, both native and not native to Pennsylvania. For these species below, there is little to no evidence to suggest any of these non-native species will have invasive tendencies, or that any of these native species will have aggressive tendencies. Other native grasses, legumes, and wildflowers not included on this list may also be used if conditions are appropriate.

Native Warm Season Grasses			
Big Bluestem	*Andropogon gerardii*	Switchgrass	*Panicum virgatum*
Indiangrass	*Sorgastrum nutans*	Purpletop	*Tridens flavus*
Deertongue grass	*Dicanthelium clandestinum*	Little bluestem	*Schizachyrium scoparium*

Native Cool Season Grasses			
Virginia wildrye*	*Elymus virginicus*	Autumn bentgrass	*Agrostis perennans*
Canada wildrye*	*Elymus canadensis*	Povertygrass	*Danthonia compressa*
Riverbank wildrye*	*Elymus riparius*	Povertygrass	*Danthonia spicata*

Native Legumes			
Partridge pea	*Chamaechrista fasciculata*	Showy tick-trefoil	*Desmodium canadense*
Senna	*Senna herbecarpa*		

Native Wildflowers			
Black-eyed susan	*Rudbeckia hirta*	Tall white beardtongue	*Penstemon digitalis*
Cardinal flower	*Lobelia cardinalis*	Ox-eye sunflower	*Heliopsis helianthoides*
Common milkweed	*Asclepias syriaca*	Goldenrods	*Solidago spp.*
Butterfly milkweed	*Asclepias tuberosa*	Asters	*Symphyotrichum spp.*
Evening primrose	*Oenothera biennis*	Hoary mountain-mint	*Pycnathemum incanum*
Ironweed	*Veronia altissima*	Narrowleaf mountain-mint	*Pycnathemum tenuifolium*
Wild bergamot	*Monarda fistulosa*		

Native Species for Riparian or Wetland Habitats			
Fox sedge	*Carex vulpinoidea*	Pennsylvania sedge	*Carex pensylvanica*
Woolgrass	*Scirpus cyperinus*	Bluejoint grass	*Calamagrostis candensis*
Soft rush	*Juncus effusus*	Blue lobelia	*Lobelia siphilitica*
Joe-pye weed	*Eupatorium purpureum*		

Non-native grasses and forbs			
Perennial ryegrass	*Lolium perenne*	Oats	*Avena fatua*
Timothy	*Phleum pratense*	Millet	*Millium spp.*
Winter wheat	*Triticum aestivum*	Hard fescue	*Festuca trachyphylla*
Cereal rye	*Secale cereale*	Alfalfa	*Medicago stavia*
Buckwheat	*Fagopyrum esculentum*	Barley	*Hordeum vulgare*

Non-native legumes

White clover	*Trifolium repens*	Birds foot trefoil	*Lotus corniculatus*
Red clover	*Trifolium pratense*	Flat pea	*Lathyrus sylvestris*
Alsike white clover	*Trifoloium hybridum*	Crimson clover	*Trifolium incarnatum*

** The seed awns of the wildryes (Elymus spp.) have been shown in certain circumstances to become ingested or attached to a dog's fur or paws, penetrating the skin and leading to the potential for grass awn migration disease. Ecological Services is researching potential native cool season grass alternatives to replace these species. Use these species with caution in areas that may be utilized by hunters.*

BOF General Native Seed Mix

Cover Crop: 30 lbs/ac Oats (*Avena fatua*)

3 lb PLS Big bluestem (*Andropogon gerardii*)
3 lb PLSLittle bluestem (*Schizachyrium scoparium*)
2 lb PLSIndiangrass (*Sorghastrum nutans*)
2 lb PLSSwitchgrass (*Panicum virgatum*)
2 lb PLSDeertongue (*Dicanthelium clandestinum*)
4 lb PLSVirginia wildrye (*Elymus virginicus*)
3 lbPartridge pea (*Chamaecrista fasciculata*)
0.5 lb Showy tick-trefoil (*Desmodium canadense*)

Total: 19.5 lbs/acre

Listed below are some additions or alterations to the native seed mix for unique situations or management goals.

To attract pollinators, consider adding a combination of these native wildflowers…

0.5-2 lb Showy tick-trefoil (*Desmodium canadense*)
0.5-1 lb Tall white beardtongue (*Penstemon digitalis*)
0.5-2 lb Grey goldenrod (*Solidago nemoralis*)
0.5-2 lb Common milkweed (*Asclepias syriaca*)
0.5-2 lb Wild bergamot (*Monarda fistulosa)*
0.5-1 lb Black-eyed susan (*Rudbeckia hirta*)
0.5-1 lb Ox-eye sunflower (*Heliopsis helianthoides*)
0.5-2 lb Butterfly milkweed *(Alclepias tuberosa*)
0.5-1 lb New England aster (*Symphiotrichum novae-angliae)*
0.5-1 lb Mountain-mints (*Pycnathemum incanum* or *P. tenuifolium*)

Typically, 0.5 lbs per acre are sufficient when added to the above Native mix. If the expressed goals of the site is to attract pollinators, consider adding more seed per acre. The best

wildflower plantings include enough species to have at least one species blooming during all three growing seasons.

A simplified version of this mix to attract game species…

3 lb PLS Switchgrass (*Panicum virgatum*)
1 lb PLS Big bluestem (*Andropogon gerardii*)
1 lb PLS Indiangrass (*Sorghastrum nutans*)
1 lb PLS Little bluestem (*Schizachyrium scoparium*)
2 lb PLS Deer tongue (Dicanthelium clandestinum)
2 lb PLS Perennial ryegrass (*Lolium perenne*)
0.5 lb Canada goldenrod (*Solidago canadensis)*
4 lb Partridge pea (*Chamaecrista fasciculata*)
30 lb Cover Crop Oats (*Avena fatua*)

Total: 12 lbs/acre

BOF General Native/Non-native Seed Mix

Areas with slopes less than 15%
2 lb Timothy (*Phleum pretense*)
6 lb Perennial ryegrass (*Lolium perenne)*
6 lb PLSVirginia wildrye (*Elymus virginiana*)
2 lb PLSLittle bluestem (*Schizachyrium scoparius)*
2 lb PLSBig bluestem (*Andropogon gerardii*)
6 lb White clover (*Trifolium repens*)
4 lb Partridge pea (*Chamaecrista fasciculata*)
0.5 lb Black-eyed susan (*Rudbeckia hirta*)

TOTAL: 28.5 lb/acre

Areas with slopes greater than 15%
6 lb Timothy (*Phleum pretense*)
4 lb Perennial ryegrass (*Lolium perenne)*
4 lb PLSVirginia wildrye (*Elymus virginiana*)
3 lb PLSLittle bluestem (*Schizachyrium scoparium*)
3 lb PLSBig bluestem (*Andropogon gerardii*)
3 lb PLSIndiangrass (*Sorghastrum nutans*)
6 lb White clover (*Trifolium repens*)
4 lb PLSDeertongue (*Dicanthelium clandestinum*)
2 lb Partridge pea (*Chamaecrista fasciculata*)
0.5 lb Black-eyed susan (*Rudbeckia hirta*)
TOTAL: 35.5 lb/ac

All attempts should be made to use all native seed mixes at sites on state forest lands. At sites with many acres that need planted, in areas with severely steep slopes, or for projects where funds available

for purchasing seed may be limited, this mix of native and non-native species may be more applicable. All additions discussed on the previous page can also be applied to this seed mix.

In shaded sites, reduce the mix to…

3 lb PLSVirginia wildrye (Elymus virginicus)
3 lb PLSCanada wildrye (Elymus canadensis)
5 lbAutumn bentgrass (Agrostis perennans)
2 lb PLSDeer tongue (Dicanthelium clandestinum)
30 lbCover Crop

Total: 43 lb/acre

This is a short-lived perennial mix that will allow for natural herbaceous and woody succession following timber sale retirement.

To simply control erosion and sedimentation reduce the mix to…

10 lb PLSDeertongue (Dicanthelium clandestinum) or Switchgrass (Panicum virgatum)
5 lb PLSVirginia wildrye (Elymus virginicus)
5 lb Autumn bentgrass (Agrostis perennans)
2 lb Partridge pea (Chamaecrista fasciculata)
30 lbCover Crop

Total: 52 lb/acre

Comparison Chart: Warm Season vs. Cool Season Grasses (Source: NRCS)
Use this comparison chart when creating a unique seed mix to help decide which grass type best fits the desired goals or outcomes of the planting. Generally, cool season grasses prefer growing when temperatures are between 65 and 80 degrees and warm season grasses prefer temperatures between 80 and 95 degrees. Differences between the two types are described below.

Topic	Warm Season Grasses	Cool Season Grasses
Erosion Control and Water Quality	Provide long-term benefits for erosion control and sediment trapping. Provide nutrient uptake during the summer when cool-season grasses are dormant.	Provide short-term and long-term benefits for erosion control and sediment trapping. Provide nutrient uptake earlier in spring and later in the fall than warm season grasses.
Wildlife Habitat	Excellent nesting and feeding habitat. Bunchgrasses provide openings for feeding, maintaining overhead protection from predators. Remain standing for good winter protection. Diverse - supporting a balanced mix of native plant species and insect populations.	Due to earlier "green-up," provide a better source of food (green foliage and insects) in early spring than warm season grasses. Mat down more rapidly than warm season grasses as they age, degrading nesting quality, feeding, and overhead protection.
Establishment	Seed may be more expensive and less readily available than cool-season grasses. Usually do not need much lime or fertilizer. Tolerates poor soil conditions (drought, nutrient- poor and/or low pH) better than cool-season grasses. Seeds are slow to germinate and seedlings usually need 2 to 3 years to establish. However, root structures are forming and providing erosion control even when not noticeably green aboveground.	Relatively inexpensive, readily available seeds. Have higher nutrient requirements than warm season grasses. Less tolerant of poor soil conditions. May need fertilizer maintenance. Seedlings are usually well established 1 to 2 years after planting. Rapid seedling growth results in less weed competition during establishment. Can be seeded in spring or late summer. Can also be seeded with cool season legumes. More susceptible to drought.
Maintenance	Maintained by using prescribed burning or, mowing to 6 inches tall. Grasses are long-lived and usually do not need reseeding. Selective herbicides may be used for weed control.	Maintained by mowing on 2- to 3-year rotation, and by overseeding with legumes every 3 to 4 years. As stands mature, grasses may thin out and need to be reseeded. Selective herbicides may be used for weed control.

3. Planting Guidance for Shrubs and Trees

There are occasions when planting seedlings is the most efficient method of ensuring that the next forest contains a desired species or to help forests recover after negative forest health impacts. For example, eastern white pine is commonly planted in areas without mature pines to produce seed.

Supplemental planting is the planting of species already present in the stand, but at less than desirable levels. This artificial regeneration supplements the regeneration present, and should target relatively open areas. A wide spacing is normal for supplemental planting (10-15 ft. spacing). Underplanting, a form of supplemental planting, is simply planting shade tolerant seedlings under an existing canopy. This can be done for the same reasons as enrichment planting, or to add understory species to the existing stand.

Enrichment planting is done in stands to establish desirable tree species, often after timber harvests. This can be done to increase diversity and wildlife value to the stand. Planting trees and shrubs along riparian areas can also be considered enrichment planting.

Reforestation planting is done to establish forest cover over an area previously forested, but not currently forested. This is done in areas where natural regeneration is lacking.

One of the keys to successful planting is matching the seedling species with existing site characteristics. A soil test may be appropriate to identify growing conditions. Some species, such as white pine, can grow almost anywhere there is adequate light. Site preparation is another step required for successful regeneration.

Additional Notes

In addition to the above restrictions on specific species/genera, the following planting guidelines are to be followed on State Forest lands:

- **The planting of non-native species in State Forest Wild and Natural Areas may be permitted under limited circumstances after receiving approval via a State Forest Environmental Review (SFER)**.

- Native tree species with no special status may be planted. Pennsylvania stock is preferred and cultivars should be avoided. Use Penn Nursery as the primary supplier of seedling stock when possible or a suitable alternative that uses regional genetic stock.

- Former plantations of exotic species (Norway spruce, red pine, etc.) may be replaced to the same species. Conversion of plantations to more natural, native stands is encouraged unless there is special historical significance to the plantation (e.g. CCC plantation of historical significance).

- Newly planted seedlings need protection from deer browse damage in many forest districts. Consider fencing entire planting areas with woven-wire fencing or protecting individual trees with tree tubes.

Tree and Shrub Species Lists:

1. Invasive: Deemed Invasive: Do Not Plant

A number of trees and shrubs are considered invasive by DCNR. Plants on DCNR Invasive Plant List are prohibited from use on State Forest lands, according to principles set forth in the State Forest Resource Management Plan. Please carefully review this list prior to making seeding or planting selections.

2. Potentially Invasive: Avoid planting except in special circumstances or situations

The use of the species listed below should be limited in most circumstances. This list was created through examining neighboring states' invasive plant lists, communications with foresters, specialists and resource managers, and research on species behavior. Native and non-native alternatives to these species are provided within Category 3. This list is revised periodically based on field observations and literature review.

Deciduous Trees and Shrubs

Sawtooth oak	*Quercus acutissima*

3. Non-invasive: Recommended native and non-native tree and shrub species.

Conifer and shrubs may provide cover, food, or structure for various wildlife species. Soft mast producing trees and shrubs provide food for many birds and small mammals. Hard mast producing trees and shrubs provide food for mammals and some birds. Hard mast can also be stored for consumption later. The following species may be used in openings, ROWs, early successional habitats, where underrepresented in the forest, or other suitable places on State Forest lands. This list is not all inclusive, many other PA native species can be considered.

Conifers

White pine	*Pinus strobus*	Red spruce	*Picea rubens*
Virginia pine	*Pinus virginiana (south of route I-80)*	Red pine	*Pinus resinosa (north of route I-80)*
White spruce	*Picea glauca*	Pitch pine	*Pinus rigida*
Black spruce	*Picea mariana (wet areas)*		

Non-native Conifers

Norway spruce**	*Picea abies*

Soft-mast Producing Trees/Shrubs

Serviceberry	*Amelanchier arborea*	Washington hawthorn	*Crataegus phaenopyrum*
Smooth serviceberry	*Amelanchier laevis*	Sweet crabapple	*Malus coronaria*
Staghorn sumac	*Rhus typhina*	Low serviceberry	*Amelanchier stolonifera*
American mtn-ash	*Sorbus americana*	Cockspur hawthorn	*Crataegus crus-galli*
Large-seed hawthorn	*Crataegus macrosperma*	White hawthorn	*Crataegus punctata*
Frosted hawthorn	*Crataegus pruinosa*		

Hard-mast Producing Trees			
Dwarf chinquapin oak	*Quercus prinoides*	Red oak	*Quercus rubra*
Scrub oak	*Quercus ilicifolia*	Allegheny chinquapin	*Castenea pumila*
Black locust	*Robinia psuedoacacia (south of route I-80)*		

Non-native Hard-mast Producing Trees			
Chinese chestnut	*Castanea mollissima*	American chestnut hybrids	*Castanea dentata x mollissima*

Blackberry / Raspberry Species			
Common blackberry	*Rubus allegheniensis*	Black raspberry	*Rubus occidentalis*
Smooth blackberry	*Rubus canadensis*	Red raspberry	*Rubus idaeaus*

Shrubs			
Arrow wood viburnum	*Viburnum dentatum*	Graystem dogwood	*Cornus racemosa*
Nannyberry viburnum	*Viburnum lentago*	Silky dogwood	*Cornus amomum*
Buttonbush	*Cephalanthus occidentalis*	Elderberry	*Sambucus canadensis*
Alder	*Alnus spp.*	Native chokeberries	*Aronia spp.*
American hazelnut	*Corylus americana*	Ninebark	*Physocarpus opulifolius*

***If Norway spruce is used to replace eastern hemlock, plant another native conifer (for example, white pine, red spruce, or white spruce) to increase opportunities for wildlife. A mixture of species will be required to compensate for the loss of eastern hemlock.*

Riparian Areas

Streams impacted by management activities and the riparian areas may be planted for canopy coverage or habitat enhancement. Forested riparian areas provide filter capabilities, stream bank stabilization, stream shading, additions of organic material to the stream, and shelter and food for wildlife.

Please consult the riparian tree and shrub list below. When planning riparian habitat planting projects, please partner with Ecological Services biologists to develop structure and composition specifications to meet habitat goals. Different riparian species may require different habitat and proper planning will help ensure suitable habitat is created.

Species recommended for stream crossing can include the following list, but be sure to use species native to the geographic region of interest.

Trees			
Bigtooth aspen	*Populus grandidentata*	Black gum	*Nyssa sylvatica*
Quaking aspen	*Populus tremuloides*	Eastern hemlock	*Tsuga canadensis*
Pin oak	*Quercus palustris*	Red maple	*Acer rubrum*
Black willow	*Salix nigra*	Yellow birch	*Betula alleghaniensis*
Black cherry	*Prunus serotina*	American sycamore	*Platanus occidentalis*
Tulip poplar	*Liriodendron tulipifera*	Black spruce	*Picea mariana*
Eastern white pine	*Pinus strobus*	Silver maple	*Acer saccharinum*
Red spruce	*Picea rubens*	Black willow	*Salix nigra*

Small Trees

Flowering dogwood	*Cornus florida*	Serviceberry	*Amelanchier arborea*
Staghorn sumac	*Rhus typhina*	Smooth serviceberry	*Amelanchier laevis*
Smooth sumac	*Rhus glabra*	Low serviceberry	*Amelanchier stolonifera*
Winged sumac	*Rhus aromatica*	Redbud	*Cercis canadensis*

Shrubs

Alder	*Alnus spp.*	Winterberry holly	*Ilex verticilata*
Chokeberry	*Aronia melanocarpa*	Silky dogwood	*Cornus amomum*
Buttonbush	*Cephalanthus occidentalis*	Elderberry	*Sambucus canadensis*
Choke cherry	*Prunus virginiana*	Highbush blueberry	*Vaccinium corymbosum*
Gray dogwood	*Cornus racemosa*	Arrow-wood viburnum	*Viburnum dentatum*
Blackhaw	*Viburnum prunifolium*	Inkberry	*Ilex glabra*
Witch hazel	*Hamamelis virginiana*	Red-osier dogwood	*Cornus sericea*
Ninebark	*Physocarpus opulifolius*		

Wildlife Use of Native Shrub and Tree Species

Species	Wildlife Species
Shrubs	
Arrowwood viburnum (*Viburnum dentatum)*	Fruit eaten by songbirds
Northern bayberry (*Myrica pensylvanica)*	Fruit and seeds eaten by songbirds. Provides habitat for ground-dwelling wildlife.
Sweet crabapple (*Malus coranaria*)	Fruit eaten by birds, deer, small mammals.
Dogwoods	Bluebird, Cardinal, Cedar waxwing, rabbit, ruffed grouse, wild turkey, wood thrush.
Gray dogwood (*Cornus racemosa)*	Fruit eaten by pheasant, turkey, grouse.
Red osier dogwood (*Cornus sericea)*	Fruit eaten by songbirds, grouse, quail, turkey. Twigs browsed by deer and turkey.
Silky dogwood (*Cornus amomum)*	Sometimes browsed by rabbits and deer.
Elderberry (*Sambucus americana)*	Fruit eaten by many birds including bluebird, brown thrasher, cardinal, indigo bunting, rose-breasted grosbeak, pheasant and dove. Recommended for rabbit, quail and turkey.
American hazelnut (*Corylus americana*)	Nuts eaten by squirrel, deer, jays, grouse, and pheasant. Recommended by quail and turkey.
Nannyberry (*Viburnum lentago*)	Fruit eaten by songbirds. Recommended for turkey.
Hawthorn (*Crataegus spp.*)	Fox sparrow, gray fox, raccoon, ruffed grouse.
Alder (*Alnus spp.)*	Beaver, goldfinch, ruffed grouse
Pines/Softwoods	
Eastern white pine (*Pinus strobus*)	Roosting trees for birds. Seeds eaten by a wide variety of birds, squirrels, and mice. Recommended for turkey.
Pine (*Pinus* spp.)	Beaver, black-capped chickadee, brown creeper, gray squirrel, mourning dove, porcupine, and nuthatches.
Non-mast producing Species	
Bigtooth aspen (*Populus grandidentata*)	Twigs and barks eaten by deer and beavers. Buds and catkins eaten by ruffed grouse. Recommended for porcupine.
Soft Mast Producing Species	
Serviceberry (*Amelanchier arborea*)	Fruits eaten by bluebird, cardinal, cedar waxwing, grey catbird, scarlet tanager, and veery. Recommended for turkey, beaver, and deer.
Hard Mast Producing Species	
Oaks (*Quercus* spp.)	Black bear, blue jay, raccoon, ruffed grouse, white-tailed deer, turkey, wood duck

Adapted from :
MacGowan, B.J. "Designing hardwood tree plantings for wildlife." USFS FNR-213. North Central Research Station, USDA Forest Service &Department of Forestry and Natural Resources, Purdue University.

Forest Stewardship #5: Wildlife. Penn State Extension publication.

Species Considerations for Conifer Planting

Species	Wildlife Habitat Characteristics	Present Distribution	Site Requirements	Shade Tolerance/Growth
Red Spruce (*Picea rubens*)	Lacking lower limb structure & thermal characteristics of hemlock. Northern flying squirrel feeds on the fruiting body of the mycorrhizae.	Northern PA, and higher elevations in northern Appalachian mountains.	Higher elevation, good moisture regime. Grows well on poor sites, acidic and shallow soils.	Tolerant- Very Tolerant. Long-lived (350-400 years), slow growing.
Norway Spruce (*Picea abies) **Non-native***	Retains lower limbs.	Throughout PA.	Tolerant of wide range of moisture regime and pH.	Very shade tolerant.
White Spruce (*Picea glauca*)	Retains lower limbs.	Northern PA	Tolerant of wide range of moisture regime and pH.	Intermediate shade tolerance. Long lived (250-300 years)
Black Spruce *(Picea mariana*)	Small dbh at maturity, retains lower limbs, shallow rooting.	Northern PA	Moisture regime important, prefers peat, and wet organic soils. Common in swamps or bogs.	Tolerant. 200 year lifespan typical.
White Pine (*Pinus strobus*)	Gets large, provides thermal cover, retains more lower limbs than red pine	Throughout PA	Tolerant of wide range of moisture regime and pH in northern North America.	Intermediate shade tolerance. Long lived.
Red Pine (*Pinus resinosa*)	Medium to large tree. Does not retain lower limbs	Northern PA	Tolerant of xeric sites, does well on sandy soils	Very intolerant, fast growth
Pitch Pine (*Pinus rigida*)	Medium sized tree	Mainly southern and eastern PA	Acidic soil, tolerant of fire	Intolerant
Virginia Pine (*Pinus virginiana*)	Relatively short	Southern PA	Grows well on xeric, nutrient poor sites	Intolerant

Preventing the Spread of Invasive Plant Species

The phrase "an ounce of prevention is worth a pound of cure" is the epitome of invasive plant management. It is more efficient and cost-effective to prevent invasive plants from becoming established than to control them once established. As might be expected, smaller or novel infestations of invasive plants are much easier to eradicate than well-established, larger populations. A number of prevention techniques can be utilized to limit the spread and establishment of invasive plants within gas development areas.

1. **Clean all vehicles and construction or mowing equipment thoroughly.** Prior to bringing equipment onto any state forest land, the operator is encouraged to clean equipment in an appropriate manner to remove all plant material, including rhizomes and seeds that might be carried on tires and the equipment undercarriage, which will help prevent the spread of invasive plants onto adjacent lands (please refer to Equipment Inspection and Cleaning Manual, and Vehicle Cleaning Technology for Controlling the Spread of Noxious Weeds and Invasive Species). If specialized cleaning equipment is not available at a staging site, consider nearby commercial car washes with high-pressure sprayers for cleaning smaller vehicles and equipment.

2. **Whenever possible, utilize on-site mulch materials (such as mulching trees marked for removal)**. While not always feasible, this practice would ensure that no contaminated mulch could be brought into the site. Invasive plants present at the edges of mulching or compost facilities could compromise and contaminate the material. Similarly, beds of dump trucks that are not properly cleaned could introduce invasive material into otherwise invasive-free mulch.

3. **Examine sources of fill and quarry material.** Instances of new populations of invasive plants following construction of gas infrastructure on state forest lands have been frequently traced back to populations growing within or at the edges of quarries. Invasive seeds and vegetative material can be collected and transported along with rock for road or pad building and become established following construction. It is recommended that operators or their botanical consultant inspect quarries prior to making large material purchases for multiple infrastructure projects.

4. **Move equipment from uninvaded areas to areas of high invasion.** The operator is highly encouraged to plan work according to invasive plant presence and avoid entering an un-infested area after working in a heavily infested area (including bringing equipment in from other states or geographic areas). If this is not logistically possible, the operator should seriously consider cleaning equipment between entries. District personnel may assist

contractor or operator in planning construction activities in relation to invasive plant locations when they are aware of their presence in particular areas.

5. **Clean seeding equipment prior to use.** Contamination can sometimes occur through the use of contaminated seed spreaders, not necessarily from the seed stock itself. Be sure that seeding equipment is clean and free of any seed used prior to these activities

6. **Use straw, not hay, following seeding.** Mulching with straw rather than hay is recommended to reduce the possibility of introducing invasive plant species propagules.

7. **Consider more aggressive native species or seed at higher rates in areas of known infestations.** Some native species, such as autumn bentgrass (*Agrostis perrenans*), deer tongue grass (*Dichanthelium clandestinum*), and switchgrass (*Panicum virgatum*) can grow aggressively and could have the potential to outcompete some invasive plants, in particular Japanese stiltgrass and reed canary grass. Seeding at higher than recommended rates of these species is necessary to achieve this result. Specific guidance in this type of seeding should be undertaken through cooperation with forest district staff and the Ecological Services section.

8. **Conduct a pre-construction survey to establish the presence or absence of invasive plants at the site prior to earth disturbance.** Knowledge of where invasive plants exist prior to construction allows for better implementation of the prevention measures discussed above. New disturbance and exposed soil often allows for the rapid spread of many invasive plants. Similarly, small infestations of invasive plants may be easier to control or eradicate when treated prior to construction.

   A pre-construction survey is recommended to determine if invasive plants are already present on-site**;** however this is not a requirement for development on state forest lands.

   The goals of a pre-construction survey are to: (1) locate established invasive plant populations that threaten the project, (2) determine appropriate prevention methods, (3) predict invasive plant control needs, and (4) assess potential responsibility for management of invasive plants and populations within a given site.

   The protocol described in the "Inventory and Monitoring of Invasive Plant Species" section can serve as an example of a potential pre-construction survey protocol. Other protocols for pre-construction surveys are acceptable, but should include collecting all data described within that protocol.

Early Detection Rapid Response Protocols

Early Detection and Rapid Response (EDRR) survey and treatment protocols maximize both sampling efficiency and discovery opportunities for new invasive plant species occurrences across state forest lands.

New forest clearing or disturbance due to gas development can provide ideal habitat and growing conditions for invasive plant species. Tracking all novel populations and treating them promptly is essential to slowing the spread of invasive plants on State Forest lands. The focus of this strategy is on high priority species that are either new or uncommon to a particular district; or are currently found outside state forest lands but have the potential to colonize within a district. In addition to tracking these species, this strategy also allows for the immediate (based on seasonality) treatment of these populations when found. One main assumption of EDRR is that new occurrences, when found, are relatively small and if immediately treated, could be eradicated with minimal effort, time, and cost. The EDRR protocol provides a brief (less than 5 minutes) reporting procedure that is carried out by trained staff. Since these populations are tracked over time, the effectiveness of treatments is also evaluated.

Prior to implementation of this protocol, a list of 11 high priority invasive plant species was developed and applied to all districts currently utilized for gas development in northern Pennsylvania (Moshannon, Sproul, Tiadaghton, Elk, Susquehannock, Tioga, and Loyalsock state forests). The list is re-evaluated annually based on the latest survey data.

Inventory and Monitoring of Invasive Plant Species

Tracking the establishment and spread of invasive plant species and detecting new populations across a leased tract, right-of-way, or at the landscape level is essential to effective prioritization planning and control of these species.

The Bureau of Forestry requires invasive plant monitoring and control following earth disturbance for the construction of gas infrastructure on state forest lands. Operators subject to a state forest Lease, Surface Use Agreement, or Right-of-Way Agreement are subject to monitoring and treatment requirements set forth by their Agreements.

As of 2015, new provisions have been put in place for new state forest Leases or Surface Use Agreements, as well as for new Right of Way Agreements. These provisions can be found at the end of this Appendix.

Prior Leases or Agreements are subject to invasive plant provisions established at the time of those particular agreements; however, the Bureau encourages operators to consider the use of more current invasive plant species control techniques and prioritization protocols.

The following are required inventory protocols for invasive plant monitoring activities:

1. During the first growing season after reseeding of the disturbed site, monitoring for invasive plant species during the growing season from May through September by a qualified botanist shall commence.

2. Target plants for monitoring are those classified as invasive, including those on DCNR's Invasive Plant List and Watch List or as specified by the Bureau of Forestry. The operator should consider

conducting inventories twice during the growing season to capture species that are conspicuous at different times during the growing season.

3. Monitoring data should be collected from the entire disturbed area plus a 100-foot buffer area, in grid cells no greater than 150' x 150' in size. The established grid should be digitized into a GIS layer, have unique labels, and be printed on maps that will be used for field data collection.

4. Standard information including date, surveyor name, and grid cell number should always be recorded prior to beginning the actual survey. During the field study, the center of each grid cell should be located using GPS, and an inventory created by noting the presence of any invasive plant species or the complete absence of any invasive plant species within the specified grid cell. For each invasive plant species occurrence, the cover class within each grid cell should be recorded as the following:

    Trace = less than 1% cover
    Low = between 1 and 5% cover
    Moderate = between 5 and 25% cover
    High = between 25 and 100% cover

    Cover may be estimated as a percent of the ground covered by a particular species. All trace and low occurrence locations should be located by GPS to aid in relocation and treatment.

    In addition, the average growth stage should be recorded as the following for each invasive plant species in each grid cell:

    Seedling
    Bolt
    Bud
    Flower
    Seed set
    Mature

5. The operator is responsible for providing the written report of the inventory findings, along with all associated data and GIS shapefiles to the Forest District Manager within thirty (30) days of survey completion. The Bureau of Forestry will assess the findings of the report and provide a treatment plan with all treatment requirement details for all prioritized invasive plant species to the operator and their botanical consultant.

Prioritization of Invasive Plant Threats

Landscape-level Management

Managing infestations of invasive plants requires diligence and effective planning, as well as an understanding of the plants-both where they currently occur and how they are spreading across a landscape. Each invasive plant species recognized by the Bureau of Forestry has different modes of spread and preferred habitat, and as such, each infestation and situation can be unique and require an individualized treatment strategy. The Bureau of Forestry is committed to managing invasive plant species across all state forest lands, which requires adaptive management and landscape-level prioritization based on efficiency, availability of resources, and perceived threat to ecosystem health. At the landscape level, rarely is it as simple as adopting a strategy of eradicating all known invasive plant populations. There are many different methods available to land managers to prioritize invasive species management across their state forest district. Many of these methods require an understanding of the current levels of infestations across a given landscape. It is recommended that prior to developing a prioritization strategy, thorough invasive plant surveys are conducted and the data is compiled spatially. The goals of the Bureau of Forestry's invasive plant management program are to: 1) control and eradicate novel and high threat invasive plant species populations, and 2) limit the spread of additional invasive plant species that threaten forest and wetland ecosystems or forest management activities.

The Bureau of Forestry is committed to a standard approach when coordinating invasive plant species surveys and treatments with operators and lessees. While managing invasive plants requires varying strategies across different landscapes, the basics of the decision-making process are similar in all forest districts. These strategies aid land managers in effectively eradicating novel invasive plant species and populations and containing the spread of existing invasive plant populations in each state forest district.

Most landscape level strategies used by the Bureau for establishing invasive plant treatment priorities consider (but are not limited to) the following factors:

1. **Threats to forest ecosystems –** As forest managers, the Bureau's primary role is to promote the health of forest ecosystems and native plant species. Some invasive plants pose a greater threat than others to forest health by easily out-competing native herbaceous plant species for nutrients and growing space, as well as inhibiting desired tree regeneration in forest stands. Threats to state-listed species populations or Wild Plant Sanctuaries are also considered.
2. **Density and scale of infestation –** Small or newly established populations of any invasive are easier to treat than dense, large-scale infestations. Treating these small populations provides a higher probability of success and limits the spread of species across a landscape, confining species to "core" areas of infestation.
3. **Novelty of species on the landscape –** Species that are new to a particular landscape are often given a higher priority than established invasive plant species. As with small populations, the probability of eradicating a particular species on a given landscape is higher with novel populations. This is often accomplished on state forest lands using Early Detection and Rapid Response strategies.

4. **Areas targeted for forest management –** Forest managers treat well-established invasive plants in areas that are targeted for forest management activities such as timber harvesting and habitat restoration or recreational activities like trails and parking lots. This helps control the spread of established populations into newly disturbed areas or areas with high visitation by the public.
5. **Resources available for treatment –** After ecological and management decisions are made using the points described above, forest managers consider the amount of time, manpower, and funds that are available for invasive plant management and allocate their resources accordingly.

Treatment Strategy

The same decision-making process is used when considering how best to treat species found during a post-construction invasive plant report submitted by a lessee or agreement holder. After review of post-construction invasive plant monitoring reports and internal discussions concerning prioritization based on the five factors listed above, populations that are selected by the Bureau for treatment by the lessee or agreement holder often can be categorized in one of three ways: (1) high priority species that are new or novel to a particular region or species that the Bureau of Forestry recognizes as posing the highest threat to all native species and ecosystems (i.e, Japanese angelica tree, common reed), (2) additional invasive plant species that are known to specifically threaten forest or wetland ecosystems (i.e. Japanese barberry, honeysuckle species), and (3) species or populations that threaten existing or proposed forest management activities in the immediate vicinity of the occurrence.

Highest-threat Invasive Plant Species

The Bureau of Forestry has established the following eleven invasive plant species listed below as the highest priority targets for immediate treatment and control. These were chosen due to their ability to severely threaten all ecosystems in Pennsylvania and because they are currently found in mostly low levels in northern Pennsylvania, raising the probability of successful control and eradication. **When found, these species are to be subject to required treatment regardless of size of the population.** Please note that this list may change as new invasive plant species are discovered in Pennsylvania. At this time, this list applies to all districts currently utilized for gas development in northern Pennsylvania (Moshannon, Sproul, Tiadaghton, Elk, Susquehannock, Tioga, and Loyalsock state forests). These species are also subject to the Bureau's Early Detection and Rapid Response Protocols, ensuring timely and aggressive treatment of any new populations identified during monitoring activities. As of 2015, the highest threat species are:

Tree-of-heaven (*Ailanthus alitissima*)
Japanese angelica tree (*Aralia elata*)
Poison hemlock (*Conium maculatum*)
Glossy buckthorn (*Frangula alnus*)
Goatsrue (*Galega officinalis*)
Mile-a-minute (*Persicaria perfoliata*)
Common reed (*Phragmites australis* ssp. *australis*)
Japanese & Giant knotweed (*Polygonum cuspidatum* & *P. sachalinensis)*
Black swallow-wort (*Cynanchum louiseae*)
Pale swallow-wort (*Cynanchum rossicum*)

**And any other invasive plants classified as PA Noxious Weeds by the PA Department of Agriculture

Species Threatening Forest and Wetland Ecosystems

While the Bureau of Forestry does maintain a list of the invasive plant species with the highest priority for treatment and eradication, they are not the only invasive plant species that threaten forest or wetland ecosystems. Additional invasive plant species, such as multiflora rose (*Rosa multiflora*), purple loosestrife (*Lythrum salicaria*), Japanese barberry *(Berberis thunbergii)*, garlic mustard (*Allaria petiolata*), and reed canary grass (*Phalaris arundicatum*) can easily out-compete native herbaceous plant species for nutrients and growing space, as well as inhibit desired tree regeneration in forest stands. Many known invasive plant species fit into this category and are actively managed by foresters across the state forest districts. When found in small populations, many of these species can be easily eradicated.

Species Threatening Forest Management Activities

Well-established invasive plants in areas that are targeted for forest management activities such as timber harvesting or habitat improvement are often priorities for treatment. This limits opportunities for existing invasive plant populations to encroach upon newly altered or enhanced forest habitat. Similarly, areas with high visitation by the public, such as trails or parking lots, are also priority treatment areas regardless of species. This limits the chance of high forest use to be an effective vector for the spread of established invasive plant species. Each state forest district also has unique ecological features including wetlands, spring seeps, or old growth forests that are given high priority for protection on the landscape planning level regardless of the invasive plant species that threaten these areas.

Control of Invasive Plant Species

The Bureau of Forestry has adopted an Integrated Pest Management approach to controlling and eradicating invasive plant species. This strategy allows for the combined use of a number of control measures, including: mowing, prescribed fire, hand-pulling, biocontrols, silvicultural techniques, and chemical treatments. All treatments require diligence, patience, and a commitment to follow-up to assess success and conduct future treatments. Rarely is a one-time only treatment an effective means to eradicate established populations of invasive plant species.

1. **Mechanical treatment.** The hand-pulling and digging of small populations of invasive plants (typically only a few plants) and removing the roots can be an effective means of control when a population is in its early growth stages. At times, mowing can also be effective if timed appropriately. The appropriate timing of mechanical treatments is critical to the success of this strategy. If plants are cut, dug, or removed after seed has set, the treatment will likely be unsuccessful. Similarly, if all root material is not removed, this treatment will also likely fail.

2. **Biocontrols**. Competing plants, predatory insects and fungi, and plant diseases co-evolve with plants within their native range. However, invasive plants, which often originate from other continents, rarely have any pests or effective competitors when they are introduced in

North America. Biocontrols are species (often insects) that are found in an invasive plant's country of origin and are carefully researched before being released into the wild. Biocontrols significantly damage invasive plants and allow native plant species to better compete with invasive plants for growing space. The advantage of biocontrols is that they effectively target an invasive plant species and in time, can spread on their own to new populations in surrounding areas.

3. **Silvicultural techniques**. Often following initial control, silvicultural techniques—such as tree and shrub planting, warm season grass seeding, or prescribed fire—can be used to control invasive plants or exclude them from previously treated areas. Some trees, shrubs, and native grasses can grow quickly and aggressively if planted correctly, and shade out potential habitat for invasive plant species. Prescribed fire can also maintain habitat conditions that benefit some native species, helping areas resist invasion by non-native invasive plants. In some cases, prescribed fire can benefit certain invasive plant species; care must be taken when using prescribed fire to control invasive plants.

4. **Chemical treatment.** Herbicides are often used for the effective treatment and control of invasive plant species. The type of chemical, mode of application, and timing of application can vary greatly based on the species and size of infestation. Some herbicides are prohibited for use on state forest lands. Any chemical treatments should be done following consultation with the District manager and Ecological Services.

The ecology and growth habits of each invasive plant species are different; therefore it is imperative that the appropriate control measures are in place for each species and individual population. The incorrect control technique or the appropriate control technique during the wrong time of the growing season often results in an inadvertent increase in the population. Consultation with District managers and Ecological Services is required prior to any invasive plant control or eradication taking place on state forest land.

Reporting Invasive Plant Monitoring and Treatment

1. For projects in which invasive plant species treatment and eradication is taking place using treatment protocols provided by the Bureau of Forestry, the operator should also report on the number of treated/eradicated populations by species and the relative success of the treatments.

2. The operator is responsible for providing the written report of the inventory findings, along with all associated data and GIS shapefiles to the Forest District Manager within thirty (30) days of survey completion. The Bureau of Forestry will assess the findings of the report and provide a

treatment plan with all treatment requirement details for all prioritized invasive plant species to the operator and their botanical consultant.

3. All other requirements involving invasive plant species control and reporting on monitoring activities is included in the Invasive Plant Species Provisions at the end of this Appendix.

State Forest Invasive Plant Provisions

The Invasive Plant Provisions for State Forest land Leases or Surface Use Agreements are as follows:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

INVASIVE PLANT and REVEGETATION PROVISIONS
FOR MINERAL LEASES AND SURFACE USE AGREEMENTS
ON STATE FOREST LANDS

Last updated January 2016

Definitions and Specifications:
These provisions apply to any disturbance or construction activities that occur pursuant to a DCNR Lease (Lease) or Surface Use Agreement (SUA) for mineral extraction.

The **disturbed area** is defined as the greater footprint of the following, plus an additional 100 feet:

1. Limits of vegetation clearing
2. Entire width and length of DCNR-issued rights-of-way (with the additional 100' buffer on all sides)
3. Soil disturbances
4. Gated access roads utilized by the lessee
5. Any road modified or improved and used exclusively by the lessee

Invasive plants include all species and watch list species identified within the most recent version of DCNR's Invasive Plant List. This document is dynamic and updated on a regular basis. Plant species on DCNR's Invasive Plant List are prohibited for use in stabilization and restoration activities on state forest lands.

Monitoring encompasses the actions of inventorying, surveying, documenting, and reporting.

Prioritized species are invasive plant species that are considered a significant ecological and economic threat to a specific habitat and/or geographic location by the Bureau of Forestry.

A population of prioritized species will be considered **eradicated** when it is absent for three consecutive growing seasons following implementation and completion of the written control prescription and desirable vegetation has become established.

A.Invasive Plant Provisions:

1.Post Disturbance Monitoring

1.1 The Lessee or SUA holder shall monitor for all incidences of **invasive plants** found within the entire **disturbed area**, to the satisfaction of the Bureau of Forestry, upon completion of the disturbance activity and successful soil stabilization pursuant to 25 Pa Chapter 102.

1.2 **Monitoring** inventories shall be conducted June through September at 1 year, 3 years, 5 years, 7 years, 9 years, and 12 years following successful initial soil stabilization.

1.3 The Lessee or SUA holder and its botanical consultant shall meet with Bureau of Forestry staff prior to initiation of the first post-disturbance monitoring inventory. At this time, the Bureau of Forestry will provide the Lessee or SUA holder with standardized invasive plant inventory and reporting protocols that must be followed.

1.4. The Lessee or SUA holder shall document the presence of **invasive plants** and provide a report, including all associated data and GIS shapefiles, to the Bureau of Forestry within 30 business days of the completion of the monitoring inventory.

1.5 The Bureau of Forestry reserves the right to use all data and reports submitted by the Lessee, SUA holder, or its designee.

1.6 Bureau of Forestry personnel may inventory the **disturbed area** at any time for **invasive plants**. If invasive plants are discovered, the Bureau of Forestry will provide written notification of their existence to the Lessee or SUA holder within 10 business days of the detection.

1.7 If new earth disturbance (greater than 5,000 square feet) occurs on a previously disturbed, stabilized, or restored site, that area shall revert back to required post-disturbance monitoring (years 1, 3, 5, 7, 9, and 12) and invasive plant eradication requirements.

2.Treatment and Eradication of Invasive Plant Species

2.1 After an invasive plant population is reported by the Lessee, SUA holder , or by Bureau of Forestry personnel, the Bureau of Forestry will determine if it is considered a **prioritized species**.

2.2 The Bureau of Forestry will develop a written required treatment prescription for each **prioritized species** population and will provide the prescription to the Lessee or SUA holder . Each **prioritized species** population subject to required treatment shall be treated at least once annually until **eradicated.**

2.3 The Lessee or SUA holder shall be responsible for implementing the written prescription and **eradicating** all populations of **prioritized species** identified within the **disturbed area** for the term of the Lease or SUA.

a. The Lessee or SUA holder may be released from this responsibility when the **disturbed area** has been restored to the satisfaction of the Bureau of Forestry.

b. Reseeding to stabilize soil and prevent erosion and sedimentation is not considered restoration by the Bureau of Forestry.

2.4 The Lessee or SUA holder is responsible for complying with all local, state, and/or federal laws and regulations regarding the use of herbicides.

a. Only herbicides identified in the written prescription may be used on state forest lands.

b. All herbicide applications on state forest land will be tracked and legible application log sheets will be provided to the Bureau of Forestry within 10 business days of treatment.

2.5 The Lessee or SUA holder will provide the Bureau of Forestry with written notification of the anticipated treatment location and start date a minimum of 10 business days prior to treatment.

B.Planting and Seeding Provisions

1. All soil stabilization and site rehabilitation activities on state forest lands shall conform to the most recent version of the Bureau of Forestry's *Planting and Seeding Guidelines*. This document is dynamic and expected to change over time when necessary in order to carry out the Bureau of Forestry's adaptive management practices.

2. The Bureau of Forestry may provide other written instructions for planting or seeding requirements.

3. The Lessee or SUA holder shall submit a soil stabilization plan to the Forest District Manager for approval, prior to any soil disturbance activities, which identifies the species and materials (including mulch, soil amendments, or other erosion control materials) planned for erosion control.

4. All site rehabilitation activities on state forest lands shall conform to the site-specific, long-term restoration plan and prescription developed by the Bureau of Forestry.

5. The Lessee or SUA holder shall provide the Forest District Manager with all seed mix tags, identifying the species composition and seeding rates utilized, within seven (7) business days of final seeding.

6. The Lessee or SUA holder shall ensure that tree and shrub plantings sustain a seventy percent (70%) survival rate for two (2) growing seasons following planting.

a) If the Forest District Manager determines its necessary, replacement seedlings shall be planted between April and June of the third growing season.

Planting outside of this window or at other times during the life of this agreement shall be at the discretion of the Forest District Manager.

The Invasive Plant Provisions for State Forest land Right-of-Way Agreements are as follows:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

INVASIVE PLANT and REVEGETATION PROVISIONS
FOR RIGHT-OF-WAY AGREEMENTS
ON STATE FOREST LANDS

Last updated January 2016

Definitions and Specifications:
These provisions apply to any earth disturbance area or activities associated with a License for Right-of-Way (Agreement) on State Forest Land.

The **disturbed area** is defined as the greater footprint of the following, plus an additional 100 feet:

1. Limits of vegetation clearing

2. Entire width and length of DCNR-issued rights-of-way (with the additional 100' buffer on all sides)3.

3. Soil disturbances, plus an additional 100 feet perpendicular on either side of the right-of-way whenever the right-of-way corridor directly borders/parallels or bisects the following features as defined by the Department:

    a. An area subjected to a designated silvicultural treatment (as identified by the Forest District Manager) within 7 years prior to right-of-way disturbance.
    b.A state forest road of any kind.
    c. A water feature of any kind.

Invasive plants include all species and watch list species identified within the most recent version of DCNR's Invasive Plant List. This document is dynamic and updated on a regular basis. Plant species on DCNR's Invasive Plant List are prohibited for use in stabilization and restoration activities on state forest lands.

Monitoring encompasses the actions of inventorying, surveying, documenting, and reporting.

Prioritized species are invasive plant species that are considered a significant ecological and economic threat to a specific habitat and/or geographic location by the Bureau of Forestry.

A population of prioritized species will be considered **eradicated** when it is absent for three consecutive growing seasons following implementation and completion of the written control prescription and desirable vegetation has become established.

A.Invasive Plant Provisions:

1.Post-Disturbance Monitoring

1.1 The Licensee shall monitor for all incidences of **invasive plants** found within the entire **disturbed area**, to the satisfaction of the Bureau of Forestry, upon completion of the disturbance activity and successful soil stabilization pursuant to 25 Pa Chapter 102.

1.2 **Monitoring** inventories shall be conducted June through September at 1 year, 3 years, 5 years, 7 years, 9 years, and 12 years following successful initial soil stabilization, and every three years thereafter for the life of this agreement.

1.3 The Licensee and its botanical consultant shall meet with Bureau of Forestry staff prior to initiation of the first post-disturbance monitoring inventory. At this time, the Bureau of Forestry will provide the licensee with standardized invasive plant inventory and reporting protocols that must be followed.

1.4 The Licensee shall document the presence of **invasive plants** and provide a report, including all associated data and GIS shapefiles, to the Bureau of Forestry within 30 business days of the completion of the monitoring inventory.

1.5 The Bureau of Forestry reserves the right to use all data and reports submitted by the Licensee or its designee.

1.6 Bureau of Forestry personnel may monitor the **disturbed area** at any time for **invasive plants**. If invasive plants are discovered, the Bureau of Forestry will provide written notification of their existence to the licensee within 10 business days of the detection.

2.Treatment and Eradication of Invasive Plant Species

2.1 After an invasive plant population is reported by the Licensee or by Bureau of Forestry personnel, the Bureau of Forestry will determine if it is considered a **prioritized species**.

2.2 The Bureau of Forestry will develop a written required treatment prescription for each **prioritized species** population and will provide the prescription to the licensee. Each **prioritized species** population subject to required treatment shall be treated at least once annually until **eradicated.**

2.3 The Licensee shall be responsible for implementing the written prescription and **eradicating** all populations of **prioritized species** identified within the **disturbed area** for the term of the right-of-way agreement.

2.4 The Licensee is responsible for complying with all local, state, and/or federal laws and regulations regarding the use of herbicides.

a. Only herbicides identified in the written prescription may be used on state forest lands.

b. All herbicide applications on state forest land will be tracked and legible application log sheets will be provided to the Bureau of Forestry within 10 business days of treatment.

2.5 The Licensee will provide the Bureau of Forestry with written notification of the anticipated treatment location and start date a minimum of 10 business days prior to treatment.

B.Planting and Seeding Provisions

1. All soil stabilization and site rehabilitation activities on state forest lands shall conform to the most recent version of the Bureau of Forestry's *Planting and Seeding Guidelines*. This document is dynamic and expected to change over time when necessary in order to carry out the Bureau of Forestry's adaptive management practices.

2. The Bureau of Forestry may provide other written instructions for planting or seeding requirements.

3. The Licensee shall submit a soil stabilization plan to the Forest District Manager for approval, prior to any soil disturbance activities, which identifies the species and materials (including mulch, soil amendments, or other erosion control materials) planned for erosion control.

4. All site rehabilitation activities on state forest lands shall conform to the site-specific, long-term restoration plan and prescription developed by the Bureau of Forestry.

5. The Licensee shall provide the Forest District Manager with all seed mix tags, identifying the species composition and seeding rates utilized, within seven (7) business days of final seeding.

6. The Licensee shall ensure that tree and shrub plantings sustain a seventy percent (70%) survival rate for two growing seasons following planting.
   a) If the Forest District Manager determines its necessary, replacement seedlings shall be planted between April and June of the third growing season.
   b) Planting outside of this window or at other times during the life of this agreement shall be at the discretion of the Forest District Manager.

Appendix D: Site Rehabilitation

Purpose

Development on State Forest land leases and severed rights areas results in the disturbance of plant and wildlife habitat, especially to core and interior forest habitats. With effective planning and implementation, suitable habitat can be created for many species of plants and wildlife during the interim reclamation and final restoration of oil and gas-related sites, reducing any long-term ecological impacts across the forest landscape.

The purpose of this appendix is to offer planning considerations and rehabilitation guidelines on oil and gas development sites in order to regain a functioning ecosystem. These guidelines encourage approaches to site rehabilitation that result in tree species diversity, appropriate species selection for a particular site, and maintenance of habitat structure. The proceeding recommendations and information are offered as a guide for rehabilitation and each case should be evaluated and decided upon first at the site level and then within the context of the forest landscape. In addition to these recommendations, the Bureau of Forestry's Planting and Seeding Guidelines also serve as a guide for planting during revegetation, reclamation, and restoration practices.

Even successful ecological restoration may take years or decades; however, the long timeframe underscores the need to look at every step in the process as an opportunity for restoration and enhancement of habitat.

Section I: Defining Revegetation, Reclamation, and Restoration

A. Explanations of Terms

The terms revegetation, reclamation, restoration, and rehabilitation are often used interchangeably, but have different meanings to the Bureau of Forestry. The definitions become important when determining final goals for a site and for clarification of expected outcomes. The word restoration is used throughout this document, but often in the short term, interim reclamation is taking place in the field, with final restoration to be completed in the future. The terms are clarified below. A full ecological restoration project often involves all steps defined below.

Rehabilitation: Rehabilitation refers to the overarching act of mitigating some type of land-use change or disturbance, which may involve tree cutting, vegetation removal, soil disturbance, and/or loss of ecosystem function. Rehabilitation is a sliding scale, with required stabilization at the "low" end and complete ecological restoration at the "high" end. Rehabilitation projects often seek to stabilize soils, increase plant and wildlife diversity, and/or improve ecosystem

functions. Additional considerations for planning all types of rehabilitation projects are given in Section II.

> ***Passive rehabilitation***: Passive rehabilitation is an activity where the degradation causes are identified and removed and the area recovers without further assistance to a more desirable condition. This activity is often appropriate for communities that have only been slightly impaired. This often involves opportunistic forb, shrub and tree species colonizing the site without human aid.
>
> ***Active rehabilitation:*** Active rehabilitation in highly disturbed communities or degraded sites includes the application of management techniques such as soil stabilization, grass establishment, invasive plant control, and shrub or tree planting. These applications are undertaken with a desired final landscape in mind. All forms of rehabilitation that involve site preparation, soil remediation, or stabilization and planting are active rehabilitation projects.

Revegetation: Revegetation refers to planting grasses and legumes over a disturbed site or bare soils. This is the site stabilization required by DEP regulations to protect exposed soils at the site from accelerated erosion and sedimentation. The Bureau of Forestry considers this only the starting point for expected site rehabilitation**.** The Bureau's Planting and Seeding Guidelines (Appendix D) provide additional considerations for revegetation projects.

Reclamation: Reclamation reduces the overall size of the disturbed area by using native forbs, shrubs, and trees to begin to rebuild organic topsoil, improve native plant diversity, and encourage site use by native insects and early successional wildlife. Reclamation projects often seek to re-establish the original form of the vegetation community at the site and begin the process of rebuilding full ecological function. Aside from ecological reclamation, disturbed sites could also be used for other state forest purposes, such as trailheads. Additional considerations specific to reclamation projects are given in Section III.

Interim Reclamation: Interim reclamation refers to minimizing the original disturbance footprint by rehabilitating all portions of the site not needed for immediate production operations, while also maintaining safety and space for safe operation of active portions of the site. For example, interim reclamation is possible when temporary workspace for a right-of-way is no longer needed, or when the size of a pad can be reduced to only that which is necessary for operation and maintenance.

Final Reclamation: Final reclamation refers to the practice of reclaiming a majority or the entire disturbed site by removing infrastructure, fencing and aggregate material; spreading topsoil and re-contouring the site; and planting native grasses, shrubs and trees. Final reclamation is, in essence, the beginning of restoration. At this point, the site can proceed through natural

processes toward the final restoration of all ecosystem functions that existed prior to the initial disturbance.

Restoration: The Bureau of Forestry defines restoration as the return of a disturbed site to the functioning ecosystem state prior to disturbance. Ideally, this functioning state would be the same as what existed at the site prior to disturbance; however, depending on ecological conditions, this may not always be possible. In these cases, the Bureau may seek to provide similar ecosystem functions towards a completely restored state. This type of rehabilitation accelerates the recovery of an ecosystem's health and sustainability, and provides the appropriate pathways for ecosystem functions to become self-sustaining. Merely recreating the landscape without ecosystem functions does not constitute restoration. Additional considerations specific to restoration projects are given in Section IV.

B. Goals and Objectives

The general ***goal*** of rehabilitation is to assist the recovery of an ecosystem that has been degraded, damaged, or destroyed. Work to achieve this goal may take many forms and be a step-wise process over the life of the site. Goals are the ideal states and conditions that an ecological rehabilitation efforts attempt to achieve. Statements of ecological goals should candidly express the degree to which recovery can be anticipated to return to a former state, condition, or trajectory. Rehabilitation goals will often take into consideration what was determined to be the need and level of rehabilitation, and what was found during pre-project monitoring.

The Bureau of Forestry's mission is to ensure the long-term health, viability and productivity of Pennsylvania's forests and to conserve native wild plants. Therefore, final restoration will not be complete unless the proper interactions upon which the integrity of the ecosystem depends are functioning.

The ***objectives(s)*** of site rehabilitation should be to:

- Establish vegetation that can aid in controlling erosion
- Allow recruitment by native plant species for increased diversity
- Fix Nitrogen (N) from the atmosphere
- Create wildlife habitat
- Minimize invasion of by invasive plant species
- Develop the area into a productive ecosystem dominated by native species

To truly restore a site, the historical species and structure should be maintained and sustained into the future. All types of rehabilitation will likely be necessary to achieve final restoration. During the planning stages, discussions should take place in regards to whether or not an active

strategy is worth the cost, the likelihood of success, and the degree of ecological and financial risk.

C. Where and when to use these site rehabilitation options

The guidelines presented in this document should be considered as options during interim reclamation and final restoration for gas-related infrastructure on State Forest land, including:

1) Well pads
2) Staging areas
3) Freshwater Impoundments
4) Rights-of-Way
5) Compressor stations
6) Retired roads, widened roads, and access roads

The information presented in this document could be considered at any stage following disturbance. This includes revegetating for erosion and sedimentation control planning, reclamation, and restoration.

Section II: Rehabilitation Planning

A. Planning Considerations

The first thing to consider in developing a rehabilitation plan is the long-term desired condition for the landscape and site. This could be based on managing to revert back to pre-disturbance conditions, fill a lacking habitat, managing for a priority species, or creating special habitat enhancements. Before implementing management actions, operators, district personnel, and Ecological Services should create clear long-term objectives for the landscape. These objectives and options for rehabilitation should consider the following:

1.Conduct pre-project monitoring as needed to identify the kind of ecosystem to be rehabilitated, focusing on existing site conditions and describing the biota of the site.

Often it is useful to obtain baseline measurements on such parameters as wildlife and plants using the site conditions, soil quality, water quality, and any other information that may be pertinent during all rehabilitation activities. This information is especially important if the site is different or unique from the surrounding landscape. This step should be conducted prior to earth disturbance since sites may not begin final restoration activities for 5-20 years after initial earth disturbance.

Descriptors that should be documented to facilitate communication at the time of rehabilitation planning include:

- Presence of invasive species
- The moisture conditions (hydric, xeric, etc)
- Site class
- Stand/community type
- Existing vegetation on site (vegetation types, species lists, community structure).
- A landscape review of available habitats within the associated Landscape Type Association (LTA) and adjacent LTAs.
- Wildlife species and plant communities currently using the area and those with the potential to use the area based on the habitat present, emphasizing community indicator species.
- Ecologically important features, such as a complex of vernal pools or wetlands that may influence the option chosen for rehabilitation.
- Species of special concern that may be impacted by disturbance and rehabilitation activities.
- Soil quality and type

2.Identify physical site conditions in need of repair following disturbance.

Many ecosystems in need of rehabilitation are dysfunctional on account of damage to the physical environment, such as soil compaction, soil erosion, or surface water diversion. The physical environment must be capable of sustaining viable, reproductive species populations that comprise the plant and animal life of the rehabilitated ecosystem. This will be especially important to consider when determining how the site will be reseeded, reclaimed and restored.

3. Identify the need for ecological restoration and the level of rehabilitation.

It may be important to describe the ecological functions that are anticipated to return to the site following final restoration and initial rehabilitation. This is important because site rehabilitation can be conducted in several contexts. The appropriate context should be identified in the project goals in order to underscore the intent of all rehabilitation stages. A few relevant contexts of rehabilitation for oil and gas development might include:

- Recovery of a degraded or damaged ecosystem to its former state
- Replacement of an ecosystem that was entirely destroyed with one of the same kind. The new ecosystem must be entirely reconstructed on a site that was denuded of vegetation.
- Transformation of another kind of ecosystem from the bioregion to replace one which was removed from a landscape that became irreversibly altered.

4. Identify rehabilitation goals and objectives.

Goals are the ideal states and conditions that an ecological rehabilitation efforts attempt to achieve. Written expressions of goals provide the basis for all rehabilitation activities, and later they become the basis for project evaluation.

5.Identify and list the kinds of ecological interventions that are needed.

Many rehabilitation projects require manipulation of the biota, particularly vegetation, to reduce or eradicate unwanted species and to introduce or augment populations of desirable species for successful rehabilitation. Invasive plant species generally require eradication. Other species, invasive or non-native, may be removed if they retard or arrest succession. Species that may need introduction include mycorrhizal fungi, N-fixing bacteria, or other soil microbiota. Animals can be enticed to colonize projects by providing perches, nest boxes, distributing coarse detritus for small animal cover, and/or providing talus rocks.

6.Identify biotic resource needs, sources, and considerations.

Prior to rehabilitation it will be important to consider what biotic resources (i.e. seeds, other plant propagules, etc.) will be needed for establishment at the project site with the rehabilitation goals taken into consideration. When determining seed choices consider the following:

- Source of seeds
  - Use appropriate seed for the region
- Native/non-native
  - When planting natives, make sure the species being planted is native to Pennsylvania, and when practical, native to the ecoregion where planting is taking place.
- Planting success
  - Use appropriate species for the site considering sunlight requirements, soil disturbance, soil type and quality, etc.
- Amount of management necessary
  - Depending on what is being planted, varying amounts of management may be required. If planting high maintenance species, also consider the proximity to necessary equipment and tools, as well as a reliable source of funding and manpower.
- Original and potential future forest community type trajectories to support the long-term desired condition.
- Soil quality, type and amount of compaction

- Bureau of Forestry's Planting and Seeding Guidelines
- Bureau of Forestry's Pipeline Right-of-Way Wildlife Habitat Guidelines
- Bureau of Forestry's Right-of-Way Vegetation Management Guidelines
- Plant Diversity
    - Diverse vegetation composition provides for a resilient food web and more viable wildlife populations.

7. ***Perform monitoring as required to document the attainment of project goals and objectives.***

An evaluation should compare the reseeded, reclaimed, or restored ecosystem to its condition prior to the initiation of rehabilitation activities. The evaluation should determine whether or not the ecological goals were met, including the ecological attributes of similar rehabilitated ecosystems. Data should be required when it will be meaningful for decision making and then results of analysis should be documented in writing. Ecological evaluations may need to occur at various points as the system recovers.

Section III: Additional Reclamation Considerations

Interim reclamation

Interim reclamation consists of minimizing the footprint of disturbance by reclaiming all portions of the gas related infrastructure site no longer needed for active operations and maintenance. Some rehabilitation features, such as shrubs and trees, take time to mature and achieve value to wildlife. Interim substitutes can be used to serve the functions intended for the permanent features. There are several practices that could potentially be implemented that may help alleviate the impacts of oil and gas development and provide habitat enhancements. Several suggestions include re-contouring and revegetating any area of the site not being used, reducing the amount of edge on a site, providing wildlife habitat with brush piles, and planting native warm season grasses and wildflowers.

Re-contour and revegetate where feasible

The portions of the well site not needed for operational and safety purposes could be re-contoured to either a final or intermediate contour that blends with the surrounding topography as much as possible. Soil compaction should be avoided and minimized, and soil should only be graded enough to achieve the desired grade. Only compact fill material where stability is a risk, and only enough to ensure stability. (ARRI FRA 3, VA Coop Ext) Fills less than 6 feet in height should not be compacted at all. At least 4 feet of un-compacted material should be at the surface of any compacted fill material. (ARRI FRA 3, VA Coop Ext) Topsoil may even be able to be spread over areas not needed for operations and revegetated after ripping the subsoil.

Reducing Edge

Infrastructure site development creates habitat fragmentation increases the amount of edge, which can negatively impact certain species. Once a site is no longer being fully utilized it might be beneficial to round the edges of the sites. Square and circular openings will minimize the edge effect. This could also be accomplished by feathering the edges. Feathered edges gradually blend the opening into the adjacent forest. Feathered edges can be created through a variety of techniques including adding several rows of shrubs leading into the forest, or by cutting stumps to ground level in temporary workspaces and allowing them to re-sprout following construction. Typically, edges must be maintained through active management. Many species, including: ruffed grouse, bobwhite quail, turkeys, white-tailed deer, rabbits, raccoons, foxes, coyotes, song sparrows, brown thrashers, gray catbirds, and indigo buntings can benefit from feathered edges (Wilson 2006).

Brush Piles

The woody limbs and stumps from the trees removed to create the site openings could be used to create brush piles. Brush piles are most beneficial to wildlife when they are located at the edges of forest openings. They should be located within 10 feet from the woodland border.

Brush piles could also be placed along streams and marshes within or next to woodlands. When properly located and constructed, brush piles can benefit many species of wildlife, including: bobwhite quail, cottontail rabbit, ruffed grouse, turkey, skunk, raccoon, juncos, and sparrows. Predators such as foxes, bobcats, hawks, owls and coyotes also benefit from the small mammal and bird populations found in or around brush piles.

Section IV: Additional Restoration Considerations

Final restoration can begin once all or most activity on the site is complete (i.e., when a well is plugged or a compressor station is dismantled). Restoration is considered successful when long-term ecosystem sustainability has been obtained. The decision of how to restore the site should be made as early in the planning process as possible, although situations may arise in which adaptive management may have to be utilized. There are several choices when it comes to final restoration on state forest lands. The site may be best suited to:

- Revert back to what it was originally
- Fill a lacking habitat/species
- Provide additional food and hunting opportunities with food plots
- Special habitat enhancement

The details of whether to revert a site to the original habitat prior to disturbance or to choose another option will be best decided at the site level. Regardless of the final choice, the goal should be long-term ecosystem sustainability.

The restoration plan should consider the Bureau of Forestry's Planting and Seeding Guidelines, address the potential for invasive plant species introduction, and be appropriate for overall Bureau of Forestry objectives. Whenever possible, consider the native species that were present prior to disturbance for use in final restoration plantings.

Forest Restoration

Typically, natural processes that lead to restoration of the forest vegetation after a disturbance begin quickly and result in the establishment of another forest over time. However, the quality of a forest and the speed with which it develops depend upon the conditions at the time of initial establishment. Although native forests could eventually be restored in oil and gas development areas by natural succession, this process is slow and centuries may be required (Skousen et al. 2007, Angel 2005) depending on the extent of disturbance. Human-mediated forest restoration provides the opportunity for "setting the stage" for successful establishment of a mature forest over time.

Forest restoration should aim to match original levels of species diversity and sustainability, while planting or encouraging tree species that are known to be originally present prior to disturbance. Reforestation can be accomplished through a combination of passive and active techniques, although more active rehabilitation may be required on some sites which are more highly degraded. Active rehabilitation can shorten the time it takes nature to produce a valuable forest by preparing the site with loose, good quality soils that encourage establishment of volunteer early-successional species; and by planting a mixture of early- and later- successional tree species.

Forest Restoration Considerations

1. *Soil:* The soils on many oil and gas development sites are going to be heavily compacted, making establishing forest vegetation challenging. Some compaction may even occur during the redistribution of stockpiled topsoil to the site. Therefore, low compaction grading processes should be utilized during restoration activities to avoid and minimize compaction (Sweigard 2007, ARRI). Loose dumping of fill material in close piles followed by a single pass with a small dozer will provide a non-compact substrate, given there is a sufficient amount of soil (ARRI FRA 3, VA Coop Ext). The subsoil should be ripped prior to placing the top layer of fill material. If low grading compaction techniques are not used, methods to reduce compaction and aerate the soil may be necessary to create conditions suitable for establishing woody vegetation. Soil should only be graded enough to achieve the desired grade. Only compact fill material if stability is a risk, and only enough to ensure stability (ARRI FRA 3, VA Coop Ext). Fills less than 6 feet in height should not be compacted at all. At least 4 feet of un-compacted material should be at the surface of any compacted fill (ARRI FRA 3, VA Coop Ext). Soil "ripping" may be necessary for successful establishment of trees and shrubs, especially with shallower soils. Sites with the least compacted soils will be the most suitable for re-establishing forest (ARRI FRA 3, VA Coop Ext).

2. *Tree-Compatible Ground Cover:* If future establishment of trees and forest productivity are goals, tree-compatible ground covers should be used. There are many tree-compatible ground covers suitable to control erosion and meet ground cover requirements. Tree-compatible ground cover guidelines include using fewer competitive species, lower seeding rates, less nitrogen (N) fertilizer, and accepting a less-dense herbaceous ground cover in the first few years after seeding. For more information see, "Tree-Compatible Ground Covers for Reforestation and Erosion Control" by Burger et al. 2009.

3. *Community Type and Species selection:* If planting trees is a part of the restoration plan it is important to select suitable and appropriate tree species to regenerate. It may be important to consider the historical community type and the possibility of an adjusted community type trajectory by the time restoration is complete. Other factors to consider include:
    - The ecosystem/sites' goals and objectives
    - Site capabilities
    - Existing natural regeneration and surrounding community type
    - Historical vegetation
    - Variation in growth rate and seed production
    - Mixing of deciduous and coniferous species
    - Planting a diversity of trees and shrubs

- Sunlight requirements
- Locally adapted seed sources
- Bureau of Forestry planting guidelines

Shrubs and herbaceous species can also be used in conjunction with tree plantings, as they are a natural and important structural element in early-successional forests and in wildlife habitat. Establishing non-tree vegetation around seedlings and saplings will also help prevent the establishment of non-desirable competing vegetation. Consider the plant community when deciding additional species to plant among the regenerating forest.

4. *Management*: On sites that have been significantly disturbed, establishing forest tree regeneration may be difficult. Some species, such as oak and hemlock, may require intensive management for successful regeneration, including: installing deer exclosures, treating competing vegetation, and replanting of failed seedlings. Another challenge to reforesting is controlling rodents. The rodents feed on the bark at the base of young trees, which in most cases kills or severely damage the tree. These restoration options will likely require some level of monitoring to gauge the relative success of planted or naturally regenerated tree seedlings. Using lower rates of native's species that combine cool season grasses, legumes, and warm season grass may create desirable conditions for a wide array of wildlife and be generally easy to maintain.

Natural or assisted regeneration usually involves no or minimal planting, instead encouraging the natural processes of forest succession (Hardwick et al. 2000). This is a passive restoration approach and will work best in areas where disturbance was minimal and not where land was disturbed in a manner that removed rooting systems, and vegetation, including seeds and plant material capable of re-sprouting. Areas targeted for natural succession must also be free of any non-native, invasive plant species in order to increase the likelihood for success.

Ecological succession describes the changes in plant composition at a site over time (Groninger 2007). Vegetation established by restoration, either passively or actively, will most likely be a combination of native grasses, planted and volunteer herbaceous species, shrubs, nurse/wildlife trees, and crop trees. The combination of plantings can be altered and the level of succession arrested to suite the goals of the site.

Some minimal seeding, such as for erosion and sedimentation control or temporary establishment of vegetation, may be necessary where natural regeneration is the preferred restoration option.

Natural Regeneration/Succession Considerations

1. *Potential for arrested succession*: If soil conditions are not suitable or the understory vegetation is too competitive for tree recruitment the site may remain in the grass-herb-shrub stage with only scattered trees for several decades after the disturbance. This stable vegetation state is called "arrested succession," which is a failure of later successional species to establish and eventually dominate the site (Abrams et al. 1985, The Appalachian Regional Reforestation Initiative, ARRI). This also creates long-term conditions suitable for invasive plant establishment. Arrested succession also occurs in areas where high deer or rodent populations consume or destroy tree seedlings or where invasive plant species dominate the vegetation layer.

2. *Rooting medium quality*: If soil replacement results in a rooting medium that is shallow or has been compacted, the site will be prone to drought and plant nutrition problems. Seeds of unplanted forest species that are carried to the site by wind or wildlife will not germinate and grow if the soil surface is compacted or has chemical properties that are not well suited to their needs (ARRI).

3. *Management:* The vegetation germinating newly disturbed sites should be monitored to be sure undesired vegetation, such as invasive plants, are not present. Treatment of undesirable vegetation should be done with assurance that desirable vegetation will naturally seed in or may be planted.

Section V: Permanent Forest Opening/Right-of-Way Rehabilitation Considerations

There are many things to consider before deciding whether an artificially created forest opening should be made permanent. First, goals and objectives for the site must be clearly defined. It is important to know if creating permanent openings will be beneficial or detrimental to the ecosystem and overall landscape. Therefore, it may be important to consult Ecological Services prior to determining whether a permanent opening and what kind is established. The following is a list of things to consider when deciding whether creating a permanent forest opening is the best option.

1. *Juxtaposition:* Juxtaposition refers to the arrangement (the placement) of habitats. This is an important concept when managing an area for wildlife, especially wildlife with relatively small home ranges. Therefore, it is important to consider proximity to and arrangement with other habitat types (including other early-successional habitats)
    - Generally, for species with small home ranges (e.g. rabbits, bobwhites, small mammals), creating openings in close proximity to one another might be preferred. On the other hand, highly mobile species such as deer, turkeys, bears, and some species of birds will readily use widely scattered opening.
    - Assess you current habitat conditions in conjunction with your management objectives to help decide whether to maintain, how many to maintain, or to restore the openings to forest.

2. *Particular Wildlife Species of Interest:* The type of wildlife species and type of habitat that will use a particular opening depends on a variety of factors including:
    - The type of habitat provided by the opening
    - The types of wildlife locally and regionally present
    - Topography and hydrology

3. *Patch Size and Right-of-Way Width:* Even though the size and shape of the site may already have been established, it may benefit the success of the site to alter these factors. Typically, openings should be:
    - Square and circular openings opposed to linear features will minimize edge effects
    - Limit the number of straight-sided rectangular openings. Nature seldom creates straight lines.

4. *Soil:* The soils on many oil and gas development sites are going to be heavily compacted. On some sites where compaction is the most severe, herbaceous or successional plantings may be the most appropriate restoration strategy. Low compaction grading techniques should be implemented during restoration activities. Similarly, the amount of available organic topsoil may be low. Consider using native warm season grasses, which help create and accumulate organic

material that becomes topsoil over time. Soil pH and type should also be considered if food plots and certain plant species are of interest.

5. *Slope:* The slope of the opening will determine the amount of sunlight and should be taken into consideration when determining plant species success. A south facing slope is the most desirable location because it will provide more ground area exposed to the sunlight. However, it will tend to be drier in the summer heat. In early spring many species will use openings with a south-facing slope because green browse will appear there first as the snow melts.

6. *Species selection:* It is essential to consider the plant community type on the site and surrounding landscape. The foundation for restoring ecological function or improving wildlife value at a site is a healthy and diverse native vegetation community. Other factors to consider include:
    - The sites goals and objectives
    - Site capabilities
    - Historical vegetation
    - Variation in growth rate and seed production
    - Mixing of herbaceous plants and shrubs
    - Sunlight requirements
    - Soil type and moisture
    - Locally adapted seed sources
    - Bureau of Forestry Planting Guidelines

7. *Food plots*: Planting food plots is a popular habitat management practice. Quality food plots can provide valuable digestible energy and protein. Prior to starting a food plot, it is important to understand how food plots should be used to augment the quantity and quality of naturally occurring foods, not take the place of them. Keep in mind that:
    - Food is only one component of habitat and it might attract wildlife, but cover will hold them. Hard-and soft-mast bearing trees and shrubs may need to be planted to provide additional food and cover.
    - Single, small isolated food plots that contain an annual crop have little impact on the overall supply of food and typically benefit only a small number of individual animals.
    - Food plots can also increase predation on small mammals as wildlife can become concentrated around food plots. In some locations with high deer concentrations, deer may eat the food plot before it even develops or matures.

8. *Maintenance:* Once a good forest opening has been established it will require maintenance. The necessary maintenance will depend on what type of opening has been established. When succession has reached the desired stage, it will have to be set back by disking, mowing, prescribed fire, or some other management technique. If the goal is to establish the opening as

herbaceous, succession will have to be stopped by killing regenerating trees. If the goal is to have a permanent early-successional opening and allow trees to regrow, the opening's effect on early-successional wildlife species will last less than 15 years (Lanier 2006).

Section VI: Wetland Rehabilitation Considerations

A rehabilitation consideration may be to try and create wetlands. This option may be possible in certain circumstances such as:

- Enhancing degraded wetlands
- Creating or restoring a wetland in a wetland complex
- Creating habitat for lacking species

A variety of techniques can also be used to create a vernal pool. The complexity of this work often depends on the site and the desired size of the pond. Typically if projects fail it is because the ponds do not hold water long enough for aquatic plants to become established and for aquatic animal larvae to completely develop. Building a pond that fails to hold water is generally due to permeable soils, a poorly constructed core under the dam, or the failure to compact soil during construction. Some other things to consider include (Biebighauser 2002):

- Know the area and the soils. In general, it is easier and less expensive to create a wetland in an area that has soils that can be made to hold water without using a synthetic liner.
- Look for construction fill. If the area has been filled with waste rock, gravel, stumps, and logs, it will be more permeable making it difficult to construct a wetland unless a synthetic liner is used
- Consider the slope. An area with less than 3% slope works best for construction
- Consider the surrounding landscape. A greater variety and number of species can be expected to use a wetland if it is built near other wetlands. However, a variety of species will use a wetland that is built in most any location.
- Avoid conflicts. Other considerations in deciding where to build a vernal pool should include the long-term management and maintenance of the completed wetland. Avoid placing vernal pools in areas where disturbance cannot be avoided.

Section VII. Summary

Although oil and gas development has the potential to create ecological impacts, with proper planning and effective, thoughtful implementation, sites used for gas infrastructure can be used to create suitable habitat for many species of plant and wildlife during the interim and final rehabilitation of gas-related sites.

Each project should be evaluated and decisions made at a landscape level based on the surrounding habitats, overall habitat conditions, and what is needed during the rehabilitation process to encourage the appropriate community response. Many rehabilitation choices exist at a site, including: reverting back to pre-disturbance conditions, filling lacking habitat/species, providing additional hunting and food opportunities with food plots, or creating special habitat enhancement. The objectives at a site should be to establish vegetation that can aid in controlling erosion, allowing recruitment by native plant species for increased diversity, fixing N from the atmosphere and creating organic topsoil, creating wildlife habitat, minimizing establishment of invasive plant species, and developing the site into a productive forest dominated by native species. There is no doubt that restoration will take years or decades to reach the management objective; however, this means it is even more important to look at every step in restoration as an opportunity to reduce oil and gas development impacts and enhance habitat for plants and wildlife.

Section VIII. Species/Habitat Relationships

Dry-Oak Mixed Hardwood (AD)

When Appropriate:
Common throughout the state
Better on less acidic sites
Should support a good diversity of spring ephemerals

Dominant Species:	Important Wildlife Species:
native oaks	black bear, blue jay, deer, nuthatches, ring-necked pheasants, ruffed grouse, wood duck, woodpeckers
native hickories	bats (esp. shagbark hickory), red-bellied woodpeckers, rose-breasted grosbeaks
sweet birch	beaver, black-capped chickadee, porcupine, ruffed grouse
red maple	bats, deer
sugar maple	deer, porcupines, snowshoe hare, numerous bird species
basswood	upland game birds, songbirds, porcupine and foxes older, dying and dead basswood trees provide dens for many animals
flowering dogwood	songbirds, upland game birds, foxes, black bear, beaver, skunks, deer, provides shelter and habitat for many wildlife species
hornbeam	beaver, bobwhite, fox squirrels, ring-necked pheasants, ruffed grouse, songbirds
serviceberry	deer, rabbits, thrushes, many other songbirds, rodents, small mammals, bear, grouse, turkey, squirrels, chipmunks, beaver, foxes
redbud	cardinals, ring-necked pheasants, rose-breasted grosbeaks, white-tailed deer, bobwhites, bees
mountain laurel	ruffed grouse, provides good winter (thermal) cover
tick-trefoil	bobwhite quail, deer, ring-necked pheasant, turkeys
Pennsylvania sedge	horned lark, ruffed grouse, turkey

Dry-Oak Heath (AH)

When Appropriate:

Common throughout the state
Better on acidic soil
Herbaceous layer typically sparse and dominated by ericaceous shrubs
Fire has been a historic disturbance in the maintenance of this vegetation type

Dominant Species:	Important Wildlife Species:
native oaks -primarily chestnut oak	black bear, blue jay, deer, nuthatches, ring-necked pheasants, ruffed grouse, wood duck, woodpeckers
sassafras	crested flycatchers, quails, turkeys, kingbirds, mockingbirds, sapsuckers, pileated woodpeckers, yellowthroat warblers, phoebes, black bears, beaver, deer
black gum	black bears, foxes, wood ducks, turkeys, woodpeckers, mockingbirds, brown thrashers, thrushes, flickers, deer, beaver; provides cavity and nesting sites for a variety of birds and mammals
sweet birch	beaver, black-capped chickadee, porcupine, ruffed grouse
red maple	bats, deer
native hickories	bats (esp. shagbark hickory), red-bellied woodpeckers, rose- breasted grosbeaks
Virginia pine	woodpeckers, pine siskinpine grosbeak, songbirds, deer
eastern white pine	yellow-bellied sapsuckers, pine warblers, red crossbills, beaver, porcupine, deer, snowshoe hare, bald eagles
mountain laurel	ruffed grouse, provides good winter (thermal) cover
huckleberry	ruffed grouse, quail, turkey, scarlet tanager, eastern towhee, fox squirrels, deer, host for the larva of the huckleberry Spinx (*Paonias astylus*), butterflies including brown elfin and Henry's elfin, bumblebees and wild bees
Pennsylvania sedge	horned lark, ruffed grouse, turkey
blueberry	ruffed grouse, black bear, quail, bluebird, scarlet tanager, foxes, deer, thrushes, skunks, fox squirrels
maple-leaved viburnum	deer, skunks, ruffed grouse, ring-necked pheasants, turkeys, beaver
sweet-fern	foliage is one food source of apple sphinx caterpillar (*Sphinx gordius*)
teaberry	deer, turkey, ruffed grouse, ring-necked pheasant, black bear, red fox

Northern Hardwood (BB)

When Appropriate:

Common throughout the northern portion of the state
Sites where sugar maple is dominant likely contain more basic soils
Should support a good diversity of spring ephemerals
Less than 25% cover of conifers

Dominant Species:	Important Wildlife Species:
American beech	black bears, foxes, ruffed grouse, ducks, chickadees
red maple	bats, deer
sugar maple	deer, porcupines, snowshoe hare, numerous bird species
black cherry	passerine birds, game birds, and mammals including foxes, black bears, raccoons
sweet birch	beaver, black-capped chickadee, porcupine, ruffed grouse
yellow birch	snowshoe hare, deer, ruffed grouse, red squirrels, beaver, porcupines
native oaks red oak	black bear, blue jay, deer, nuthatches, ring-necked pheasants, ruffed grouse, wood ----primarily duck, woodpeckers
witch-hazel	ruffed grouse
hornbeam	beaver, bobwhite, fox squirrels, ring-necked pheasants, ruffed grouse, songbirds
Canada mayflower	deer, ruffed grouse and other birds, chipmunks and other rodents
hobblebush	deer, beaver, skunks, ruffed grouse, turkeys, cardinals, cedar waxwings, thrushes, brown thrashers
Serviceberry	deer, rabbits, thrushes and many other songbirds, rodents, small mammals, bear, grouse, turkey, squirrels, chipmunks, beaver, foxes
New York fern	provides cover
rhododendron	cover for deer, black bears, snowshoe hares, ruffed grouse, turkeys, songbirds
native alders	deer, elk, redpolls, siskins, goldfinches, beavers

Hemlock (White-Pine) - Northern Hardwood (FB)

When Appropriate:

Common throughout the state
Mid to lower slopes or cool, moist terrain on plateau
Typically late successional, not directly developing from early successional forest
At least 25% cover of conifers and often a rich bryophyte layer

Dominant Species:	Important Wildlife Species:
eastern hemlock	Ninety-six bird and forty-seven mammal species are associated with hemlock
sassafras	crested flycatchers, quails, turkeys, kingbirds, mockingbirds, sapsuckers, pileated woodpeckers, yellowthroat warblers, phoebes, black bears, beaver, deer
eastern white pine	yellow-bellied sapsuckers, pine warblers, red crossbills, beaver, porcupine, dDeer, snowshoe hare, bald eagles
American beech	black bears, foxes, ruffed grouse, ducks, chickadees
sweet birch	beaver, black-capped chickadee, porcupine, ruffed grouse
red maple	bats, deer
sugar maple	deer, porcupines, snowshoe hare, multiple bird species
yellow birch	snowshoe hare, deer, ruffed grouse, red squirrels, beaver, porcupines
witch-hazel	ruffed grouse
rhododendron	cover for deer, black bears, snowshoe hares, ruffed grouse, turkeys, songbirds
Viburnum spp.	deer, beaver, skunks, ruffed grouse, turkeys, cardinals, cedar waxwings, thrushes, brown thrashers
New York fern	provides cover
black cherry	passerine birds, game birds, and mammals including foxes, black bears, and racoons
native alders	deer, elk, redpolls, siskins, goldfinches, beavers

Section IX: Specific Considerations for Restoring Wildlife Habitat Structures

Nest Boxes

The booklet "Woodworking for Wildlife" (PGC, fourth edition) has a variety of nest box plans and instructions on proper placement. Boxes do require periodic maintenance and replacement, but can prove valuable for many wildlife species.

Bat boxes, which typically house summer maternity colonies of little brown or big brown bats, can be erected on posts in wildlife openings if water is nearby. The boxes must receive at least 7-8 hours of direct sunlight per day and as such should not be placed on trees.

Dead and Down Woody Material

Dead and down woody material is valuable to many different species of wildlife. Numerous types of invertebrates, reptiles, amphibians, and mammals can be found on, in, or under fallen logs. These logs may be used as nesting sites, feeding sites, or escape cover. Ruffed grouse use logs for drumming sites as a part of their mating rituals. A lot of small mammals use this habitat type for hiding and food caches. Several salamander species spend just their adult life phase in a rotting log foraging for invertebrates and hiding, whereas a few species may spend their entire life in a single log. Coarse woody debris is host to a huge number of insects, approximately 400, and an unknown but large number of non-insect invertebrates. Therefore, it is important to maintain some level of down woody material on the forest floor. The larger and less decayed material is best, however, any size can usually be utilized by some species.

Brush Piles

When natural cover is limited in wildlife habitat, brush piles may be provided. Brush piles could be a by-product of other land management activities. Timber harvest and timber stand improvements provide the woody limbs suitable for brush piles. Brush piles are most beneficial to wildlife when they are located at the edges of forest openings. They should be located within 10 feet from the woodland border. Brush piles could also be placed along streams and marshes within or next to woodlands. When properly located and constructed, brush piles can benefit many species of wildlife, including bobwhite quail, cottontail rabbits, ruffed grouse, wild turkeys, skunks, raccoons, juncos, and sparrows. Predators such as foxes, bobcats, hawks, owls, and coyotes also benefit from the small mammal and bird populations found in or around brush piles.

Materials used for brush piles will largely depend on what is available. Hardwoods, including oak and locust, are rot resistant and make durable bases. Other suitable materials include large stumps, cull logs, old fence posts and stones. Brush piles are usually mound shaped and ideally, should be six to eight feet high and 15 feet in diameter. Covering brush piles with evergreen boughs will provide wildlife with additional cover. Brush piles are relatively short lived (six to eight years) and new ones should be created periodically.

Section X: Considerations for Specific Wildlife Species

If you are interested in managing for a particular species please contact Ecological Services and the jurisdictional agency, the Pennsylvania Game Commission or Pennsylvania Fish and Boat Commission.

American Woodcock

Woodcock abundance is closely related to the availability and quality of four distinct types of habitat. Clearings are important to provide courtship areas for males. Near the clearings there should be good nesting and brood rearing cover consisting of young, second growth hardwoods. Also of great importance is the need for abundant feeding covers made up of alders or dense stands of young aspen on moist, rich soils. Lastly, woodcock require large fields to roost in at night. Woodcock management generally works best on forestlands with a good amount of aspen and birch mixed with a few old farm fields, several forest openings, and a few brush lowland areas. Forests dominated by maples, oaks, pines, or spruce typically do not provide high-quality woodcock habitat.

The woodcock feeds on invertebrates by probing the soil with its long bill. Woodcocks are opportunistic and consume a variety of invertebrates. Earthworms make up 50-90 per cent of the woodcock's diet. Alders and second growth forest located on fertile, moist soil are favorite feeding sites. Other animal foods, such as beetles and fly larvae are also eaten. Planting shrubs such as alder, hawthorn, gray dogwood, spicebush, silky dogwood, black haw and dentate viburnum around ponds, along streams, and in wet bottom lands or marshes will provide adequate cover in these areas where soil fertility and earthworm production is good.

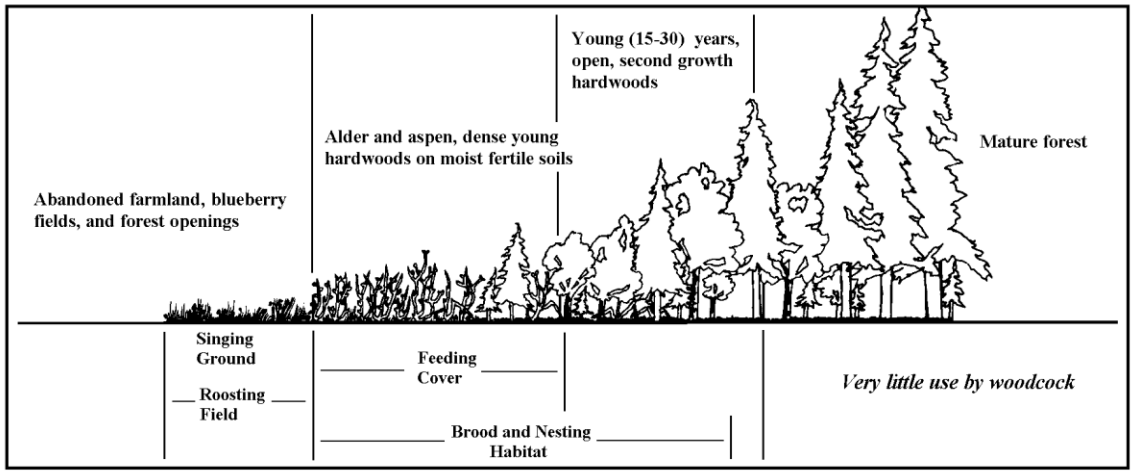


Fig. 2. The stages of forest succession used by woodcock. (from Sepik, etal, 1981).

Appalachian Cottontail

The Appalachian cottontail is more specialized than the eastern cottontail. Appalachian cottontails are typically found at higher elevations and are often associated with coniferous forests and dense understory forests. They are the only cottontails known to feed heavily on conifer needles. They are known to inhabit brushy habitat, especially birch/red maple forests, hemlock and rhododendron areas within oak-hickory forests, blueberries, mountain laurel thickets, and coniferous forests. These rabbits

are sometimes especially abundant in five to ten year old clear-cuts, and around brushy edges of mountain balds.

Bobwhite Quail

Bobwhite quail require their habitat needs to be in close proximity. It is important that nesting cover, brooding cover, loafing cover, and escape cover must be close— generally within a 40-acre area. Therefore, it will be important to concentrate on improving quality cover and proximity of required cover types to meet the year-round needs of these game birds.

Litte bluestem and side oats-gramma grasses provide excellent structure for nesting for bobwhite quail. Nesting habitat should be adjacent to brooding habitat. Fields intended for quail should be relatively open with a forb canopy overhead. Forbs that should be encouraged for bobwhites include ragweed, pokeweed, partridge pea, milk pea, and butterfly pea. . Good shrubs including blackberry, wild plum, and elderberry should be scattered throughout the field to provide protective cover for loafing and escaping.

Elk

Elk are primarily grazers and prefer open brushlands and grasslands for foraging and forested areas for winter and security cover. Ideal elk habitat is comprised of a mosaic of brushland and grassland with islands of forest that are interspersed with agricultural land. Food preferences of elk vary with the time of year. Among natural foods, grasses and forbs make up the bulk of the diet during the snow-free period. Woody browse is used during late fall and winter when herbaceous forage is less abundant. Elk also utilize agricultural crops, particularly those adjacent to wild land where they can feed without venturing far from cover. Sunflowers, soybeans, and oats are favored crops, while corn, wheat and barley are also utilized. Alfalfa is utilized during spring green-up and late in the fall.
Forest openings for Elk should be from 3 to 40 acres in size. Aspen cover and early successional shrubland provide good habitat for elk and other wildlife as well.

Golden-winged Warbler

The Golden-winged warbler prefers higher elevation, early successional habitat with patches greater than 20 acres in size. Suitable habitat for golden-winged warblers is areas with small, interspersed patches of herbs and multi-stemmed shrubs or root-suckering trees, plus a forested edge. During winter it seems to favor semi-open or less dense forests, forest borders, and gaps. The males arrive on the breeding ground a few days ahead of the females. The female usually selects a nest site on the ground, which she will build.

They typically eat leaves and twigs, often concentrating its foraging at dead leaf clusters. They will sometime be seen hanging upside-down like a chickadee while foraging. It often focuses on moths, their larvae and pupae. Most foraging takes place in the upper half of trees and shrubs in the perimeter of the branches on the breeding ground.

Ruffed Grouse

Ruffed grouse require a number of vegetation stages or types. Optimum ruffed grouse habitat should include brushy areas, young aspen stands, mature aspen stands with an understory of hazel or ironwood, and dense sapling aspen stands.

Aspen trees are an important habitat component for ruffed grouse. Aspen trees 15 years and older provide the most important year-round food sources in the form of green leaves, flower buds, and catkins. During winter the flower buds of aspen become the staple grouse food, but winter catkins of hazel and those of willow and birch are also eaten.

Aspen younger than 12 or 15 years provide the thick, dense cover that helps protect nesting grouse and hens with broods from aerial predators (hawks and owls) and land predators (foxes and coyotes). Therefore, the key to more grouse is to create varying ages of aspen, when possible, and a variety of hardwoods and brushy covers when aspen is not available. A grouse can be sustained in 10 to 20 acres if the habitat is ideal.

Species composition and density also determine the long-term capabilities of a forest in sustaining grouse. Tall shrubs, greater than 5 feet, provide year round food and cover. Recommended species include hazel-nut, dogwood, witch hazel, serviceberry, and nannyberry. Maintenance of dense young forest should be the highest priority of grouse habitat management. In addition, ground cover such as blown down trees and debris also provide substantial cover and necessary drumming sites.

If there are no aspen, oak, or lowland hardwoods, grouse may still be attracted to woody plants such as apples, crabapples, hawthorn, wild plums, dogwoods, nannyberry, raspberry, blackberry, sumac, grape, willow, cherry, hazelnut, and ironwood. Make small clearcuts no larger than 2 1/2 acres in size in the interior of the woods, sparing the above species. The result will be an explosion of dense thickets of young trees and shrubs, which will attract grouse.

Whenever creating a clearcut for grouse, be sure to leave one log per acre as a potential drumming site. The log must be at least 10 inches in diameter and cut at least 3 feet from the ground so as to leave a sufficiently sized stump. Eventually young trees will grow over the log, and a drumming site will develop.

Snowshoe Hare

Snowshoe hare are active year-round, mostly at dawn, dusk, or at night. They seek shelter next a ledge or large rock, or under tree roots, hollow logs, or fallen trees. This shelter will often be used by the same hare throughout the year. Hare are typically active within a core area of 5-10 acres, but they may range up to 25 cares. Hare populations are cyclical, with peaks usually occurring every 9-11 years.

Snowshoe hare typically avoid open areas, but may be found in cut-over areas including clearcuts, blowdowns, and burns. Cover is very important habitat component for hare. They require good base cover, which is the dense softwood cover where they spend the day. Softwood stands with tree heights of 8-15 feet and low lateral visibility (5,000-13,000 stems per acre) is good base cover. Travel cover is also important and is used to move from their daytime cover to a food source. Good travel cover includes tree heights of 15-46 feet with a more open understory (1,000-3,000 stems per acre). General recommendations within a 20-acre management unit can include maintaining 30% base cover, 45% travel cover, 10% herbaceous food source, and 15% regeneration.

In summer hare will often eat clover, grass, dandelions, berries, and ferns. In winter they typically shift to twigs, buds, tender bark of shrubs and trees, and stems of bushes and saplings including aspen, alder, spruce, fir, birch, willow, and pine.

Wild Turkey

Habitat management for turkeys consists of retaining, creating and managing suitable food, cover and water. Turkeys need forestland, with a variety of forest types with open areas well distributed. Adults use openings for resting and feeding. Turkeys usually select areas with dense brush, tall grass, and fallen tree tops for nesting. Important brood habitat includes forested areas with moderate herbaceous understories, forest clearings, power line rights-of-way and a water source. Forest openings for turkeys should be at least 1 acre or more in size, especially in areas with high deer densities. They should be well distributed and located in or near woods.

Choice foods for the late fall, winter and spring are acorns, beechnuts, flowering dogwood, berries, wild grapes, pine seed, as well as, small grains and winter clovers. Use of food plots by wild turkeys increases when they are placed adjacent to favorable cover such as dense brush, tall grass and fallen tree tops.

Food options for summer and early fall are blackberries, mulberries, millet, corn, wheat, insects, and seeds. Mature wheat plots producing seed in May provide a quality food source for birds through the summer. If allowed to remain fallow, these fields can provide excellent brood habitat for turkeys and bobwhites the following summer as a variety of forbs become established from the seed bank. If you plant wheat for turkeys, use a lighter seeding rate as opposed to the heavier seeding rate for deer forage production.

Species of Special Concern

A PNDI review prior to well construction may reveal that a species of special concern such as the Allegheny woodrat or timber rattlesnake are in close proximity to the site. The restored well site could be used to create habitat for these species. Ecological Services can be consulted to assist with the habitat creation effort.

Allegheny Woodrat

Allegheny woodrats are rock-dwelling mammals that are sensitive to forest fragmentation. Fragmented habitats allow predators like the raccoon and feral cats to proliferate. Woodrat populations have become decimated in many areas by the spread of raccoon roundworm that the woodrats acquire through the collection of raccoon feces.

Woodrats leave their rocky denning areas at night to forage for seeds, berries, and herbaceous food sources. Restoring contiguous forest and mast and fruit-producing trees and shrubs near their rocky habits is important. Improving rocky habitat will also benefit the mesopopulation of woodrats. More information is provided in the documents referenced at the end of this paper.

Timber Rattlesnake

Timber rattlesnakes are active mid-April through mid-October and prefer upland forested areas where they forage for small mammals. Dens or hibernacula for this species are hard to locate and may consist of an inconspicuous opening with a few rocks that are completely under tree canopy. These den sites may or may not have rocky, open habitat close by that is used mainly by gravid (pregnant) females for

gestation. Den habitat has not been successfully created, but valuable gestation areas for gravid females and basking areas can be.

The Pennsylvania Fish and Boat Commission have indicated that there are opportunities at, gas well clearings and pipelines to create good gestation habitat. Forest openings created in more remote areas with very minimal disturbance should be the areas targeted for the creation of rattlesnake gestation habitat. Often large rock slabs will be unearthed during the excavation of these openings. Rock placement should be in a position so the rocks receive a daily minimum of 5 to 7 hours of direct sunlight. Large flat slabs (minimum of 4' x 6' piled horizontally one or two layers high) should be placed on the north or east side of the well openings and food plots approximately 5 to 10 yards out into the opening from the existing tree line. It is important to maintain the appropriate amount of shade and sun on these areas to provide proper habitat. Please review the PA Fish and Boat Commission document Guideline for Timber Rattlesnake Habitat Creation (2010) for additional information.

Northern Flying Squirrel

The northern flying squirrel is a nocturnal squirrel occurring north of Interstate-80, in high elevation northern hardwood forests with a conifer component. This squirrel is dependent on a fungal diet, that is associated with red spruce and white pine. Den sites are often in mature yellow birch cavity trees. Red spruce and white pine should be planted at appropriate sites, and yellow birch should be allowed to colonize the area. Please refer to the Bureau of Forestry Northern Flying Squirrel Habitat Guidelines for more information.

References Used

Abrams, D.A., D.G. Sprugel, D.I. Dickmann. 1985. Multiple successional pathways on recently disturbed jack pine sites in Michigan. Forest Ecology and Management 10(1-2):31-48.

Bat Conservation International. 2006. Forest Management & Bats. National Fish & Wildlife Foundation, USDA, Natural Resource Conservation service. 13 pp.

Biebighauser, T.R. 2002. A guide to creating vernal ponds. USDA Forest Service in cooperation with Ducks Unlimited, Inc. and the Izaak Walton League of America

Boyd, R.J. 1980. American elk. Pages 11-29 in J.L. Schmidt and D.L. Gilbert, eds. Big game of North America, Ecology and Management. Wildlife Management Institute. Stackpole Books, Harrisburg, Pennsylvania.

Brauning, D.W. (ed) 1992. Atlas of breeding birds in Pennsylvania. University of Pittsburgh Press. Pittsburgh, Pennsylvania.

Clewell, A., J. Reiger, J. Munro. 2005. Guidelines for developing and managing ecological restoration projects. Society for Ecological Restoration International.

Connecticut Department of Environmental Protection, Wildlife Division. Openings for wildlife. Wildlife Habitat Series.

DeGraaf, R.M. and M. Yamasaki. 2001. New England Wildlife. Habitat, Natural History, and Distribution. University Press of New England. Lebanon, New Hampshire.

Dessecker, D.R. and D.G. McAuley. 2001. Importance of early successional habitat to ruffed grouse and American woodcock. Wildlife Society Bulletin, 29(2):456-465.

Eastman, John. 1992. Forest and thicket. Trees, shrubs, and wildflowers of Eastern North America. Stackpole Books. Mechanicsburg, Pennsylvania.

Groninger, J., J. Skousen, P. Angel, C. Barton, J. Burger, C. Zipper. 2007. Mine reclamation practices to enhance forest development through natural succession. The Appalachian Regional Reforestation Initiative. Forest Reclamation Advisory No. 5.

Hassinger, J., et al. Woodlands and wildlife. Pennsylvania State University College of Agriculture. University Park, Pennsylvania.

Harper, C.A. 2008. A guide to successful wildlife food plots, blending science with common sense. University of Tennessee Department of Agriculture.

Hunter, M.L. 1990. Wildlife, Forests, and Forestry. Regents/Prentence Hall, Englewood Cliffs, NJ. 370 pp.

Lanier, J.W. Managing regenerating and young forest habitat. New Hampshire Fish and Game Department. Concord, New Hampshire.

Litvaitis, J.A. 2001. Importance of early successional habitats to mammals in eastern forests. Wildlife Society Bulletin, 29(2):466-473.

MacGowan, B.J. Designing hardwood tree plantings for wildlife. Department of Forestry and Natural Resources, Purdue University.

Martin, A.C., H.Z. Zim, A.L. Nelson. 1951. American wildlife and plants A guide to wildlife food habits. Dover Publications, Inc. New York, New York.

McGlincy, J. Managing for timber and wildlife diversity. NWTF Wildlife Bulletin No. 15.

McIver, J., L. Starr. 2001. Restoration of degraded lands in the interior Columbia River basin: passive vs. active approaches. Forest Ecology and Management 153: 15-28.

Merrit, J.J. 1987. Guide to the mammals of Pennsylvania. University of Pittsburgh Press. Pittsburgh, Pennsylvania.

Miller, A.H.and K.V. Miller. 2005. Forest plants of the southeast and their wildlife uses. The University of Georgia Press. Athens, Georgia.

Mizejewski, David. 2004. Attracting birds, butterflies and other backyard wildlife. National Wildlife Federation. Upper Saddle River, New Jersey.

Partners in Amphibian and Reptile Conservation (PARC). 2006. Habitat Management Guidelines for Amphibian and Reptiles of the Northeastern United States. Technical Publication HMG-3. 106 pp.

Peles, J.D and J Wright (Eds.). 2008. The Allegheney Woodrat: Ecology, Conservation, and Mangement of a Declining Species. Springer Science+Business, LLC, New York, NY. 231 pp.

Pennsylvania Department of Conservation and Natural Resources. 2010. Non-native planting, seeding and monitoring guidelines. Pennsylvania Bureau of Forestry. In Draft.

Pennsylvania Department of Conservation and Natural Resources. 2010. Guidelines for Administering Oil and Gas Activity on State Forest Lands. Pennsylvania Bureau of Forestry. In Draft.

Pennsylvania Fish & Boat Commission. 2010. Guidelines for Timber Rattlesnake Habitat Creation. Division of Environmental Services, Natural Diversity Section, Bellefonte, PA. 7 pp.

Pennsylvania Game Commission. 2006. Allegheny Woodrat: The Environmental Review Process for Pennsylvania. Bureau of Wildlife Habitat Management, Division of Environmental Protection and habitat Management, Harrisburg, PA. 28 pp.

Pennsylvania Game Commission. Woodcrafting for Wildlife, fourth edition. Wild Resource Conservation Fund. 64 pp.

Pennsylvania Game Commission. Pennsylvania comprehensive wildlife conservation strategy. Habitat narratives and cwcs-priority species.

Rhoades, A.F. and T.A. Block. 2000. The plants of Pennsylvania. University of Pennsylvania Press, Philadelphia, PA.

Rothbart, P. and S. Capel. Maintaining and restoring grasslands. Connecticut Department of Environmental Protection and Virginia Department of Game and Inland Fisheries.

Schneck, Marcus. Landscaping for wildlife in Pennsylvania. Wild Resource Conservation Fund. Harrisburg, Pennsylvania.

Sullivan, K.L. and M.C. Brittingham. 2008. Forest stewardship. Wildlife. The Pennsylvania State University.

Sweigard, R., J. Burger, C. Zipper, J. Skousen, C. Barton, P. Angel. 2007. Low compaction grading to enhance reforestation success on coal surface mines. The Appalachian Regional Forest Initiative. Forest Reclamation Advisory No. 3.

Thompson, F.R. and R.M. DeGraaf. 2001. Conservation approaches for woody, early successional communities in the eastern United States. Wildlife Society Bulletin, 29(2):483-494.

United States Department of Agriculture. Forest Service. 2004. Wildland shrubs of the United States and its territories: thamnic descriptions. Volume 1. John K. Francis, editor. Rocky Mountain Research Station.

United States Department of Agriculture. 1999. American elk (*Cervus elaphus*). Fish and Wildlife Habitat Management Leaflet. Number 11.

United States Fish and Wildlife Service. 2003. Native plants for wildlife habitat and conservation landscaping. Chesapeake Bay Watershed. Annapolis, Maryland.

Appendix E: Emergency Contact Information

General Emergency Contact Information	
Operator	**Emergency Number**
Anadarko	(570)-244-4013
Atlas America/Atlas Energy	(412) 262-4613
BG Production, LLC	(412) 309-3457
Chesapeake Appalachia, LLC	(607) 738-4101
Chief Oil and Gas	(866) 947-6447
Consol Energy (CNX)	1-800-583-3755
D&L Energy, Inc.	(888) 343-4427
Diversified Oil and Gas, Inc.	(724)-471-2030
Dominion Transmission Inc.	1-888-264-8240
Energy Corporation of America	(724) 463-8400
EOG Resources	(724) 430-9902
EQT	1-800-926-1759
EXCO Production Company (PA), LLC	1-888-788-3781
Haddad and Brooks, Inc.	(740) 922-0923
KSM Energy, Inc.	(412) 967-0164
NCL	(814) 387-6060
NFG	1-800-444-3130
PGE	(814) 723-3230
Range Resources	(724) 825-9755
R E Energy Development	(814) 278-7279
Seneca Resources	1-800-526-2608
Talisman Energy	(800) 530-5392
Ultra Resources	(570) 439-7127
XTO Energy	1-877-829-8521

Appendix F: Glossary

Ambient Noise Level: The background sound level at a given location.

Avoidance Measure: An agreed upon policy implemented by the seismic operator to aid in ensuring that a specific area is adequately avoided.

BMP's (Best Management Practices): The procedures that reflect the best practices available to the industry and land managers that consider cost-effectiveness, technology, environmental protection and safety.

Cathodic Protection: A method of protecting metallic pipelines from corrosion as commonly applied to protect buried bare or coated pipelines.

Centralized Compression: A compressor station that serves multiple well pads in a region.

Completion: The process of readying a well for production that may include, but is not limited to, installation of the wellhead, setting casing, cementing and stimulation.

Compression: The act of increasing pressure of the produced gas.

Compressor Stations: The facility that uses one or more compressors to raise the pressure of a gas stream to deliver to market.

Conceptual Development Plan: An overall plan of oil and gas development of the surface based on subsurface geology, which may include pads, roads, pipelines, compression needs, laterals and pad infrastructure and placement.

Corridor: A narrow linear tract of land along a route identified by a specific common purpose.

Development: Permanent or temporary earth disturbance activities related to construction and placement of infrastructure necessary to produce oil and gas not including seismic exploration.

Development Phase: The period during which a well pad is being constructed and prepared for the extraction of natural gas and/or oil.

Distributed Compression: A compressor that may be co-located on the established well pad and service all the producing wells within that pad.

Distribution Pipeline: A pipeline that moves gas from the transmission system directly to the customer, regulated by the Public Utility Commission (PUC).

Drainage Area: The maximum area that may be drained efficiently by one well so as to produce the recoverable oil or gas in the area.

Drill Buggy: A wheeled or tracked vehicle used to drill bore holes in which sources are placed during seismic survey, may also be used to carry and transport equipment to support the survey operations.

Drilling Mud/Drilling Fluids: A mixture of base substance and additives used to lubricate the drill bit, transport cuttings from the drill to the surface, and counteract the natural pressure of the formation.

Dust Suppression: To restrict or control the movement of soil particles from becoming airborne.

Emergency Response Plan: A plan that is developed as a DEP Chapter 78 requirement, by an unconventional well operator, that provides for equipment, procedures, training and documentation to properly respond to emergencies that threaten human health and safety for each well site.

ESCGP-2: DEP Erosion and Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing, or Treatment Operations or Transmission Facilities

Exclusion Area: An area in which the Bureau recommends that operational activities be prohibited.

Extraction: Production of oil or natural gas.

FERC (Federal Regulatory Commission): An independent regulatory agency within the U.S. Department of Energy

Field Inspection: An onsite verification of compliance to the terms of lease or conditions of approval.

Flowback Water: Water generated initially in conjunction with oil and natural gas exploration and development activities before the well is brought on line for production. This is typically a high percentage of the hydraulic fracturing fluids injected into the well mixed with a relatively low percentage of native formation waters.

Frac Tanks: portable tanks which can be transported by tractor; capacity is generally 500 barrels (21,000 gallons).

Fragmentation: The process by which a continuous forest habitat is converted to non-forest and becomes separated into smaller, more isolated forest patches.

Gas Storage: Use of a depleted formation to store gas brought in from another field.

Gathering Pipeline: A pipeline that transports oil and gas from a well to a transmission line.

Guideline: A general rule, principle, or recommendation.

Headwater Streams: The source and upper reaches of a stream.

Heavy Hauling: Vehicles with gross weights of more than 10 tons, as used in Road Use Agreements and Road Bonds.

Horizontal Directional Drill (HDD): A pipeline installation technique whereby a steerable assembly is used to bore a shallow horizontal hole between two open pits for the purpose of installing a pipeline without excavating the surface between the pits.

Hydraulic Fracturing: An essential completion technique that facilitates production of oil and natural gas trapped in low-permeability reservoir rocks. The process involves pumping fluid at high pressure into the target formation, thereby creating small fractures in the rock that enable hydrocarbons to flow to the wellbore.

Impoundments: An open air, lined, earthen enclosure used to store fresh water.

Inadvertent Return: Unintentional discharge of drilling mud (primarily water and bentonite) during horizontal directional drill (HDD) of pipeline infrastructure.

Infiltration Basin: A shallow impoundment that stores and infiltrates runoff over a level, uncompacted, (preferably undisturbed area) with relatively permeable soils.

Joint-Use Road: State Forest Public Use (Z1) and Drivable Trails (Z2), which are open to public travel year-round, that are designated for dual snowmobiles and license motor vehicles.

Legacy Lease: An historic or pre-Marcellus lease.

License for Right of Way Agreement on State Forest Land: A right-of-way agreement that can be issued as authorized pursuant to Section 302 (b)(3) of the Conservation and Natural Resources Act, Act of June 28, 1995, P.L. 89, No. 18, 71 P.S. §1349.302(b)(3); it does not provide for a permanent interest in the land.

Midstream Operator: An operator, other than the rights holder, that has the right to gather, transport, process and deliver gas to market.

Mineral Exploration: The phase of operations that covers the search for mineral resources by carrying out detailed geological and geophysical surveys followed up where appropriate by exploratory drilling. (MCOR)

Mineral Development: The act of extracting mineral resources from the subsurface in order to bring them to market.

Mineral Production: The act of processing or transporting mineral resources to market.

Mineral Resource: Quantities of oil, gas, coal and hard minerals estimated to exist in naturally occurring accumulations. A portion of the resources maybe estimated to be recoverable, and another portion may be considered unrecoverable. Resources include both discovered and undiscovered accumulations (MCOR)

Monitoring: The actions of inventorying, documenting and reporting.

Mulchers: A machine that is used to cut and chip small woody vegetation in order to clear a path used for seismic survey.

Native Species: With respect to a particular ecosystem, a species that historically occurred or currently occurs in an ecosystem other than as a result of an introduction.

Natural Areas: A legislatively defined area of unique scenic, historic, geologic or ecological value, which will be maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention.

Non-Native Species: With respect to a particular ecosystem, a species that has not historically occurred in an ecosystem or that currently occurs in an ecosystem only as a result of an introduction

Oil & Gas Lease: A legal document executed between a mineral owner and a company or individual that conveys the right to explore for and develop hydrocarbons and/or other products for a specified period over a given area.

Pad: An area cleared of vegetation and graded as necessary to site infrastructure.

Pollution Events: Unintended release of hazardous, regulated or other substances with the potential to cause negative environmental effects.

Post Construction Stormwater Management (PCSM): The use of BMP's to manage changes in stormwater runoff volume, rate and water quality after earth disturbance activities that have ended and the project site is permanently stabilized.

Proprietary: Information provided to the Department that the operator considers confidential business information or trade secrets.

Protective Coating: A substance or material applied to the exterior of the pipe or a pipeline component to prevent contact with the outside environment.

Public Utility Commission (PUC): The Pennsylvania state regulatory agency that provides oversight, policy guidance and direction to public utilities.

Receiver Line: A single row of geophones placed on the surface used to record energy wave reflections from the subsurface. A seismic survey may consist of one or more receiver lines.

Right-To-Know Law (RTKL): A presumption of openness that every record is subject to being requested and presumably public unless an exemption or other provision of RTKL, which may include proprietary information, permits an agency to withhold it.

ROS (Recreational Opportunity Spectrum): An inventory and planning tool used by recreation managers to assure a diverse range of opportunities from which people can derive various experiences.

ROW (Right of Way): Granted interest that provides access across surface lands.

Seismic Agreement: A legally binding agreement between the Bureau and entity that governs and dictates operational procedures and requirements to conduct seismic survey.

Seismic Survey: A geophysical method used for exploration wherein reflections of energy waves from the subsurface are recorded at the surface to produce an image of the geology.

Separators: Devices designed to take the gross production flow from a well at the surface to separate out the undesirable solids from the liquids and gases.

Severed Rights: An ownership or lease interest in the mineral resource in, on and under a given tract of land owned by a person other than the surface owner.

Shale Gas: Natural gas derived from shale formations that are typically dark, organic rich, and acts as both the source rock and reservoir for the natural gas.

Soil Stabilization: The proper placing, grading, constructing, reinforcing, lining, and covering of soil, rock or earth to ensure its resistance to erosion, sliding or other movement.

Source Line: A single row of devices placed on the surface or in a series of boreholes in order to produce energy waves into the subsurface. A seismic survey may consist of one or more source lines.

State Forest Restoration: To bring back to the original contour/grade, land use and function.

State Forest Reclamation: To change an area used for gas development to another district approved condition, e.g. recreation parking infrastructure, herbaceous opening or forested habitat.

Subsurface Rights: An ownership or lease interest in the mineral resource in, on or under a described tract of land.

Surface Rights: The right of a mineral owner or an oil and gas lessee to use so much of the surface of land as may be reasonably necessary for the conduct of operations under the lease.

Transmission Pipeline: A pipeline that transports gas from a gathering line or storage facility to an oil and gas market, regulated by the Federal Energy Regulatory Commission (FERC).

Vegetative Screening: The use of coniferous or hardwood vegetation, either naturally reproduced or planted, to create vertical structure for minimizing visual and noise impacts.

Waiver: Official and vetted terms of approval, given in formal written consent, granted to lessee separate from the lease

Wastewater: All flowback and produced water that exits the wellbore. All produced water is considered a wastewater by DEP.

Well Pad: The area surrounding an oil or gas wellhead that is subject to earth disturbance and that is used or planned for use for the drilling, production or plugging of the well, including associated support

activities (such as storage of chemicals, wastewater, drill cutting, and equipment). The well pad does not include roads, pipelines, and facilities for the withdrawal, storage, and conveyance of freshwater.

Wetland: Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs and similar areas.

Wild Area: A legislatively defined extensive area which the general public will be permitted to see, use and enjoy for such activities as hiking, hunting, fishing and the pursuit of peace and solitude.

Wild Character: A concept that has different meanings to different people; some components of wild character the bureau considers are scenic viewsheds, undeveloped, “back-country” character, aesthetic buffers, and noise impacts.

APPENDIX I
State Forest Environmental Reviews and Tract Leases

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

BUREAU OF FORESTRY

AUGUST 2008 OIL and GAS LEASE SALE STATE FOREST ENVIRONMENTAL REVIEW

Prepared by:

Bureau of Forestry
Department of Conservation
and Natural Resources
June 20, 2008

AUGUST 2008 OIL and GAS LEASE SALE
STATE FOREST ENVIRONMENTAL REVIEW

PURPOSE

The purpose of this report is to describe the August 2008 Oil and Gas Lease Sale currently scheduled to occur on Monday August 18, 2008 at 2 pm. The project review criteria include a description of the project, the proposed lease area, project assessment related to a number of ecological, operational and stakeholder considerations as well as any actions necessary to ensure that the lease sale upholds the principles associated with sustainable ecosystem management.

The Bureau of Forestry typically conducts a environmental review for any project on State Forest lands that may or will disrupt or otherwise modify the existing land use. The planning process for the August 2008 Oil and Gas Lease Sale began approximately six (6) months ago. Based on the preliminary results of this review and subsequent discussions within the agency, the Department publicly announced its decision to conduct lease sale in late 2008 before the Senate Environmental Resources Committee on April 1, 2008.

In most instances, the appropriate district forester or district staff undertakes the environmental reviews. As a result of size and scope of this project, the Bureau of Forestry utilized a planning process for the August 2008 Oil and Gas Lease Sale and consolidated the results into a single document. The environmental review and all associated information will be made available to the public via the Internet.

BACKGROUND

Exploration and development of natural gas resources has been ongoing for more than 60 years on State Forest land as part of the array of resources, uses, and values of the State Forest. Since 1947, DCNR has held 72 lease sales offering the oil and gas industry the opportunity to access State Forest lands in a controlled manner while providing the mechanism for the recovery of hydrocarbon resources. As a result of this comprehensive history, approximately 1,400 wells have been drilled on *fee simple* State Forest lands. Currently, there are approximately 650 producing wells.

DCNR lease sales consistently have been predicated by oil and gas industry nominations. Industry expresses an interest in natural gas exploration on State Forest land by submitting written nominations specifying certain tracts of land for consideration in an upcoming lease sale. The Bureau of Forestry reviews and acknowledges these confidential nominations while periodically offering nominated tracts of State Forest land for lease by competitive bid. DCNR last held an oil and gas lease sale in September 2002.

Following the 2002 Oil and Gas Lease Sale, the Department has been committed to establishing transparent public policies and processes. Stakeholder meetings were convened with a broad-base of constituents. Additionally, legislative action through oversight and recommendations has added to the transparency of the State Forest oil and natural gas leasing program over the last five (5) years. The most recent changes to the

Oil and Gas Lease agreement were properly vetted to the public during the State Forest Resource Management Plan update that occurred in the Fall of 2007.

Industry interest in leasing State Forest land has been growing exponentially since the 2002 (deep) Trenton-Black River lease sale. Currently, approximately 5.25 million acres of State Forest land has been nominated (i.e., tracts have been nominated more than once by separate companies). State Forest land is attractive to outside parties due to the subsurface geology as well as the size and contiguous nature of our State Forests. Large blocks of land with a single land owner are heavily sought after due to the ease associated in dealing with one entity rather than many as is the case throughout most of the state.

Over the last few years, numerous companies have experienced success drilling moderately deep to deep natural gas wells in southern New York, West Virginia and portions of Pennsylvania. In addition to the long-sought after Trenton-Black River Formation, new targets such as the Marcellus Shale, Tuscarora Sandstone, and the Utica Shale are coming into play. Of these formations, perhaps the biggest development in Appalachia is newly created interest in the Middle-Devonian aged Marcellus Shale.

The Marcellus Shale is the basal member of the Hamilton Group and is characterized as thick, organic-rich black shale ranging in depth from approximately 5,500 – 8,500 feet below the surface throughout a majority of Pennsylvania. Regionally uniform, the Marcellus stretches from New York to West Virginia and into portions of Kentucky. The organic composition (total organic carbon as high as ten percent [10%]) of this shale has long been thought to be the source of natural gas found within numerous sandstone reservoirs throughout Appalachia.

The known geologic parameters of the Marcellus lend itself to supplying large quantities of natural gas in north-central Pennsylvania. Much of the Marcellus fairway happens to be coincident to State Forest land. Additionally, State Forest lands in north-central Pennsylvania are also prospective for the potential Tuscarora, Utica and Trenton-Black River reservoirs many geoscientists believe exist in this region. Nominations for potential leasing indicate that there is a high level of interest by the oil and gas industry to pursue exploration for the Marcellus Shale, as well as deeper potential reservoirs, beneath State Forest land.

This environmental review is based on the Bureau's deliberations on the scope, potential impacts and benefits of these deep gas plays. Based on these deliberations, the Department decided to pursue this opportunity under a portion of the State Forests where our management protocols will support natural gas exploration and development as well as satisfy our legal mandates to offer State Forest land for this purpose.

DCNR plans to hold a natural gas lease sale (auction) at which time the Department will accept bids from pre-qualified bidders for the leasing of eighteen (18) tracts of State Forest land, comprising seventy-four-thousand-twenty-three (74,023) acres in Tioga and Lycoming counties. The lands contained in the lease sale auction are being proposed for the controlled leasing of subsurface oil and gas rights only.

PROJECT OVERVIEW

Approximately 74,000 acres of State Forest lands are included in the August 2008 Oil and Gas Lease Sale. Although the subsurface natural gas rights provide for the

exploration and development of the entire area, only a small portion of the total acreage would be used for well site locations, pipeline development or access roads. Drilling moderately deep to deep natural gas wells is expensive due to the depths of these formations as well as the technologies required to prudently develop the natural gas resources.

Appalachia's oil and gas industry is currently undergoing tremendous growth (a boom). The current boom is best characterized by the need for a lease position quickly followed by a sharp increase in drilling permits. Based on the current market demands, the Bureau of Forestry has estimated that at least ninety percent (90%) of State Forest land will be successfully leased through competitive bidding during the August 2008 Oil and Gas Lease Sale. Operators ante up the first year's rentals through a bonus bid process where the highest-dollar-per-acre rate obtains the lease for an individual tract of State Forest land. The following years' rental payments are fixed per the lease agreement.

It is extremely difficult to predict the number of well sites that will be developed as a result of a successful August 2008 Oil and Gas Lease Sale. Estimates have ranged from zero (0) to more than one-hundred-sixty (160). However, at this time, DCNR is projecting between thirty-five (35) and fifty (50) well sites will be developed on State Forest land as a result of this lease offering. This estimate is based on:

- The expected nature of the Marcellus reservoirs with "sweet spots" being developed over time;
- The estimated (large) drainage area per horizontal well (~320 acres);
- Drilling costs associated with the depth of the gas likely to be found in the Marcellus Shale or deeper reservoirs; and
- Amount of land excluded from surface activity including non-development areas (22,339 acres), viewsheds and other environmental considerations.

Based on the Departments' best estimate of thirty-five (35) to fifty (50) well sites, each well site "footprint" will be about two (2) to five (5) acres. During drilling, a rig will be onsite for about fifteen (15) to thirty (30) days per well, after which time a successful well will be fitted with a wellhead and hooked up to a transmission line. Operators are encouraged to use one well site for multiple gas wells. A well may produce gas for several decades or more.

ENVIRONMENTAL SAFEGUARDS

DCNR has adopted a multi-level approach for managing potential impacts to the environment when leasing State Forest lands for oil and natural gas exploration and development.

First-level environmental safeguards involved the establishment of "non-development" areas, such as State Parks and State Forest wild and natural areas, where no surface activity is permitted. Non-development portions of a lease tract state that no surface activity or development will be permitted. More specifically, no well sites, pipelines, roads or related disturbances will be permitted in these areas. Detailed buffer zones have been devised to protect areas of ecological, recreational and aesthetic importance, such as water bodies, roads, trails and buildings. Non-development areas

total approximately twenty-two-thousand-three-hundred-thirty-nine (22,339) acres; thirty and one-tenths percent (30.1 %) of the acreage being offered for lease.

Site-specific second-level safeguards include, but are not limited to, the Pennsylvania Natural Diversity Inventory (PNDI) searches for disturbances associated with well locations, well spacing and construction specifications for roads and pipelines. These specifications are contained in the *Oil and Gas Lease for State Forest and Park Lands* (Appendix A) and are administered on the ground by the Bureau of Forestry's district foresters. Specific environmental and ecological protections and safeguards can be found in the lease agreement.

Third-level environmental safeguards require compliance with all applicable Department of Environmental Protection (DEP) regulations. These laws and regulations are solely administered by DEP and are distinct and separate from DCNR requirements.

PROJECT AREA DESCRIPTION

DCNR is proposing to hold a natural gas lease sale for the leasing of eighteen (18) oil and gas lease tracts, comprising seventy-four-thousand-twenty-three (74,023) acres of State Forest land in Tioga and Lycoming counties. The proposal includes the subsurface oil* and natural gas rights beneath State Forest land in the Loyalsock, Tiadaghton and Tioga state forests.

** - It is highly unlikely that oil will be encountered during routine exploration for natural gas in this region; including the oil rights is standard business practice as the substances are often found together when both are present.*

PROJECT REVIEW ITEMS:

1. **Consistency with State Forest Resource Management Plan**

The overarching goal for the management of State Forest lands is: To manage state forests sustainably under sound ecosystem management, to retain their wild character and maintain biological diversity while providing pure water, emphasizing opportunities for dispersed recreation, habitats for forest plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources.

Our current policy statement contained in the draft State Forest Resource Management Plan (2008) states: Geology is a critical component of State Forest management. The mineral resources associated with State Forest lands will be managed for the long-term good of the citizens of the Commonwealth of Pennsylvania. All exploration, development, and utilization will incorporate environmentally and financially sound methods.

Additionally, DCNR issued a public oil and gas position statement on April 1, 2008 stating: "DCNR supports the continued economic development of oil and gas resources beneath State Forest lands in a manner that minimizes potential negative impacts to other forest resources and values. The department favors the development of deeper oil and gas reservoirs due to the increased production potential, wider well site spacing, and reduced surface impact that can be achieved. The likely proliferation of well sites, rights-of-way, and roads associated with shallow gas development is less compatible with other forest values across much of the State Forest. DCNR will consider leasing for shallow gas if it is found during the development of deeper gas fields, or on a limited, case-by-case basis. DCNR will continue to honor existing leases and will continue to provide access to areas where it does not own the subsurface rights. DCNR will seek to purchase outstanding oil and gas rights when opportunities exist."

The August 2008 Oil and Gas Lease Sale conforms to the Bureau's stated policy and goals as well as the Department's oil and gas position statement.

2. **Erosion and Sedimentation**

Potential surface disturbances associated with oil and gas well activities include well site clearing, well pad construction, access road construction, small-diameter pipeline gathering system construction, site restoration and activities associated with geophysical or "seismic" surveys.

Runoff and erosion with subsequent sedimentation are potential impacts to adjacent and surrounding forests, wetlands and streams. Potential for erosion and sedimentation depends on many factors such as terrain, soil type, rain events and length of time of bare soil exposure. Erosion and sedimentation controls are addressed in *Exhibit "C*" (*Stipulations for Protection and Conservation of State Forest and Park Lands*) of the Oil and Gas Lease. More specifically, Section 7 (Siltation) of *Exhibit "C"* designates that a Lessee must have an approved site-specific Erosion and Sedimentation Control Plan that meets the criteria set by DEP's Title 25, Chapter 102 regulations. This plan is

required to be available on-location during all exploration and development activities (*Photo 1*).

Intermittent soil erosion and sedimentation may be expected to occur with surface clearing activities. However, these impacts will be minimized through certain lease provisions as well as adherence to federal and state laws and regulations including Federal Clean Water Act, National Pollutant Discharge Elimination System permit requirements, PA Clean Streams Law, and various DEP regulations.

All earth disturbances of one (1) acre to less than five (5) acres in extent that have a point source discharge to surface waters (channel of conveyance) are required to have a National Pollution Discharge Elimination System (NPDES) permit (25 Pa. Code § 92). The only exceptions to this requirement are earth disturbances that are part of agricultural plowing or tilling, road maintenance and timber harvesting activities. An individual permit (25 Pa. Code § 92.83.9) is required if the activities are in a High-Quality/Exception Value watershed (Chapter 93). These permits necessitate special protection requirements as outlined in Chapter 102, Section 102.4(b)(6).

Oil and natural gas operators proposing earth disturbance activities that are five (5) or more acres at one time over the life of the project, must complete DEP's Notice of Intent (NOI) authorization for the Erosion and Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing, or Treatment Operations or Transmission Facilities (ESCGP-1)

DEP regulates and enforces other laws and regulations (provisions) to which an operator is legally bound. These provisions include, but are not limited to, the Oil and Gas Act (Act 223), Oil and Gas Conservation Law (Act 359), Coal and Gas Resource Coordination Act (Act 214), Clean Streams Law (Chapter 91), Solid Waste Management Act (Act 97), and Non-Coal Surface Mining Conservation and Reclamation Act (Chapter 77).

3. **Surface Water Quality**

Degradation of water quality can result from possible sedimentary, thermal and chemical pollution of surface waters. The potential for sedimentation and the appropriate mitigating environmental controls were discussed above under Erosion and Sedimentation. Additional provisions are included in *Exhibit "C"* (*Section 8 - Waters*) of the lease agreement.

Thermal pollution, or increases in water temperature, can result if vegetation (shade) is removed from streamside or riparian zones. These concerns are addressed in *Section 23* (*Drilling Restrictions*) of the oil and gas lease agreement. Specifically, the lease states that no drilling or wellsite clearing is permitted within two-hundred (200) feet of a stream or body of water. Furthermore, no drilling or wellsite clearing is permitted within three-hundred (300) feet of any exceptional value (EV) stream or body of water. These standoffs exceed the criteria established in the Bureau's Aquatic Buffer Guidelines (Effective January 1, 2007).

Although unlikely, the potential exists for chemical pollution from recovery of drilling fluids (including brine), or from a spill of fluids used in the construction of wells such as gasoline, diesel fuel and various oils and lubricants. Additionally, accidental or unintentional spills of hydrocarbon fluids, although rare, are possible. The adverse impact associated with a pollution event depends on the amount of fluids spilled and released (concentration and time), the surficial geology, and soil type associated with the specific sites. Each permitted well will have a Preparedness, Prevention and Contingency Plan (PPCP) approved by DEP to address these concerns. All applicable laws, regulations and appropriate mitigation strategies apply.

Marcellus wells throughout the Appalachian Basin are thought to produce very little or no brine. The formation is considered "dry". It is anticipated that Marcellus wells in Pennsylvania will exhibit the same characteristics. Fluids encountered during well drilling activities must be handled, treated, and disposed of according to DEP regulations (i.e. DEP-Chapter 78, Chapter 95, Chapter 16; Act 223-Sections 204 through 210, 215; EPA UIC 40 CFR Parts 144, 146, & 147).

4. **Air Quality**

Exploration and development activities associated with drilling natural gas wells has the potential to temporarily contribute internal combustion engine exhaust, dust, smoke, and other gaseous pollution to the atmosphere. The use of machinery and/or heavy equipment will produce emissions such as carbon monoxide, nitrogen oxide, and sulfur dioxide. Equipment operated or transported along dirt/gravel road or pad sites may result in temporary increases in dust or particulate matter. These emissions are covered by the Air Pollution Control Act (P.L. 2119, 35 P.S. 4001, et seq.) as well as *Exhibit "C"* (*Section 1-Environmental Quality Control*) of the lease agreement.

The potential emissions resulting from all phases of natural gas exploration, development, and production will be well within the acceptable environmental standards. Excessive dust resulting from use of dirt and gravel roads will be handled using normal Forest District procedures. The use of water and/or other similar suppression mechanisms/treatments on a periodic basis greatly reduces dust levels.

5. **Water Quantity**

The Bureau was established, in part, to protect those watersheds integral to the growth and viability of the Commonwealth. Municipalities and other forest users rely on the State Forests not only for a source of water but also to provide the necessary protections for other downstream users. A decline in water quantity can be detrimental to aquatic communities, local fisheries and potable water sources.

Pennsylvania's surface waters are monitored and regulated by DEP's Bureau of Watershed Management (BWM). Act 220 was created in 2002 to provide for the identification of a "significant hydrologic unit where existing or future demands exceed or threaten to exceed the safe yield of available water resources" also known as Critical Water Planning Areas (CWPAs). The demand on water resources were assessed on several criteria which include the following: Size of Hydrologic Unit; Time Horizon;

Existing and Future Demands including Population Projections; Withdrawal and Non-Withdrawal Uses; and Safe Yield of Available Resources including developing Watershed Water Budgets, Water Quality, Aquatic Resource Uses and Other Critical Uses.

Act 220 created a statewide water withdrawal and use registration and reporting system. More specifically, Act 220 requires any person, organization, or entity that withdraws or uses 10,000 or more gallons of water per day, over a 30-day period, from one or more points of withdrawal in a watershed operated as a system, to register and then periodically report their water withdrawal and usage to DEP. Annual reporting, of withdrawals and use, is also required (DEP, Sept. 2007). Additional reporting and/or filing is required by the Susquehanna River Basin Commission (SRBC) and the Delaware River Basin Commission (DRBC).

Unlike Appalachia's conventional oil and natural gas reservoirs, the Marcellus Shale requires the use of massive induced hydraulic fractures (fracs) for the strata to produce economic quantities of natural gas. In addition to proppant (typically sand used to keep the fractures open), Marcellus fracs contain massive amounts of water and gel. This is known as a "slick-water frac". The water when mixed with the non-toxic gel forms a jello-like substance that is forced down the well bore and into the underlying rock at very high pressures. This process does not pose any threat to the surface attributes as fracing is completely underground.

Frac techniques are currently being honed and tweaked to determine what method(s) produce the best results for the least amount of capital investment. To date, the preferred frac technique(s) uses approximately one million (1,000,000) gallons of water to perform. The most commonly utilized source(s) of water are typically surface streams and/or commercial suppliers with on-site storage (*Photo 2-3, Drawing 1*). Regulation and compliance are subject to the provisions of Act 220 as well as Act 223 (Chapter 4, pg 73-81).

Future water withdraws will be coordinated with the appropriate agencies (i.e., DEP, SRBC, PAFBC) to ensure that the watershed will not be negatively impacted.

6. **Groundwater**

The Bureau maintains strict protocols that govern the protection and sustainable use of the groundwater resources beneath State Forest lands. *Exhibit "C"* (*Section 17-Water Wells*) of the lease agreement provides the Lessee with the option to drill and develop water wells, subject to the written approval of the Bureau, for use in natural gas exploration and development on that lease tract. Water well development for this purpose is subject to Act 610 (P.L. 1840) which provides for the orderly development of ground water resources.

Wells developed under the above lease provision are not intended to provide the massive volume(s) of water required for a Marcellus Shale frac. The original intention of this provision was to provide a Lessee with access to water for use in traditional frac

process associated with shallow Upper Devonian natural gas development. These water wells may be drilled and developed for dust suppression or other sustainable uses.

Chapter 4 of Act 223 (pg 73-81) specifies DEP's casing requirements for the protection of groundwater resources. All drilling, casing, cementing, and well completion practices (including fracs) are to be carried out in such a manner that protects fresh ground water. A lessee's well casing program must be designed in accordance with 25 PA Code § 78.81 – 78.86 and 25 PA Code § 78.62 and § 78.63 while accounting for a) Burst Strength, b) Tension, and c) Collapse. All top-hole water must be kept free of pollution or contamination by additives, brine, oil, and anthropogenic-induced conditions.

7. **Soils**

Surface disturbances associated with oil and gas well activities include well site clearing, well pad construction, access road construction, pipeline construction and site restoration activities associated with geophysical surveys. Potential problems associated with these activities include soil compaction or chemical pollution associated with spills or mishandling of industrial fluids.

Compaction, resulting from repeated use by heavy equipment, affects soil moisture regimes and drainage thereby affecting vegetative productivity. Equipment is present during the construction phase of gas well development and is typically removed following the successful completion of a natural gas well. The lease requires preparation of an Erosion and Sedimentation Control Plan as outline in Item 2 above however the following procedures are highly recommended:

> *Soil Compaction Mitigation* – Test topsoil and subsoil for compaction at regular intervals in areas disturbed by construction activities; Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate pre-construction conditions; Use penetrometers or other appropriate devices to conduct compaction tests.
>
> *Topsoil Segregation* – Prevent the mixing of topsoil with subsoil by stripping topsoil from the full work area and subsoil storage area; Maintain separation of salvaged topsoil and subsoil throughout all construction activities; In areas where topsoil has been segregated, plow the subsurface before replacing the segregated topsoil; Perform appropriate soil compaction mitigation.

Pollution from fluid spills could impact soil productivity and depending on extent, could reach groundwater resources. The potential for chemical spills, subsequent mitigation, and groundwater protection are discussed above in Items # 3 and #6 respectively.

8. **Unique and Unusual Geologic Features**

DCNR's Bureau of Topographic and Geologic Survey published a two-volume book titled "Outstanding Scenic Geologic Features of Pennsylvania" (1979). This comprehensive work documents outstanding geologic and topographic features

throughout the Commonwealth. These sites have been incorporated into the Pennsylvania Natural Heritage Program (PNHP) and Pennsylvania Natural Diversity Inventory (PNDI) information systems. All activities associated with oil and gas development undergo a PNDI review prior to the commencement of earth moving activities commencing. Surface use of these areas for gas activities will be avoided.

9. **Aesthetics**

The aesthetic qualities of the State Forest system play a key role in attracting forest users. State Forests provide a large serene wooded landscape for public use and enjoyment.

Non-development areas have been delineated to preserve certain aesthetic features of the State Forest system. Surface disturbance is prohibited in any area that has been designated as non-development. For example, all State Forest wild and natural areas are non-development.

Development and construction of well sites, roads and other related infrastructure may negatively impact the visual aspect of some portions of the State Forest. Viewscapes (or viewsheds) are the scenic portions of the landscape that can be seen primarily from a transportation corridor (i.e., road or trail). Any visual impact will depend on proximity of gas wells to viewshed features such as vistas, public use roads, trails, State Parks, or other high-use areas.

Impact on publicly viewed areas has been considered prior to implementing forest management activities associated with natural gas exploration. Viewsheds have been specifically analyzed throughout the lease sale analysis process. Any future well site will minimize, to the extent possible, any adverse affect on the visual experience of the State Forest user as well as the aesthetic values of the viewshed. Important viewsheds (i.e., Pine Creek viewshed) have been identified and zoned as areas of special consideration where surface disturbance is extremely limited and reviewed on a case-by-case basis. Well locations will not be approved within the Pine Creek valley as it is the intention of the Department to preserve the viewsheds of Pine Creek and the Pine Creek Rail-Trail.

The landscapes where most activity may occur have been actively managed in the past. These areas typically contain roads, trails, pipelines, and log landings as well as a variety of forest conditions. The regional landscapes contain forest stands of varying species composition and ages, reflecting the Bureau of Forestry's past forest management activities.

DCNR has several control measures contained within the lease agreements to minimize visual impacts. In addition to important viewsheds, other areas are also excluded from surface activity (i.e., State Forest Wild and Natural Areas). Well site spacing is limited to the derivative-based formula (as outlined below in *Item 16*), whereas the total number of permissible well pads has been predetermined and clearly stated within the lease agreement. All applicable buffers, as designated in Oil and Gas Lease Agreement as well as the Aesthetic Buffer and Aquatic Habitat guidelines (roads, trails,

and streams) shall be adhered to unless the a written waiver is applied for and subsequently granted by the District Forester (certain buffer variances require a SFER).

The District Forester will maintain a record of all such requests and specifically notate whether or not said waiver was granted (or denied) and the reason for doing so. Existing openings, roads and rights-of-way will be utilized wherever possible. Any impacts on visual resources from seismic activity should be slight and temporary.

10. **Noise and Light Levels**

Noise levels may increase as a result of activities associated with the exploration and development of Marcellus Shale (or deeper) gas on State Forest lands. Potential impacts include temporary increases in noise levels as a result of seismic exploration, construction of well sites, roads or pipelines, well drilling, and truck traffic.

Adverse impacts from an increase in noise levels depend on distance from noise source, weather, topography and vegetation. The primary increases in noise level will result from well drilling and road and pipeline construction. Seismic and maintenance activity may also result in localized, very short term increases in the ambient noise level within the State Forests.

Noise level will be a considered throughout the well location approval process by the appropriate program area(s). Wherever possible, well site locations will be located in a manner to maintain the alleviate temporary increases in background noise levels in high use areas such State Park campsites or State Forest Picnic Areas.

The use of lighting may temporarily impact the night sky as a result of drilling activities. Natural gas drilling is a twenty-four (24) hour per day activity that requires proper illumination for the health and safety of the drilling crews. This impact should occur in a limited fashion and last no longer than the time required to properly drill and complete a natural gas well (i.e., two or three weeks).

11. **Archeological Sites and Historic Sites**

The Pennsylvania Historic and Museum Commission maintains information relevant to the Commonwealth's significant historic and archeological sites. Information on the known locations of these sites on State Forest lands has been shared with the Bureau of Forestry. The Bureau has initiated a system to identify these sites and notify the Commission of any action that may disrupt these resources.

All earth disturbance activities associated with oil and gas development undergo an archeological review prior to siting. Use of these sites for natural gas activities will be avoided as provided by law. Discovery of potential new sites or artifacts will be forwarded to the Historic and Museum Commission for their review and documentation.

12. **Recreation Sites and Opportunities**

Natural gas (Marcellus Shale or deeper) exploration and development activities could affect some recreational experiences on State Forest lands. Increased noise levels and potential visual impacts could affect the recreational experiences of State Forest visitors'. Any potential impact directly depends on the visitor's activity location within the State Forest, and their expectation of a particular experience.

Although it is not anticipated, some roads may be temporarily closed during drilling operations or other peak periods of heavy use to reduce potential safety hazards. Actions to limit road access will be made on a case-by-case basis at the discretion of the District Forester. Drilling periods on any given well are anticipated to last three to four weeks under normal conditions. At the end of the drilling period, if roads are closed, they will be reopened.

Areas under lease will be open for traditional uses; however the immediate well site (2 to 5 acres) will be closed to the public during drilling operations. If a well is successful, only the immediate surrounding area will continue to be restricted to the public.

The natural gas drilling season on State Forest lands typically runs from mid-March through November 1. This seasonal window allows Lessees to explore for and develop natural gas reserves prior to the on-set of Pennsylvania's major hunting season(s) and inclement weather. There may be instances where, due to equipment limitations or logistical snafus, that a Lessee is permitted to operate beyond the November 1 date. In this case, actions to limit hunter access to reduce potential safety hazards will be made on a case-by-case basis.

DCNR has implemented several measures to minimize impacts on the recreating visitor. State Parks and State Forest Wild and Natural Areas are "non-development areas" and, therefore, are excluded from all surface activity. As mentioned above, a buffer system has been developed to protect parks, natural and wild areas, streams, roads, trails, and other recreational features.

Additional areas of special consideration have been delineated using a GIS-based analysis. The Recreational Opportunity Spectrum (ROS) delineates certain recreational experiences available to a forest user based on current, existing surface use. Two (2) such classes, Primitive and Semi-Primitive Non-Motorized, have been zoned "non-development" (7,765 acres) thereby preserving these unique recreational experiences.

ROS Primitive Class Definition

Primitive areas are normally 1,000 acres in size or larger and located at least one (1) mile from the nearest motorized use (road, railroad, or trail). Accessible only by foot (motorized use is prohibited); interaction between forest visitors is very low resulting in a recreational experience consisting of isolation, independence, and closeness to nature. These areas are sought after by visitors seeking a high degree of self-reliance, challenge, and risk. Openings in the forest canopy are the result of natural occurrences only.

Management goals for this ROS class include conserving natural ecosystems and providing recreational experiences compatible with a primitive environment.

ROS Semi-Primitive Non-Motorized Class Definition

Semi-Primitive Non-Motorized areas are normally 500 acres in size or larger and located at least one-half (1/2) mile from all non-gated (open to the general public) roads, railroads, and trails with motorized use. Accessible only by foot or equine, there is no motorized use by the public although administrative use may be conducted by motor vehicle. Interaction between forest visitors is low resulting in the high probability of experiencing isolation, remoteness, independence, and closeness to nature. These areas are sought after by visitors seeking self-reliance and the possibility of challenge and risk. Openings in the forest canopy may be the result of either natural or anthropogenic occurrences. Management goals for this ROS class include providing a non-motorized semi-primitive recreational experience as well as necessary forest management.

Other recreation-based areas of special consideration specifically pertain to those hiking trails previously identified as either State Forest Hiking Trails or National Scenic Trails. The following guidelines apply.

State Forest Hiking Trails (SFHTs)

DCNR-Forestry gave special recognition to a discreet number of hiking trails that were designated primarily for foot travel only. Currently, there are eighteen (18) trails totaling seven-hundred-ninety-one (791) miles carrying this designation. A large majority of the SFHT mileage is located on State Forest land; however these trails also traverse other public and private lands. SFHTs are subject to a 100-foot "non-development" buffer on both sides of the trail. Any proposed disturbance activity within a SFHT buffer zone requires written approval prior to commencement.

National Scenic Trails (NST)

The National Park Service designates the National Scenic Trail (NST) system. Currently, there are sixty (60) miles of NSTs on State Forest land. All sixty (60) miles are encompassed within three (3) trails: Appalachian, North Country, and Laurel Highlands. NSTs are subject to a two-hundred (200) foot aesthetic/non-development buffer zone on both sides of the trail.

13. Public Health and Safety

Public health and safety concerns center on fire hazard, pollution potential, and well blowouts. Safety requirements are contained in the DCNR Oil and Gas Lease; more specifically, Section 24 (*Drilling Operations*) and Section 18 (*Deep Well Control Insurance and Safety*).

Public access is restricted to the well location during the drilling and completion phase of operations. The well site is normally occupied twenty-four (24) hours a day, seven (7) days a week during well drilling. The lessee (operator) provides the necessary security during these operations at no cost to DCNR.

If and when economic natural gas production is established, public access will continue to be restricted to the immediate area around the well and its equipment until production ceases. Vandalism has been minimal throughout the history of the natural gas leasing program. Although isolated, lessees are encouraged to document, to the best of their ability with pictures and prose, any vandalism that occurs and provide said documentation to the District Forester.

State and Federal regulations require compliance with the U.S. Department of Labor's Occupational Health and Safety Administration (OSHA) (http://www.osha.gov/SLTC/etools/oilandgas/index.html). Specific OSHA standards for oil and natural gas drilling, servicing, and storage can be found here: http://www.osha.gov/SLTC/oilgaswelldrilling/standards.html. The Federal Environmental Protection Agency (EPA), through the Underground Injection Control Program (Safe Drinking Water Act, 42 U.S.C.A. Section 300 F et seq.; 40 CFR Part 147), provides protection for the protection of public drinking water.

Further safeguards that ensure the protection of public health and safety involve specific rules and regulations of the PA-Department of Labor and Industry (37 Pa. Code, Chapter 11 and 13), PA-Department of Transportation (PA Vehicle Code Title 75, Chapter 49 and 189; 67 Pa. Code, Chapter 403), and the PA-Department of Environmental Protection (Solid Waste Management Act, Act 97, 35 P.S. §6018.101 et seq.; Oil and Gas Act, Act 223, 25 Pa. Code Chapter 78)

A DEP-issued oil and/or natural gas well permit is the primary authorization for exploration and development activities. The well permit addresses well location; notice to landowners, owners of water supplies, coal owners and gas storage operators; distance restrictions for existing building, streams, springs and wetlands, and public resources. As referenced above in *Item 3*, each operator must have a DEP-approved Preparedness, Prevention and Contingency (PPC) Plan for every permitted oil and/or natural gas well which addresses many health and safety issues.

14. **Transportation & Pipelines**

The State Forest system is home to an extensive road network. There are approximately 2,500 miles of State Forest public-use roads and many hundreds of miles of administrative, logging, and gas well access roads. There are two general concerns dealing with the roads and transportation: 1) a major increase in the number of roads, and 2) the capability of the existing State Forest roads to handle the increased heavy truck traffic. Other related concerns include: traffic congestion, impacts to the road, potential road closure, and State Forest visitors safety with such an increase in traffic.

Pennsylvania's State Forest road network is adequate in accessing most areas of the State Forest system. Short access roads may need to be developed in situations where well site locations are not reasonably adjacent to existing access roads. New access roads will be constructed in conjunction with existing roads and right-of-ways, using this infrastructure wherever possible. Access roads will be built using current design standards (see Oil and Gas Lease - *Exhibit "E": Oil and Gas Lease Access Road*

Specifications for State Forest Lands). Deviations from these specifications will require the written approval of the District Forester.

Existing State Forest road infrastructure can properly handle heavy truck traffic associated with natural gas exploration and development. Occasionally, State Forest roads may require slight improvement (i.e., additional road base material) to maintain a good running surface. Any improvements, when necessary, will be made at the sole expense of the Lessee to the satisfaction of the District Forester.

The types of trucks used for gas exploration are similar to that of the logging industry. There will be a noticeable increase in truck traffic due to the nature of this type of drilling operation. Generally, heavy truck hauling will not be permitted from November 1 to March 30 (no-haul period). Any exceptions to the "no-haul period" must be made in writing to District Forester; upon review of said request, District Forester will respond appropriately in writing.

Additional limitations on vehicular use, including but not limited to heavy hauling, during certain times of the year may be necessary to protect the integrity of the roads. These restrictions typically occur during late-winter and early-spring (break-up), however road use may be limited at any time of the year based on due cause at the discretion of the District Forester. Bridge crossings are subject to all posted weight limits as well as the approval of the District Forester. There may be instances where the Lessee may be required to improve certain bridges or similar crossings to support vehicular traffic, especially heavy hauling. Such improvements will be completed only as necessary, and within Department standards, at the sole expense of the Lessee.

In the event that State Forest lands are used as "draft points" for obtaining water from streams, the draft point and associated roads may require significant improvements and upgrades to meet Department standards prior to the commencement of this activity. These instances will be considered on a case by case basis.

Safety concerns may necessitate that certain roads be closed to public access during drilling operations or other periods of heavy use to reduce potential safety hazards. In some situations, gates will be used or installed to limit access to the drilling sites. Signage warning of heavy track traffic must be sufficiently posted to assure public safety on State Forest roads. Road access limitations will be at the discretion of the District Forester on a case-by-case basis. Normal Bureau of Forestry protocols will remain in effect. Any vehicles traveling in excess of twenty-five-miles-per-hour (25 mph) may be subject to the issuance of a traffic citation.

Appropriate safety measures will be utilized wherever possible to protect the usage of the forest roadway by recreation-based user groups (hiking, biking, horseback riding, etc.). Certain State Forest roads have been designated as Joint-Use (JU). Prior written permission must be obtained before to using such roads. Reducing conflict between State Forest stakeholders on JU roads means activities, such as snowmobiling, horseback riding, and timber harvesting, need to be considered, and the appropriate safety

measures taken, to minimize road-based conflict. Any JU road is subject is the necessary criteria outlined in the *Joint-Use Road Plowing Strategy* (November 1, 2005). Recreation safety and activities are highly important; however, in-line with timber management activities, natural gas exploration takes precedence over recreational activity in our working forests. Generally conflicts are minimal and often easily resolved.

Areas contained with a given lease tract will be accessible to the public and open for traditional uses. However, the localized well site (2-5 acres in size) will be closed to public access during drilling activities. If a well is successful, the actual well site infrastructure remaining on site is off limits to the public thereby lessening pubic safety concerns and benefits the continuous function of the well site operation. Development activities on a given well are anticipated to last approximately two (2) months under normal conditions. At the end of the drilling period, any roads that were temporarily closed will be reopened.

Natural gas that is discovered and produced as a result of this lease sale will require new pipeline infrastructure construction. All pipeline activity is governed by the Oil and Gas Lease Agreement (*Section 29 – Oil and Gas Pipelines*). Gathering systems or marketing lines are permissible under the terms of the agreement. No rights for developing major transmission pipelines are granted in the lease agreement and, thereby, require a standard right-of-way application (*see attached Pipeline Theory*) and SFER.

Typically, gathering and/or marketing pipelines are placed in and along existing corridors to minimize surface impact as well as construction and development costs. Gathering lines (small diameter, plastic/PVC pipe or steel) have historically been placed along access roads - in adjacent ditches or beneath the road itself (*see Photos 4-7*). The practice of pipeline placement is preferred by the Department. All pipeline corridors or similar routes developed for the purpose of moving natural gas to market are subject to the approval of the District Forester. Although the lease agreement explicitly grants a lessee the right to move recoverable volumes of natural gas from off the leased premises, major transmission lines <u>are not</u> subject to this expressed right.

<u>Non-Lease Sale Related Pipeline Activity</u>

Independent of whether or not State Forest land is offered for lease, DCNR will undoubtedly face requests for the construction of new major natural gas transmission lines. The recent flurry of Marcellus Shale leasing and subsequent exploration is occurring in areas that are deficient in pipeline infrastructure. Existing natural gas transmission lines currently have <u>little to no</u> additional capacity available for new natural gas reserves being brought to market.

15. **Energy Needs/Use**

Machinery used in the construction, exploration and development phases of natural gas exploration will consume fuels (primarily diesel fuel). Types of machinery typically used in natural gas development include: tractor-trailers, tri-axle trucks, front-loaders, skid-steers, bulldozers, drilling rigs, personal vehicles, water trucks and

generators. Fuel quantities required for these activities are unknown and will vary between operators.

The 2008 Oil and Gas Lease Sale proposal may add significant quantities of natural gas to the Northeastern U.S. corridor. The Northeast is the largest consumer of natural gas in the United States. Estimated ultimate recovery (EUR) from one (1) Marcellus Shale well is thought to be approximately one-billion-four-hundred-million-cubic-feet of natural gas (1.4 Bcf/well). The EUR from one (1) Trenton-Black River well is thought to range between five- and forty-billion-cubic -feet (5-40 Bcf/well). The average U.S. household that uses natural gas to heat and cool a two-thousand-square foot (2,000 sq/ft) home consumes approximately 120,000 cubic feet per year. Thus, a single well may provide the natural gas necessary to meet the heating and cooling needs of forty-one-thousand (41,000) to over three-hundred-thousand (300,000) homes.

16. **Existing/Potential Land Use**

The Pennsylvania State Forest system represents one of the largest expanses of public forestland in the eastern United States. These forests provide an abundance of high quality forest products, varied recreational opportunities, wildlife/plant habitat, and watershed protection and use. The principles associated with ecosystem management draw upon the overarching goal of forest sustainability which, in turn, assures the array of resources, uses, and values of the state forest for current and future generations.

This region of Pennsylvania lies well within the Marcellus Shale fairway. Private landowners have been leasing property in these areas for the last few years. In light of the increase in natural gas leasing on private lands, the selected lease tracts are highly marketable and saleable. The portions of State Forest that are being offered for lease may help the private landowners capitalize on their previous decision to lease their land. DCNR has implemented several measures to minimize forest fragmentation effects through its multi-level management approach. The design of the August 2008 Oil and Gas Lease Sale was intentional in that those areas included in the upcoming lease minimize the potential for environmental impact while maximizing the potential return.

Two (2) of the major concerns associated with the August 2008 Oil and Gas Lease Sale are impact on existing uses of the State Forests and the potential for additional forest fragmentation. Any temporary impact on the existing use of the State Forest was addressed, specifically, the sections for Recreation Sites & Opportunities (*Item 12*), Public Health and Safety (*Item 13*), and Transportation and Pipelines (*Item 14*). In summary, temporary closures and restrictions may be needed to minimize user conflicts. The need for these controls will be at the discretion of the District Forester.

Historically, there were attempts made to explore for and develop shallow natural gas reservoirs (Upper Devonian) in this region. These attempts failed as no commercial production from the Upper Devonian sandstones exist in these areas. Forest fragmentation is most closely associated with close-spaced drilling (forty acres or less). Therefore, since there is little likelihood that economic quantities of natural gas exist in these sandstones, fragmentation of this nature is unlikely to be seen.

A newly designed and implemented planning process was used in the August 2008 Oil and Gas Lease Sale. This approach consisted of several key components that provided for proper assessment and analysis of on-the-ground attributes of the State Forest system. These analyses were completed using field-based reconnaissance assessments and ArcGIS-based methodology, modeling, and analysis which are ultimately captured by comprehensive lease tract analysis whose results are captured in a series of maps (*see Map Appendix*).

These key components include, but are not limited to, aesthetic/buffer zones, geologic/spacing assessments, viewshed delineation, important recreation zones, and silvicultural/ecological considerations; all of which are summarized as follows:

Standardized Management Protocols

WILD AREA MANAGEMENT ZONE: Those areas that have been designated or are pending designation by the Department as State Forest Wild Areas. A Wild Area is defined as an extensive area which the general public will be permitted to see, use and enjoy for such activities as hiking, hunting, fishing and the pursuit of peace and solitude. No development of a permanent nature will be permitted so as to retain the undeveloped character of the area and conserve ecological resources. The guidelines governing the administration of Wild Areas are as follows:

(1) Campsite leases will be prohibited.
(2) No new public access roads will be constructed. Existing roads will remain open only where there is a public need. All motorized conveyances or vehicles shall be prohibited with the exception of licensed vehicles, which may be operated only on open public roads.
(3) Forest trail use will be restricted to foot travel, horseback riding and bicycling. Handicapped persons, in hand or electrically powered wheelchairs, or in other electrically powered vehicles adapted for this use, may operate such conveyances on designated trails.
(4) Buildings and other improvements will be restricted to the minimum required for public health, safety and interpretive aids.
(5) **Leases, mineral development, and new rights-of-way will be prohibited; however, subsurface oil and gas rights may be leased where no surface use or disturbance of any kind will take place on the Wild Area.**
(6) Overnight camping will be limited to the backpack primitive type.

NATURAL AREA MANAGEMENT ZONE: Those areas that have been designated or are pending designation by the department as State Forest Natural Areas. Natural Areas are defined as an area of unique scenic, historic, geologic or ecological value, which will be maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human

intervention. These areas are set aside to provide locations for scientific observation of natural systems to protect examples of typical and unique plant and animal communities, and to protect outstanding examples of natural interest and beauty. The guidelines governing the administration of Natural Areas are as follows:

(1) No human habitation will be permitted, except that primitive type, backpack camping may be permitted in designated areas only.
(2) Access for all but essential administrative activities will be restricted to foot travel and non-motorized watercraft, except in designated areas.
(3) Buildings and other improvements will be restricted to the minimum required for public health, safety and interpretive aids.
(4) Timber harvesting will not be permitted except as may be required for the maintenance of public safety.
(5) **Leases and mineral development are prohibited; however, subsurface oil and gas rights may be leased where no surface use or disturbance of any kind will take place on the Natural Area. New rights-of-way are prohibited except for designated utility corridors in the Bucktail Natural Area.**

Approximately sixty-nine (69) acres of the Bark Cabin Natural Area are included within Tract 322. This area has been delineated as a *Non-Development – Wild or Natural Area*. No surface disturbance will be permitted.

LIMITED RESOURCE MANAGEMENT ZONE: Applied to areas where management alternatives are limited due to site quality or topographic constraints. Recreation, aesthetics, water, and soil retention are the primary values. Topography can be an inhibiting factor that restricts or prohibits natural gas exploration and development practices on these areas (e.g., steep slope). This zone is typically not part of the commercial forest land base. Natural gas exploration and development is usually not practical.

Approximately fourteen-thousand-five-hundred (14,500) acres have been delineated as *Non-Development-Steep Slope*. No surface disturbance will be permitted.

AESTHETICS / BUFFER MANAGEMENT ZONE: Applied to areas where connectivity, aesthetics and water quality conservation are the primary values. These areas encompass a wide array of lands and are associated with linear features such as roads, trails, and streams or encompass significant features of State Forest lands. Appropriate forest community types within this zone are considered part of the commercial forest land base, however, natural gas exploration and development is typically excluded from certain areas. It is fair to anticipate requests for "waiver of buffer zone" (specifics in *Section 23* of lease agreement). Any request for encroachment will be reviewed on a case-by-case basis to minimize impact. All requests are subject to the

written approval of the district forester. This management zone includes the following areas:

A. Palustrine Wetlands and Frost Pockets

B. Parks and Picnic Area

C. Campsite Leases

D. Roads

E. Natural Areas

F. Fire Hazard Areas

G. Trails

H. Sensitive Areas

AQUATIC HABITAT BUFFERS: Areas around wetlands, vernal ponds, spring seeps, streams, lakes, ponds and impoundments should be designated as aquatic habitat buffers. These guidelines provide a standard set of operating procedures to be followed when conducting management activities in or near aquatic habitats on State Forest land. Management efforts should focus on providing connectivity, wildlife habitat and protecting water quality. The specific guidelines (see *Aquatic Buffer Appendix*) are organized as follows:

A. Streamside Forests
   Wilderness Trout Stream and Wild Rivers
   Exceptional Value (EV) Streams and Scenic Rivers
   High Quality (HQ) and All Other Perennial Streams
   Intermittent or Ephemeral Streams

B. Lakes, Ponds, and Impoundments

C. Vernal Ponds

D. Spring Seeps

E. Wetlands

2008 Oil & Gas Lease Sale Management Protocols

WELL SITE SPACING: Derivative-based well spacing will be applied throughout the lease tracts. Recent developments in drilling technology, known as horizontal drilling, have made it possible to develop well pad sites in a manner that

reduces surface impact exponentially. Previous well spacing was fixed through the lease agreement using hard spacing requirements – or the acceptable distance between wells (e.g. 40 acres, 320 acres, or 640 acres). The new derivative-spacing formula will take the total acreage of a tract divided by a reasonable drainage radius (per well). The result is the number of permissible well pad sites permitted on that lease tract (see *Theoretical Spacing Diagram*). For example:

3200 acres / 300 acres per well = ~11 acceptable well pad sites

Access roads and necessary pipelines will be constructed along existing roads and rights-of-way wherever possible. Extensive consideration was given to the appropriate well spacing needed for economic recovery of natural gas from the Marcellus Shale (or deeper). The methodology used in the derivative-spacing formula appears to minimize the potential impacts to the surface while maintaining the engineering integrity required to economically recover the natural gas reserves without waste (i.e., Oil and Gas Conservation Law).

VIEWSHED DELINEATION: ArcGIS was utilized for performing viewshed analysis for those areas that contain historic and/or important viewsheds (i.e., Pine Creek). Digital elevation models (DEM) were used to clearly define those high-points on the surface where an observer stationed along and/or within a defined area (i.e., Pine Creek Valley). The results were applied to the lease tracts and implemented as an Area of Special Consideration – Viewshed.

Approximately twenty-five-thousand (25,000) acres have been appropriately delineated as *Area of Special Consideration - Viewshed.* More than fifty-percent (50%) of this area is also contained within the *Non-Development-Steep Slope* areas.

RECREATION ZONES: The basis for the delineated recreation zones contained within a lease tract is the Recreation Opportunity Spectrum (ROS). ROS is an inventory system built on the premise that people expect certain types of recreational experiences on public land, and that land managers should be able to direct people to appropriate places for those experiences. ROS allows the land manager to provide recreational opportunities across a spectrum, or continuum, of 5 land-use classes so that the user may find satisfying recreational experiences in a variety of recreation activities.

Zones that meet the appropriate criteria to be considered "Primitive" or "Semi-Primitive, Non-Motorized" have been delineated as such and subsequently have been classed as *Non-Development - Recreation* according to the Department's standard ROS guidelines. Approximately seven-thousand-seven-hundred-sixty-five (7,765) acres meet these criteria

The following steps were taken to determine appropriate recreational opportunities, experiences and uses of public lands. As land managers, ROS has aided us in providing a systematic and consistent inventory and assessment as part of the long-

range planning process. The resulting consistent protocol will be used in management planning on State Forest lands.

Conducting the ROS Inventory (Using ArcGIS)

Each class (zone) is defined with respect to its combination of activity, setting, and experience opportunities. Three criteria are used to delineate the setting component for mapping: *physical, social and managerial*. The mapping criteria for the physical setting are *remoteness, size, and evidence of humans*. User density is the criterion for the social component, and (managerial) regimentation and noticeability are the criteria for the managerial setting.

Use the Existing Recreation Resources Map as the base map to conduct the ROS. Use Mylar overlays or the GIS Existing Recreation Resources Map to draw ROS categories on the map. A GIS-based program can be developed to prepare the Remoteness and Size of Area overlays as the first step in defining the Physical Setting Overlay. Otherwise, this must be done manually on the base map. If the map is "busy" or difficult to read, adjust the base map scale for developing the ROS class designation. Seasonal maps—(one for summer and one for winter) are highly recommended as activities, settings, and experiences can change significantly with the season.

Class Delineation (Using ArcGIS)

Mapping the ROS classes should be done on a map scale, which allows an overall view of the planning area. A 1" = 1 mile scale is usually sufficient to provide this overview. If necessary, the map information may be transferred to larger scale maps later in the data processing state to conform to integrated data collection criteria.

The ordered items below illustrate mapping criteria that applies to each component of the setting. *When conducting a ROS inventory, proceed through the criteria in the same sequence as that outlined in the table*. Definitions of the setting and step-by-step directions are detailed later in this manual.

Setting Component	**Mapping Criteria**
Physical	Step 1 = Remoteness
	Step 2 = Size
	Step 3 = Evidence of Humans
Social	Step 4 = User Density
Managerial	Step 5 = Managerial Regimentation & Noticeability
Inconsistencies	Step 6 = Resolving Inconsistencies (if necessary)

Once the classes are mapped on the basis of the setting components, the activity opportunities within the classes are identified. The recreational activities considered must meet the following criteria:

1. The resource must be capable of sustaining the impact of the use.
2. The activity is suitable as defined by internal guidelines, policy and zoning.

HIGH VALUE TIMBER CONSIDERATIONS: An ArcGIS-based analysis was performed to properly assess where DCNR's high-value timber is located in relation to the lease tracts. Using the current typing layer(s) for the applicable forest districts, those areas that comprised of Northern Harwood Forest (BB) and/or Black Cherry – Northern Harwood Forest (BC) and met the Site Class 1 criteria have been delineated based on these criteria:

BB *Northern Hardwood Forest* **:** Dominant trees usually include *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *A. saccharum* (sugar maple), *Prunus serotina* (black cherry)—at less than 40% relative cover, *Betula lenta* (sweet birch), *B. alleghaniensis* (yellow birch), *B. papyrifera* (paper birch), *Q. rubra* (northern red oak), and *Fraxinus americana* (white ash). This type may contain scattered *Pinus strobus* (eastern white pine) and/or *Tsuga canadensis* (eastern hemlock), but combined conifer cover does not exceed 25% of the canopy. *Rhododendron maximum* (rosebay) may be locally abundant. Other common shrubs include *Hamamelis virginiana* (witch-hazel), *Acer pensylvanicum* (striped maple), *Viburnum lantanoides* (witch-hobble), *Ilex montana* (mountain holly), *Amelanchier laevis* (smooth serviceberry), *A. arborea* (shadbush), and *Carpinus caroliniana* (hornbeam). The herbaceous layer is generally sparse and reflects a northern affinity; common components include *Maianthemum canadense* (Canada mayflower), *Trientalis borealis* (starflower), *Thelypteris novaboracensis* (New York fern), *Dryopteris carthusiana* (fancy fern), *Lycopodium lucidulum* (shining clubmoss), *Gaultheria procumbens* (teaberry), *Mitchella repens* (partridge-berry), *Aralia nudicaulis* (wild sarsaparilla), *Medeola virginiana* (Indian cucumber-root), and *Maianthemum canadense* (Canada mayflower).

Related types: If combined relative cover by conifers approaches or exceeds 25%, please read description for the "Hemlock (white pine) - northern hardwood forest." If cover by *Prunus serotina* (black cherry) approaches or exceeds 40% of canopy, please read description for the "Black cherry - northern hardwood forest" type.

Range: Glaciated NE, Glaciated NW, Pocono Plateau, Unglaciated Allegheny Plateau.

BC *Black Cherry - Northern Hardwood Forest:* (Allegheny Hardwoods). This type is characterized by at least 40% *Prunus serotina* (black cherry) and is most characteristic of the Unglaciated Allegheny Plateau. Common associates are *Acer rubrum* (red maple), *A. saccharum* (sugar maple), *Betula lenta* (sweet birch), *B. alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and *Quercus* spp. (oaks), usually *Q. rubra* (northern red oak). *Pinus strobus* (eastern white pine) and/or *Tsuga canadensis* (eastern hemlock) may be present (at less than 25% relative cover). Shrubs include *Viburnum lantanoides* (witch hobble), *Acer pensylvanicum* (striped maple), *Rubus allegheniensis* (Allegheny blackberry), *Ilex montana* (mountain holly), *Hamamelis virginiana* (witch-hazel), and *Amelanchier*

arborea (shadbush). Common herbaceous species include *Dennstaedtia punctilobula* (hayscented fern), *Thelypteris novaboracensis* (New York fern), *Dryopteris intermedia* (common wood fern), *Lycopodium* spp. (ground pine), *Aster acuminatus* (wood aster), *Viola* spp. (violets), *Medeola virginiana* (Indian cucumber-root), *Uvularia sessilifolia* (wild-oats), *Brachyelytrum erectum* (brachyelytrum), *Maianthemum canadense* (Canada mayflower), and *Oxalis acetosella* (common wood-sorrel).

Related types: The "Northern hardwood forest" may contain *Prunus serotina* (black cherry) as a component, but it does not generally exceed 40% relative cover. This type is most characteristic of the Unglaciated Allegheny Plateau.

Range: Glaciated NE, Glaciated NW, Unglaciated Allegheny Plateau.

Site Class 1 (SC1): SC1 is characterized by moist, well-drained, fairly deep soils that usually occur in protected coves, along streams, or in bottomlands that remain moist throughout the year. On northern exposures, Site 1 may extend higher up a slope than on southern exposures because of more favorable soil moisture conditions. In addition to the usual beech-birch-maple-cherry of northern and Allegheny hardwoods, white pine, hemlock, ash and basswood are generally present. In the oak types where red oak and white oak along with hemlock form the major portion of the stand, the presence of tuliptree (yellow poplar) and ash indicates Site 1. Dominant and co-dominant trees have a projected merchantable main stem of > 50 feet at maturity (> three 16-foot logs). Total tree heights average > 80 feet at maturity.

The results of the stand analysis were compiled on a tract by tract basis and classed as an *Area of Special Consideration – Timber*. Although these areas, totaling approximately seventeen-thousand-two-hundred-ten (17,210) acres, are not entirely off-limits, natural gas exploration and development activity will require careful coordination between the Department and the Lessee. All Lessees will pay double-stumpage (e.g., two times the market value) for all timber harvested as part of this activity.

ECOLOGICAL CONSIDERATIONS: The current PNDI/PNHP databases were queried to determine where ecological conflicts might occur in the future should a Lessee wish to explore for natural gas. More specifically, an ArcGIS-based analysis was performed for those areas contained in or immediately adjacent to the lease tracts. Given the developing comprehensive nature of these databases, the information assembled and delineated as having *ecological importance* are not intended to serve as restrictions but rather a notification that conflicts may exist within portions of a given lease tract. These conflicts may require that avoidance, monitoring, or specific mitigation measures be taken as a result of exploration and development activities. This proactive approach serves as a communication tool between Lessor and Lessee whereby the Lessee is made aware that, in advance of obtaining a lease, additional consideration will be given to

activities that disrupt habitats, plants, or wildlife prior to approving development activities.

The survey results were placed into eight (8) categories and displayed accordingly on the *Ecological Concerns* map. Generalized categories for the three (3) State Forest districts are as follows:

Important Species: species of interest known to exist in this area

Important Species – Slope: species of interest known to exist in this area; steep sided valleys and slopes present

Important Species – Plant Assemblage: species of interest known to exist in this area; plant of interest known to exist in this area

Plant Assemblage – Wetland: plant of interest known to exist in this area; delineated wetlands exist in this area

County Natural Area Inventory: an area of ecological significance

Country Natural Area Inventory – Important Species: an area of ecological significance; species of interest known to exist in this area

Hibernacula: an area known to contain bat hibernacula

Initial results produced the following potential concerns for the specific State Forest district:

Tiadaghton State Forest (FD #12)
Important Species
Important Species – Slope

Tioga State Forest (FD #16)
County Natural Area Inventory:
Important Species:
Important Species – Plant Assemblage:
Plant Assemblage – Wetland:
County Natural Area Inventory – Important Species:

Loyalsock State Forest (FD #20)
Hibernacula:
County Natural Area Inventory:

*** Examples of Important species include: bald eagles, timber rattlesnakes, wood rats, mud sunfish, or certain shrews.*
*** Examples of Plant Assemblages include: tall gamma (Bouteloua curtipendula), red milkweed (Asclepais rubra), elk sedge (Carex garberi), or wild oat (Chasmanthium latifolium)*

The inclusion of this pre-lease survey data is in no manner construed as a waiver of the PNDI requirement for permitting a natural gas well or constructing any ancillary facilities (i.e., pipelines, roads, etc.). The results of the survey (approximately 17,000 acres) have been compiled on a tract by tract basis and classed as an *Area of Special Consideration – Ecological*.

17. **Protected Animals and Plants**

Certain animal and plant species have been listed and given protected status by the U.S. Fish and Wildlife Service, the Pennsylvania Game Commission, the Pennsylvania Fish and Boat Commission and the Pennsylvania Department of Conservation and Natural Resources. The likelihood that purposeful damage to or destruction of these features is highly unlikely however the possibility of inadvertent impacts could occur during construction and development of well sites, roads and pipelines.

The Pennsylvania Natural Diversity Inventory (PNDI) information system contains information on known locations of listed species as well as significant natural communities and other ecological features. PNDI is a public/private partnership between DCNR, the Western Pennsylvania Conservancy, PA-Fish and Boat Commission and PA-Game Commission. All activities associated with oil and gas development undergo a PNDI review prior to a well permit being issued.

All potential lessees have been notified through the tract analysis maps (see Item 16 above), as well as specific language in the lease agreement, of known areas of special consideration for plants, animals, and habitats exist in localized areas. The lessee will perform a PNDI screening using the PNDI ER Tool. The entire earth disturbance area will be included in the screening, which will include the pad site and any associated pipelines and/or access roads. If potential impacts exist as a result of the screening, the lessee will coordinate with the agency/agencies listed on the PNDI Receipt. A requested survey should be performed during the appropriate time of year whenever possible. The project will require PNDI clearance before any earth disturbance activity commences. Projects that will have an adverse effect on any of the important species or critical habitats should be avoided.

18. Habitat Diversity and Interspersion

Habitats are classified as either terrestrial, wetland, aquatic or riparian. The Bureau's management strategies, in most cases, are designed to optimize diversity within and between these habitats, primarily by promoting various habitat components. Habitat is species dependent. Any management activity, including no activity, will affect some species positively, some will not be affected, and still others will be negatively impacted.

Aside from critical plant and animal species, which are covered in *Item 17*, the maintenance and/or restoration of eco-regional biological diversity is a key consideration in resource management efforts on State Forest lands.

Wildlife and plant habitat will be protected and managed through the implementation of the multi-level management approach. Environmental safeguards have been established through a tiered approach to ensure the protection of critical habitats and species. First-level environmental safeguards involved the establishment of "non-development" areas, such as State Parks and State Forest wild and natural areas, where no surface activity is permitted. Non-development portions of a lease tract state that no surface activity or development will be permitted. More specifically, no well sites, pipelines, roads or related disturbances will be permitted in these areas.

Additional habitat protections have been outlined above. Please refer to *Environmental Safeguards* and *Existing/Potential Land Use (Item 16)* for specifics.

19. **Biological Productivity**

Vegetation will be cleared due to construction of well sites, roads, and pipelines. Specific clearing areas cannot be delineated at this time; however, approximately two (2) to five (5) acres may require clearing for a well site Additional clearing areas will be associated with the development of necessary access roads and/or pipelines. No clearing will take place in non-development areas.

Most of the considerations, impacts, and mitigation efforts covered in *Protected Animals and Plants (Item 17) and Habitat Diversity and Interspersion (Item 18)* apply specifically to biological productivity. Although the clearings will result in a temporary loss of forest cover, well site and pipelines will be re-vegetated to benefit targeted wildlife species and decrease the impact of invasive species invasion.

20. **Vegetation**

The Bureau of Forestry is very active in the effort to control and prevent the spread of invasive species on State Forest land. Invasive plant or animal species can be transported by natural methods (i.e., animal excretion), vehicles, by spraying or mowing, during construction or through erosion controls where planting non-native mixes, mulching, or using imported soil are applied. Therefore, an appropriate re-vegetation plan has been established for natural gas related disturbances.

The Lessee will pay double-stumpage for all timber harvested as part of natural gas exploration and development activity. All timber to be removed is marked and tallied by a management forester within the appropriate forest district. Additionally, the Lessee will be required to follow the *Invasive Plants and Revegetation Guidelines (Exhibit D)* of the lease agreement. Protocols call for implementation and adherence including, but not limited to, the following:

-- Lessee shall make provisions to monitor for invasive species within the area disturbed by the construction activity for a period of five (5) years following construction or until invasive plants are not observed on-site for two consecutive years, whichever is longer.

-- Post-construction invasive species surveys along access roads shall be limited to areas where gravel was placed or the existing road was widened for Lessee use. After a period of two growing seasons, any new invasive populations will be assumed to be the result of outside sources other than Lessee construction materials and equipment. Control and monitoring of invasive species found along access roads within two growing seasons post-construction will continue until populations are eradicated.

-- The results of all Lessee annual invasive surveys shall be summarized into a report that shall include the following elements: methods, a summary of invasive species detected, abundance of each species, number of new populations per species, number of eradicated populations by species, and management recommendations for management and control. Report and raw electronic observation data shall be submitted to District Forester. Submission of any electronic data should occur simultaneously with the report submission. Data recording and management should be consistent year to year so data can be easily compared by grid cell number. The department reserves the right to audit the findings of the Lessee's reports and as a result of any audit, Department may require alternate methods of management and control.

-- Management and control of established invasive plant populations shall be planned on a species by species basis to determine the best method of control. Lessee and/or its consultant shall submit a "Management and Control Plan" to District Forester no less than three (3) months after the conclusion of all construction activity.

Revegetation of disturbed areas will be completed using DCNR-accepted standards and in a manner that promotes the management goals of the Bureau of Forestry as well as the applicable forest district. The lessee shall utilize a native grass and herb mix for cover and stabilization wherever possible within the disturbed work areas. The required seed mix will provide for immediate stabilization and reduce the chance of invasive species establishment. The grass and herb mix shall be applied at fifteen pounds (15 lbs) per acre.

Additionally, seeds necessary to establish a cover crop will be mixed in with the native grass and herb mix. The cover crop will either be oats or barley (spring months) or wheat or grain rye (fall months). This can be applied at the same time with the mix below and can be done with the hydro-seeder. The cover crop should be applied at thirty pounds (30 lbs) per acre.

The detail components of the native grass and herb mix as well as shrub planting are listed below:

Native Grass and Herb Mix

20% Little Bluestem PA ecotype (Andropogon scorparius)
10% Big Bluestem variety "Niagara" (Andropogon gerardii) (genetic origin is NY)
15% Virginia Wild Rye PA ecotype (Elymus virginicus)
l0% Indiangrass PA ecotype (Sorghastrum nutans)

l0% Deertongue variety "Tioga" (Panicum clandestinum)
5% Swithchgrass variety "Shelter" (Panicum virgatum) (genetic origin is WV)
5% Partridge Pea PA ecotype (Chamaecrista fasciculate)
3% Showy Tick Trefoil PA ecotype (Desmodium canadense)
5% Ox-eye sunflower PA ecotype (Heliopsis helianthoides)
2% Autumn bentgrass PA ecotype (Agrostis perennans)
2% Woolgrass PA ecotype (Scirpus cyperinus)
3% Soft Rush PA ecotype (Juncus effuses)
5% Pennsylvania smartweed PA ecotype (Polygonum pensylvanicum)
5% Common Milkweed PA ecotype (Asclepias syriaca)

All re-vegetation plans or other specific vegetative treatments shall be performed to the satisfaction of the District Forester. Local requirements may dictate that alternative treatments or strategies be developed to meet local management goals.

21. **Non-Native Species**

The Bureau of Forestry is very active in the effort to control and prevent the spread of invasive species on our lands. Invasive plant or animal species can be moved by vehicles, by spraying or mowing, during construction and through erosion controls where planting non-native mixes, mulching, or using imported soil are applied.

Non-Native Species specifics are addressed in greater detail in *Vegetation* (*Item 20*) above. Additional criteria for non-native species are also addressed in *Invasive Plants and Revegetation Guidelines* (*Exhibit D*) of the lease agreement.

22. **Other**

Economic Considerations

It is not possible for DCNR to predict at this time how many leases will be successfully obtained nor how many wells will be drilled as a result of the new leases. The Commonwealth receives money from three (3) unique revenue streams when leasing subsurface oil and gas rights. These distinct payments are:

Bonus Bid: The first year's rentals, which are set at a minimum bid of one-thousand dollars ($1000) per acre, are used in determining the winning bidder. The highest dollar-per-acre-bid obtains a given lease. Any combination of higher/lower bids and acreages will affect this estimate accordingly.

Annual Rentals: After the first year, leased acreage requires a twenty-dollar, per-acre, per-year ($20/acre/year) rental, payable in advance of that year, for years two, three, and four of the lease. Years five (5) and beyond requires a thirty-five-dollar, per acre, per year ($35/acre/year) rental, payable in advance.

Royalties: Royalty is paid on the natural gas produced from each individual well. The royalty rate for the 2008 Oil and Gas Lease Sale offering has been established at sixteen-percent (16%) of the gross volume of natural gas produced and metered at the well head. Market rates per thousand cubic feet (Mcf) of natural gas prevail. A sharp increase in market rate may cause revenues to rise albeit temporarily regardless of the decline in production.

All revenues from oil and gas activities (except pipeline rights of way) are required to be deposited in the Oil and Gas Lease Fund. By law, these funds are earmarked for recreation, conservation, and flood control projects.

23. **Permits**

Natural gas exploration and development are subject to the substantial conditions of the DCNR oil and gas lease (*see Lease Appendix*). Additionally, all oil and natural gas exploration and development activities within Pennsylvania are subject to DEP permitting requirements.

Lessees are required to abide by all applicable Federal, State, and Local laws, rules and/or regulations. DCNR has no responsibility to aid an operator in obtaining the necessary permits. Furthermore, DCNR is not required to obtain any permits to allow these activities to occur.

COMMONWEALTH OF PENNSYLVANIA
Department of Conservation and Natural Resources
June 27, 2008
717-783-0387

SUBJECT: Environmental Review **SFER – 000802**
August 2008 Oil and Gas Lease Sale

TO: Daniel A. Devlin
State Forester

FROM: Craig A. Chapman CAC
Forest Resource Planner

This review was placed in circulation for critical analysis on June 26, 2008. No negative comments were received.

Please approve or disapprove this project based on the information in the attached packet. Any amendments to the packet will require another critical analysis and resubmission of this form for your review and signature.

If you decide to disapprove this project please list the conditions that need to be met for the project to meet your approval, or why the project cannot be approved at this time.

Daniel A. Devlin 6/27/2008
APPROVED **DATE**

_____
DISAPPROVED **DATE**

Comments on Disapproval:

☐ The project will be reconsidered after the following items are addressed:

☐ The project cannot be approved at this time because:

_____

_____

_____

_____

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
BUREAU OF FORESTRY

MAY 2010 OIL & GAS LEASE OFFERING STATE FOREST ENVIRONMENTAL REVIEW

Prepared by:

Bureau of Forestry
Department of Conservation
and Natural Resources
May 10, 2010

MAY 2010 OIL & GAS LEASE OFFERING
STATE FOREST ENVIRONMENTAL REVIEW

PURPOSE

The purpose of this report is to describe the May 2010 Oil and Gas Lease Offering that will be finalized on Monday May 10, 2010. The project review criteria include a description of the project, the proposed lease area, project assessment related to a number of ecological, operational and stakeholder considerations as well as any actions necessary to ensure that the lease sale upholds the principles associated with sustainable ecosystem management.

The Bureau of Forestry typically conducts an environmental review for any project on State Forest lands that may or will disrupt or otherwise modify the existing land use. Planning for the May 2010 Oil and Gas Lease Offering began approximately five (5) months ago at the direction of the Governor's Office as part of the FY 2010-11 Commonwealth budget process. Based on the preliminary results of this review and subsequent discussions within the agency, the Department determined it was not adequately prepared to meet the terms of the budget legislation, and corresponding fiscal projections (e.g., FY 2010-11), enacted in mid-October for FY 2009-10 (July 1, 2009 through June 30, 2010). The final compilation of lease tracts incorporates portions of the preliminary assessment as well as acreage identified by Anadarko E&P Company LP as being "acreage of interest". More importantly, more-detailed analyses, including surface use restrictions, led to the final Environmental Review and current lease proposal, which seeks to minimize environmental and social impacts while returning the mandated $180 million needed for the Commonwealth budget. This lease offering is a direct result of FY 2010-11 budget projections as outlined in the budget agreement and fiscal code for FY 2009-10.

For most projects, the appropriate district forester or district staff completes the environmental review. As a result of size and scope of this project, the Bureau of Forestry utilized a planning process for the May 2010 Oil and Gas Lease Offering, which was identical to that used in both the FY 2009-10 and the September 2008 lease sales, and consolidated the results into a single document. The environmental review and all associated information will be made available to the public via the Internet.

BACKGROUND

Exploration and development of natural gas resources has been ongoing for more than 60 years on State Forest land as part of the array of resources, uses, and values of the State Forest. Since 1947, DCNR has held 74 lease sales offering the oil and gas industry the opportunity to access State Forest lands in a controlled manner while providing the mechanism for the recovery of hydrocarbon resources. As a result of this comprehensive history, approximately 1,400 wells have been drilled on *fee simple* State Forest lands. Currently, there are approximately 750 producing wells.

DCNR lease sales consistently have been predicated by oil and gas industry nominations. Industry expresses an interest in natural gas exploration on State Forest land by submitting written nominations specifying certain tracts of land for consideration in an

upcoming lease sale. The Bureau of Forestry reviews and acknowledges these confidential nominations while periodically offering nominated tracts of State Forest land for lease by competitive bid. DCNR last held an oil and gas lease sale in January 2010. In the case of the May 2010 Lease Offering, Anadarko E&P Company LP expressed its interest in explicit acreage directly to the Bureau of Forestry.

Industry interest in leasing State Forest land has significantly increased since the initial Marcellus Shale-focused lease sale in 2008. Currently, 5 million acres of State Forest land has been nominated (i.e., tracts have been nominated more than once by separate companies). State Forest land is attractive to outside parties due to the subsurface geology as well as the size and contiguous nature of our State Forests. Large blocks of land with a single land owner are heavily sought after due to the ease associated in dealing with one entity rather than many as is the case throughout most of the state.

Arguably, the biggest development in domestic natural gas plays in recent years has been the Appalachian-based Middle-Devonian aged Marcellus Shale. Over the last eighteen (18) months, numerous companies have experienced success drilling moderately deep Marcellus Shale wells throughout portions of Pennsylvania. A large majority of the exploration and development activity in the Marcellus Shale has occurred in two distinct regions within the Commonwealth - the southwestern and northeastern corners.

The Marcellus Shale is the basal member of the Hamilton Group and is characterized as thick, organic-rich black shale ranging in depth from approximately 5,500 – 8,600 feet below the surface throughout a majority of Pennsylvania. Regionally uniform, the Marcellus stretches from New York to West Virginia and into portions of Kentucky. The organic composition (total organic carbon as high as ten percent [10%]) of this shale has long been thought to be the source of natural gas found within numerous sandstone reservoirs throughout Appalachia.

The known geologic parameters of the Marcellus lend itself to supplying large quantities of natural gas in north-central Pennsylvania. Much of the Marcellus fairway happens to be coincident to State Forest land. Additionally, State Forest lands in north-central Pennsylvania are also prospective for the potential Geneseo/Burket, Tuscarora, Bald Eagle, Utica and Trenton-Black River reservoirs many geoscientists believe exist in this region. Nominations for potential leasing indicate that there is a high level of interest by the oil and gas industry to pursue exploration for the Marcellus Shale, as well as deeper potential reservoirs, beneath State Forest land.

Although this environmental review is based on the Bureau's deliberations on the scope, potential impacts and benefits of these deep gas plays, the legislated directives expressed in this year's budget frame the importance of this comprehensive review. Based on these deliberations, the Department decided to pursue this opportunity under a portion of the State Forests where our management protocols will support natural gas exploration and development as well as satisfy our legal mandates to offer State Forest land for this purpose.

DCNR plans to offer natural gas leases to Anadarko E&P Company LP through a series of negotiations. The Department will negotiate a fixed price-per-acre with Anadarko E&P Company LP for the leasing of eleven (11) tracts of State Forest land, comprising thirty-two-thousand-eight-hundred-ninety-six (32,896) acres in Centre,

Clearfield, Clinton, and Lycoming Counties (*Appendix A-Tract Map*). The lands contained in the lease sale offering are being proposed for the controlled leasing of subsurface oil and gas rights only.

PROJECT OVERVIEW

Approximately 33,000 acres of State Forest lands are included in the May 2010 Oil and Gas Lease Offering. Although the subsurface natural gas rights provide for the exploration and development of the entire area, only a small portion of the total acreage would be used for well site locations, pipeline development or access roads. Drilling moderately deep to deep natural gas wells is expensive due to the depths of these formations as well as the technologies required to prudently develop the natural gas resources.

Appalachia's oil and gas industry is currently undergoing tremendous growth (a boom). The current boom is best characterized by the need for a lease position quickly followed by a sharp increase in drilling permits. Based on the current market demands, the Bureau of Forestry has estimated that (100%) of State Forest land offered will be successfully leased by Anadarko E&P Company LP as a result of the May 2010 Oil and Gas Lease Offering. Anadarko E&P Company LP will ante up the first year's rentals through a bonus bid where dollar-per-acre rate for an individual tract of State Forest land has been successfully negotiated and represents the current market value for a this region as determined by the FY 2009-10 Oil and Gas Lease Sale. The following years' rental payments are fixed per the lease agreement.

It is extremely difficult to predict the number of well sites that will be developed as a result of the May 2010 Oil and Gas Lease Offering. Estimates have ranged from zero (0) to approximately eighty-two (82) due to multiple wells per well pad. However, at this time, DCNR is projecting between two-hundred (200) and three-hundred (300) wells – between twenty-five (25) and fifty (50) well pad sites - will be developed on State Forest land as a result of this lease offering. This estimate is based on:

- The expected nature of the Marcellus reservoirs with "sweet spots" being developed over time;
- An estimated six (6) to ten (10) wells per well pad;
- The estimated drainage area per horizontal well bore (~80-100 acres);
- Drilling costs associated with the depth of the gas likely to be found in the Marcellus Shale or deeper reservoirs; and
- Amount of land excluded from surface activity including non-development areas (approximately 29,000 acres w/ overlapping features), viewsheds and other environmental considerations.

Based on the Departments' best estimate of twenty-five (25) to fifty (50) well pad sites, each well pad's "footprint" will be about five (5) acres. During drilling, a rig will be onsite for about twenty (20) to thirty (30) days per well, after which time a successful well will be fitted with a wellhead and hooked up to a pipeline. Marcellus operators have determined that multiple gas wells collocated on a single well pad site are required to achieve economic gas recovery from the Marcellus Shale. An individual well may produce gas for several decades or more.

ENVIRONMENTAL SAFEGUARDS

DCNR has adopted a multi-level approach for managing potential impacts to the environment when leasing State Forest lands for oil and natural gas exploration and development.

First-level environmental safeguards involved the establishment of "non-development" areas, such as State Parks and State Forest wild and natural areas, where no surface activity is permitted. Non-development portions of a lease tract state that no surface activity or development will be permitted. More specifically, no well sites, pipelines, roads or related disturbances will be permitted in these areas. Detailed buffer zones have been devised to protect areas of ecological, recreational and aesthetic importance, such as water bodies, roads, trails and buildings. Non-development areas total approximately twenty-nine-thousand (29,000) acres. Please note that this acreage total is cumulative and is not differentiated within overlapping non-development zones (*Appendix B – Restriction Maps*).

Site-specific second-level safeguards include, but are not limited to, requiring Pennsylvania Natural Diversity Inventory (PNDI) coordination for disturbances associated with well locations, well spacing and construction specifications for roads and pipelines. These specifications are contained in the *Oil and Gas Lease for State Forest and Park Lands* and are administered on the ground by the Bureau of Forestry's district foresters. Specific environmental and ecological protections and safeguards can be found in the lease agreement.

Third-level environmental safeguards require compliance with all applicable Department of Environmental Protection (DEP) regulations. These laws and regulations are solely administered by DEP and are distinct and separate from DCNR requirements.

PROJECT AREA DESCRIPTION

DCNR is proposing to offer natural gas leases on eleven (11) oil and gas lease tracts, comprising thirty-two-thousand-eight-hundred-ninety-six (32,896) acres of State Forest land in Centre, Clearfield, Clinton, and Lycoming Counties. The proposal includes the subsurface oil* and natural gas rights beneath State Forest land in the Moshannon, Sproul and Tiadaghton State Forests.

** - It is highly unlikely that oil will be encountered during routine exploration for natural gas in this region; including the oil rights is standard business practice as the substances are often found together when both are present.*

PROJECT REVIEW ITEMS:

1. Consistency with State Forest Resource Management Plan

The overarching goal for the management of State Forest lands is: To manage state forests sustainably under sound ecosystem management, to retain their wild character and maintain biological diversity while providing pure water, emphasizing opportunities for dispersed recreation, habitats for forest plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources.

Our current policy statement contained in the State Forest Resource Management Plan (2008) states: Geology is a critical component of State Forest management. The mineral resources associated with State Forest lands will be managed for the long-term good of the citizens of the Commonwealth of Pennsylvania. All exploration, development, and utilization will incorporate environmentally and financially sound methods.

Following the FY 2009-10 Lease Sale, DCNR and the Bureau of Forestry decided not to offer additional lands for lease but rather study the Marcellus play and the operational developments and requirements on the 700,000 acres (approximate) within the Marcellus fairway already subject to valid lease agreements. However, due to projected shortfalls in the Commonwealth budget, the Bureau of Forestry has been mandated to generate $180 million for the Commonwealth. This lease offering is a direct result of the budget agreement and fiscal code for FY 2009-10. While counter to DCNR's planning following the FY 2009-10 Lease Sale, based on the comprehensive Environmental Review and resulting compilation of lease tracts, which incorporates many surface use restrictions designed to minimize environmental and social impacts, the impending sale meets the Bureau's management guidelines and protocols.

In summary, while the decision to conduct this lease sale was based on the legislated requirements to generate bonus bid revenues of $180 million for inclusion in the FY 2010-11 General Fund, this Oil and Gas Lease Sale conforms to the Bureau's stated policy and goals.

2. Erosion and Sedimentation

Potential surface disturbances associated with oil and gas well activities include well site clearing, well pad construction, access road construction, multi-phase construction of pipeline gathering/marketing systems, site restoration and activities associated with geophysical or "seismic" surveys.

Runoff and erosion with subsequent sedimentation are potential impacts to adjacent and surrounding forests, wetlands and streams. Potential for erosion and sedimentation depends on many factors such as terrain, soil type, rain events and length of time of bare soil exposure. Erosion and sedimentation controls are addressed in *Exhibit "C"* (*Stipulations for Protection and Conservation of State Forest and Park Lands*) of the

Oil and Gas Lease. More specifically, Section 7 (Siltation) of *Exhibit "C"* designates that a Lessee must have an approved site-specific Erosion and Sedimentation Control Plan that meets the criteria set by DEP's Title 25, Chapter 102 regulations. This plan is required to be available on-location during all exploration and development activities.

Intermittent soil erosion and sedimentation may be expected to occur with surface clearing activities. However, these impacts will be minimized through certain lease provisions as well as adherence to federal and state laws and regulations including Federal Clean Water Act, National Pollutant Discharge Elimination System permit requirements, PA Clean Streams Law, and various DEP regulations.

All earth disturbances of one (1) acre to less than five (5) acres in extent that have a point source discharge to surface waters (channel of conveyance) are required to have a National Pollution Discharge Elimination System (NPDES) permit (25 Pa. Code § 92). The only exceptions to this requirement are earth disturbances that are part of agricultural plowing or tilling, road maintenance and timber harvesting activities. An individual permit (25 Pa. Code § 92.83.9) is required if the activities are in a High-Quality/Exception Value watershed (Chapter 93). These permits necessitate special protection requirements as outlined in Chapter 102, Section 102.4(b)(6).

Oil and natural gas operators proposing earth disturbance activities that are five (5) or more acres at one time over the life of the project, must complete DEP's Notice of Intent (NOI) authorization for the Erosion and Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing, or Treatment Operations or Transmission Facilities (ESCGP-1)

DEP regulates and enforces other laws and regulations (provisions) to which an operator is legally bound. These provisions include, but are not limited to, the Oil and Gas Act (Act 223), Oil and Gas Conservation Law (Act 359), Coal and Gas Resource Coordination Act (Act 214), Clean Streams Law (Chapter 91), Solid Waste Management Act (Act 97), and Non-Coal Surface Mining Conservation and Reclamation Act (Chapter 77).

3. Surface Water Quality

Degradation of water quality can result from possible sedimentary, thermal and chemical pollution of surface waters. The potential for sedimentation and the appropriate mitigating environmental controls were discussed above under Erosion and Sedimentation. Additional provisions are included in *Exhibit "C"* (*Section 8 - Waters*) of the lease agreement.

Thermal pollution, or increases in water temperature, can result if vegetation (shade) is removed from streamside or riparian zones. These concerns are addressed in *Section 23* (*Drilling Restrictions*) of the oil and gas lease agreement. Specifically, the lease states that no drilling or wellsite clearing is permitted within two-hundred (200) feet of a stream or body of water. Furthermore, no drilling or wellsite clearing is permitted

within three-hundred (300) feet of any exceptional value (EV) stream or body of water. These standoffs exceed the criteria established in the Bureau's Aquatic Buffer Guidelines (Effective January 1, 2007).

Although unlikely, the potential exists for chemical pollution from recovery of drilling fluids (including brine), or from a spill of fluids used in the construction of wells such as gasoline, diesel fuel and various oils and lubricants. Additionally, accidental or unintentional spills of hydrocarbon fluids, although rare, are possible. The adverse impact associated with a pollution event depends on the amount of fluids spilled and released (concentration and time), the surficial geology, and soil type associated with the specific sites. Each permitted well will have a Preparedness, Prevention and Contingency Plan (PPCP) approved by DEP to address these concerns. All applicable laws, regulations and appropriate mitigation strategies apply.

Marcellus wells throughout Pennsylvania have (to date) not been found to produce reservoir-brine. The formation is considered "dry". Fluids encountered during well drilling and completion activities must be handled, treated, and disposed of according to DEP regulations (i.e. DEP-Chapter 78, Chapter 95, Chapter 16; Act 223-Sections 204 through 210, 215; EPA UIC 40 CFR Parts 144, 146, & 147).

The necessary consumption of large amounts of fresh water in the "fracing" process generates large amounts of contaminated flow-back waters from the wells, which may contain a number of constituents, both dissolved and solid, generated by contact with the shale formation and as initial additives to the frac fluid, that need to be disposed of in a proper manner to ensure the environmental integrity of the surface waters on state forest lands. All handling, recycling, and disposal of frac waters are highly regulated by DEP, Bureau of Waster Water Management, DEP, and Bureau of Oil & Gas Management and by the Susquehanna River Basin Commission, as the agencies with primacy in regard to this issue. The Commonwealth Lease Agreement requires compliance with all applicable laws governing waste frac water reuse and disposal as listed above.

The flow-back waters are typically contained within metal tanks as they evolve from the well bore at the well site. As the tanks are filled they are transported to facilities that may process the fluid by filtration and recycling of the water, filtration and disposal of the water in regulated waste water treatment plants and reuse of the waters in new well completion activity. At this time the Department does not support the construction and maintenance of large open pit waste holding ponds on its lands and requires that all fluid be tanked. The technology is rapidly evolving to recycle and reuse the water and dispose of any solids in proper landfill settings, which the department is carefully and continuously monitoring. The Department stands ready to adapt its lease provisions and operational restrictions to new technology as it is proven by the industry.

4. Air Quality

Exploration, development, and production activities associated with drilling, completing, and producing natural gas wells have the potential to temporarily contribute

internal combustion engine exhaust, dust, smoke, and other gaseous pollution to the atmosphere. The use of machinery and/or heavy equipment will produce emissions such as carbon monoxide, nitrogen oxide, and sulfur dioxide. Equipment operated or transported along dirt/gravel road or pad sites may result in temporary increases in dust or particulate matter. These emissions are covered by the Air Pollution Control Act (P.L. 2119, 35 P.S. 4001, et seq.) as well as *Exhibit "C"* (*Section 1-Environmental Quality Control*) of the lease agreement.

Compression facilities will be required within the leased premises. Today's compressors typically utilize electricity, natural gas, or a combination thereof (e.g., gas-powered generators) as operating fuel. Compressors are generally housed within a shed-like structure equipped with proper sound-proofing and ventilation devices. Limited emissions produced from compression facilities are not expected to have an adverse effect on air quality due to the clean-burning fuel used for power as well as the open, non-populated landscapes where these facilities will be located.

The potential emissions resulting from all phases of natural gas exploration, development, and production will be well within the acceptable environmental standards. Excessive dust resulting from use of dirt and gravel roads will be handled using normal Forest District procedures. The use of water and/or other similar suppression mechanisms/treatments on a periodic basis greatly reduces dust levels.

5. Water Quantity

The Bureau was established, in part, to protect those watersheds integral to the growth and viability of the Commonwealth. Municipalities and other forest users rely on the State Forests not only for a source of water but also to provide the necessary protections for other downstream users. A decline in water quantity can be detrimental to aquatic communities, local fisheries and potable water sources.

Pennsylvania's surface waters are monitored and regulated by DEP's Bureau of Watershed Management (BWM). Act 220 was created in 2002 to provide for the identification of a "significant hydrologic unit where existing or future demands exceed or threaten to exceed the safe yield of available water resources" also known as Critical Water Planning Areas (CWPAs). The demand on water resources were assessed on several criteria which include the following: Size of Hydrologic Unit; Time Horizon; Existing and Future Demands including Population Projections; Withdrawal and Non-Withdrawal Uses; and Safe Yield of Available Resources including developing Watershed Water Budgets, Water Quality, Aquatic Resource Uses and Other Critical Uses.

Act 220 created a statewide water withdrawal and use registration and reporting system. More specifically, Act 220 requires any person, organization, or entity that withdraws or uses 10,000 or more gallons of water per day, over a 30-day period, from one or more points of withdrawal in a watershed operated as a system, to register and then periodically report their water withdrawal and usage to DEP. Annual reporting, of

withdrawals and use, is also required (DEP, Sept. 2007). Additional reporting and/or filing is required by the Susquehanna River Basin Commission (SRBC) and the Delaware River Basin Commission (DRBC).

The SRBC has exercised its authority to review, approve, control, and monitor any consumptive use within the river basin specifically relating to surface water withdrawals, as well as groundwater withdrawals, for oil and gas completion operations. Working in conjunction with DEP, an operator must have a SRBC-approved water source(s) for use during completion operations prior to an oil and gas permit being issued. The water permitting process is explicit and complex. More specifically, the SRBC requires that certain biological and hydrologic assessments and surveys are completed and included within the permit application. Based on the hydrologic characteristics of a given (surface) watercourse, the SRBC may typically allow a fraction (e.g., 10%) of the seven (7) day, ten (10) year average-discharge (e.g., stream flow) (Q7-10) for a surface withdrawal from a stream. Similar protocols, such as a seventy-two (72) hour aquifer test, are required for permitting groundwater withdrawals.

Unlike Appalachia's conventional oil and natural gas reservoirs, the Marcellus Shale requires the use of massive induced hydraulic fractures (fracs) for the strata to produce economic quantities of natural gas. In addition to proppant (typically sand used to keep the fractures open), Marcellus fracs contain massive amounts of water and gel. This is known as a "slick-water frac". The water when mixed with the non-toxic gel forms a gelatin-like substance that is forced down the well bore and into the underlying rock at very high pressures. This process does not pose any threat to the surface attributes as fracing is completely underground.

Frac techniques are currently being honed and tweaked to determine what method(s) produce the best results for the least amount of capital investment. To date, the preferred frac technique(s) uses approximately three- to five-million (3-5,000,000) gallons of water to perform. Water use is dependent on the number of frac stages as well as the size of a given stage. These variables are determined on a well by well basis once formation heterogeneities and rock mechanics are properly delineated and accounted for. The most commonly utilized source(s) of water are typically surface streams and/or commercial suppliers with on-site storage via frac tanks or centralized impoundments. Regulation and compliance are subject to the provisions of Act 220 as well as Act 223 (Chapter 4, pg 73a-81).

The SRBC, as part of the water withdrawal permitting process, that the applicant submit a signed "surface access agreement" (between applicant and surface owner) clearly stating that the applicant has the express permission of the landowner to utilize said surface lands as a "take-point" for obtaining water from a surface stream. This provision is required regardless of ownership (i.e., public or private). Therefore, although DCNR has no regulatory authority to approve or deny a water withdrawal application, the opportunity exists to approve all proposed take-points prior to a withdrawal permit being issued. Therefore, by default, surface landowners have been given "defacto" regulatory authority.

Future water withdraws will be coordinated with the appropriate agencies (i.e., DEP, SRBC, PAFBC) to ensure that the watershed and associated wetlands will not be negatively impacted.

6. Groundwater

The Bureau maintains strict protocols that govern the protection and sustainable use of the groundwater resources beneath State Forest lands. *Exhibit "C"* (*Section 17-Water Wells*) of the lease agreement provides the Lessee with the option to drill and develop water wells, subject to the written approval of the Bureau, for use in natural gas exploration and development on that lease tract. Water well development for this purpose is subject to Act 610 (P.L. 1840) which provides for the orderly development of ground water resources.

Wells developed under the above lease provision are not intended to provide the massive volume(s) of water required for a Marcellus Shale frac. Although the original intention of this provision was to provide a Lessee with access to water for use in traditional frac process associated with shallow Upper Devonian natural gas development, a properly sited groundwater well, exuding a consistent and sustainable yield, may be able to supplement water withdrawals from surface waters and/or commercial sources. These water wells may also be drilled and developed for dust suppression or other uses such as potable water source for drilling crews.

Chapter 4 of Act 223 (pg 73-81) specifies DEP's casing requirements for the protection of groundwater resources. All drilling, casing, cementing, and well completion practices (including fracs) are to be carried out in such a manner that protects fresh ground water. A lessee's well casing program must be designed in accordance with 25 PA Code § 78.81 – 78.86 and 25 PA Code § 78.62 and § 78.63 while accounting for a) Burst Strength, b) Tension, and c) Collapse. All top-hole water must be kept free of pollution or contamination by additives, brine, oil, and anthropogenic-induced conditions.

Future water withdraws will be coordinated with the appropriate agencies (i.e., DEP, SRBC, Army Corps) to ensure that groundwater/aquifers and associated wetlands will not be negatively impacted.

7. Soils

Surface disturbances associated with oil and gas well activities include well site clearing, well pad construction, centralized impoundment construction, access road construction, pipeline construction and site restoration activities associated with geophysical surveys. Potential problems associated with these activities include soil compaction or chemical pollution associated with spills or mishandling of industrial fluids.

Compaction, resulting from repeated use by heavy equipment, affects soil moisture regimes and drainage thereby affecting vegetative productivity. Equipment is present during the construction phase of gas well development and is typically removed following the successful completion of a natural gas well. The lease requires preparation of an Erosion and Sedimentation Control Plan as outline in Item 2 above however the following procedures are highly recommended:

Soil Compaction Mitigation – Test topsoil and subsoil for compaction at regular intervals in areas disturbed by construction activities; Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate pre-construction conditions; Use penetrometers or other appropriate devices to conduct compaction tests.

Topsoil Segregation – Prevent the mixing of topsoil with subsoil by stripping topsoil from the full work area and subsoil storage area; Maintain separation of salvaged topsoil and subsoil throughout all construction activities; In areas where topsoil has been segregated, plow the subsurface before replacing the segregated topsoil; Perform appropriate soil compaction mitigation.

Pollution from fluid spills could impact soil productivity and depending on extent, could reach groundwater resources. The potential for chemical spills, subsequent mitigation, and groundwater protection are discussed above in Items # 3 and #6 respectively.

8. Unique and Unusual Geologic Features

DCNR's Bureau of Topographic and Geologic Survey published a two-volume book titled "Outstanding Scenic Geologic Features of Pennsylvania" (1979). This comprehensive work documents outstanding geologic and topographic features throughout the Commonwealth. These sites have been incorporated into the Pennsylvania Natural Heritage Program (PNHP) and Pennsylvania Natural Diversity Inventory (PNDI) information systems. All activities associated with oil and gas development undergo a PNDI review prior to the commencement of earth moving activities. Surface use of these areas for gas activities will be avoided.

9. **Aesthetics**

The aesthetic qualities of the State Forest system play a key role in attracting forest users. State Forests provide a large serene wooded landscape for public use and enjoyment.

Non-development areas have been delineated to preserve certain aesthetic features of the State Forest system. Surface disturbance is prohibited in any area that has been designated as non-development. For example, all State Forest wild and natural areas are non-development.

Development and construction of well sites, roads and other related infrastructure may negatively impact the visual aspect of some portions of the State Forest. Viewscapes (or viewsheds) are the scenic portions of the landscape that can be seen primarily from a transportation corridor (i.e., road or trail). Any visual impact will depend on proximity of gas wells to viewshed features such as vistas, public use roads, trails, State Parks, or other high-use areas.

Impact on publicly viewed areas has been considered prior to implementing forest management activities associated with natural gas exploration. Viewsheds have been specifically investigated throughout the lease sale analysis process. Any future well site will minimize, to the extent possible, any adverse affect on the visual experience of the State Forest user as well as the aesthetic values of the viewshed. Important viewsheds (i.e., Historic Route 6 viewshed) have been identified and zoned as areas of special consideration where surface disturbance is extremely limited and reviewed on a case-by-case basis.

The landscapes where most activity may occur have been actively managed in the past. These areas typically contain roads, trails, pipelines, and log landings as well as a variety of forest conditions. The regional landscapes contain forest stands of varying species composition and ages, reflecting the Bureau of Forestry's past forest management activities.

DCNR has several control measures contained within the lease agreements to minimize visual impacts. Well site spacing is limited to the derivative-based formula (as outlined below in *Item 16*), whereas the total number of permissible well pads has been predetermined and clearly stated within the lease agreement. All applicable buffers, as designated in Oil and Gas Lease Agreement as well as the Aesthetic Buffer and Aquatic Habitat guidelines (roads, trails, and streams) shall be adhered to unless the a written waiver is applied for and subsequently granted by the District Forester (certain buffer variances require a SFER).

The District Forester will maintain a record of all such requests and specifically notate whether or not said waiver was granted (or denied) and the reason for doing so. Existing openings, roads and rights-of-way will be utilized wherever possible. Any impacts on visual resources from seismic activity should be slight and temporary.

10. **Noise and Light Levels**

Noise levels will temporarily increase as a result of activities associated with the exploration and development of Marcellus Shale (or deeper) gas on State Forest lands. Potential impacts include temporary increases in noise levels as a result of seismic exploration, construction of well sites, compressors, roads or pipelines, well drilling, and truck traffic.

Adverse impacts from an increase in noise levels depend on distance from noise source, weather, topography and vegetation. The primary increases in noise level will result from well drilling, compression facilities, truck traffic, and road and pipeline

construction. Seismic and maintenance activity may also result in localized, very short term increases in the ambient noise level within the State Forests.

Noise level will be a considered throughout the well location approval process by the appropriate program area(s) within the Bureau of Forestry. Wherever possible, well site locations will be located in a manner to alleviate temporary increases in background noise levels in high use areas such State Park campsites or State Forest Picnic Areas.

The use of lighting may temporarily impact the night sky as a result of drilling activities. Natural gas drilling is a twenty-four (24) hour per day activity that requires proper illumination for the health and safety of the drilling crews. This impact should occur in a limited fashion and last no longer than the time required to properly drill and complete a natural gas well (i.e., two or three weeks).

In those areas where current pipeline infrastructure may be lacking, well flaring, immediately following completion activities, will be required. Well flaring is the method by which an operator burns natural gas during frac flowback whereby frac water is flowed back to the surface (via the wellbore) in an attempt remove as much water as possible from target formation as quickly as possible. During a flare, a vertical stack is placed away from the wellhead and any produced gas is burned. The stack and corresponding flame is very similar to a super-sized candle burning for a prolonged (i.e., up to two weeks) period of time.

11. **Archeological Sites and Historic Sites**

The Pennsylvania Historic and Museum Commission maintains information relevant to the Commonwealth's significant historic and archeological sites. Information on the known locations of these sites on State Forest lands has been shared with the Bureau of Forestry. The Bureau has initiated a system to identify these sites and notify the Commission of any action that may disrupt these resources.

All earth disturbance activities associated with oil and gas development undergo an archeological review prior to siting. Use of these sites for natural gas activities will be avoided as provided by law. Discovery of potential new sites or artifacts will be forwarded to the Historic and Museum Commission for their review and documentation.

12. **Recreation Sites and Opportunities**

Natural gas (Marcellus Shale or deeper) exploration and development activities could affect some recreational experiences on State Forest lands. Increased noise levels and potential visual impacts could affect the recreational experiences of State Forest visitors'. Any potential impact directly depends on the visitor's activity and location within the State Forest as well as their expectation of a particular experience.

Although it is not anticipated, some roads may be temporarily closed during drilling operations or other peak periods of heavy use to reduce potential safety hazards. Actions to limit road access will be made on a case-by-case basis at the discretion of the District Forester. Drilling periods on any given well are anticipated to last three to four

weeks under normal conditions. At the end of the drilling period, if roads are closed, they will be reopened.

Areas under lease will be open for traditional uses; however the immediate well site (4 to 5 acres) will be closed to the public during drilling operations. If a well is successful, only the immediate surrounding area will continue to be restricted to the public. Public access is restricted to the well location during the drilling and completion phase of operations. The well site is normally occupied twenty-four (24) hours a day, seven (7) days a week during well drilling. The lessee (operator) provides the necessary security during these operations at no cost to DCNR.

Historically, the natural gas drilling season on State Forest lands typically lasted from mid-March through November 1. This seasonal window allowed Lessees to explore for and develop natural gas reserves prior to the on-set of Pennsylvania's major hunting season(s) and inclement weather. There may be instances where, due to equipment limitations, timing to avoid ecological impacts, logistical snafus, or due to an acceptable operational plan that limits road impacts and preserves the hunting traditions, that a Lessee is permitted to operate beyond the November 1 date. These types of exceptions will be reviewed on a case-by-case basis. Furthermore, actions to limit hunter access to reduce potential safety hazards will be made where necessary.

DCNR has implemented several measures to minimize impacts on the recreating visitor. State Parks and State Forest Wild and Natural Areas are "non-development areas" and, therefore, are excluded from all surface activity. As mentioned above, a buffer system has been developed to protect parks, natural and wild areas, streams, roads, trails, and other recreational features.

Additional areas of special consideration have been delineated using a GIS-based analysis. The Recreational Opportunity Spectrum (ROS) delineates certain recreational experiences available to a forest user based on current, existing surface use. Two (2) such delineations exist with those areas designated by ROS as Semi-Primitive Non-Motorized. These areas have been zoned "non-development" (703 acres) or "area of special consideration" (2,704 acres) thereby protecting these unique recreational experiences. The major difference between these zoning classes within the same ROS designation is a result of the presence of existing haul roads or other anthropogenic features.

ROS Semi-Primitive Non-Motorized Class Definition

Semi-Primitive Non-Motorized areas are normally 500 acres in size or larger and located at least one-half (1/2) mile from all non-gated (open to the general public) roads, railroads, and trails with motorized use. Accessible only by foot or equine, there is no motorized use by the public although administrative use may be conducted by motor vehicle. Interaction between forest visitors is low resulting in the high probability of experiencing isolation, remoteness, independence, and closeness to nature. These areas are sought after by visitors seeking self-reliance and the possibility of challenge and risk. Openings in the forest canopy may be the result of either natural or anthropogenic

occurrences. Management goals for this ROS class include providing a non-motorized semi-primitive recreational experience as well as necessary forest management.

Other recreation-based areas of special consideration specifically pertain to those hiking trails previously identified as either State Forest Hiking Trails or National Scenic Trails. The following guidelines apply.

State Forest Hiking Trails (SFHTs)

DCNR-Forestry gave special recognition to a discreet number of hiking trails that were designated primarily for foot travel only. Currently, there are eighteen (18) trails totaling seven-hundred-ninety-one (791) miles carrying this designation. A large majority of the SFHT mileage is located on State Forest land; however these trails also traverse other public and private lands. SFHTs are subject to a 100-foot "non-development" buffer on both sides of the trail. Any proposed disturbance activity within a SFHT buffer zone requires written approval prior to commencement.

National Scenic Trails (NST)

The National Park Service designates the National Scenic Trail (NST) system. Currently, there are sixty (60) miles of NSTs on State Forest land. All sixty (60) miles are encompassed within three (3) trails: Appalachian, North Country, and Laurel Highlands. NSTs are subject to a two-hundred (200) foot aesthetic/non-development buffer zone on both sides of the trail.

13. Public Health and Safety

Public health and safety concerns center on fire hazard, pollution potential, and well blowouts. Safety requirements are contained in the DCNR Oil and Gas Lease; more specifically, Section 24 (*Drilling Operations*) and Section 18 (*Deep Well Control Insurance and Safety*).

Public access is restricted to the well location during the drilling and completion phase of operations. The well site is normally occupied twenty-four (24) hours a day, seven (7) days a week during well drilling. The lessee (operator) provides the necessary security during these operations at no cost to DCNR.

If and when economic natural gas production is established, public access will continue to be restricted to the immediate area around the well and its equipment until production ceases. Vandalism has been minimal throughout the history of the natural gas leasing program. Although isolated, lessees are encouraged to document, to the best of their ability with pictures and prose, any vandalism that occurs and provide said documentation to the District Forester.

State and Federal regulations require compliance with the U.S. Department of Labor's Occupational Health and Safety Administration (OSHA) (http://www.osha.gov/SLTC/etools/oilandgas/index.html). Specific OSHA standards for oil and natural gas drilling, servicing, and storage can be found here: http://www.osha.gov/SLTC/oilgaswelldrilling/standards.html. The Federal

Environmental Protection Agency (EPA), through the Underground Injection Control Program (Safe Drinking Water Act, 42 U.S.C.A. Section 300 F et seq.; 40 CFR Part 147), provides protection for the protection of public drinking water.

Further safeguards that ensure the protection of public health and safety involve specific rules and regulations of the PA-Department of Labor and Industry (37 Pa. Code, Chapter 11 and 13), PA-Department of Transportation (PA Vehicle Code Title 75, Chapter 49 and 189; 67 Pa. Code, Chapter 403), and the PA-Department of Environmental Protection (Solid Waste Management Act, Act 97, 35 P.S. §6018.101 et seq.; Oil and Gas Act, Act 223, 25 Pa. Code Chapter 78)

A DEP-issued oil and/or natural gas well permit is the primary authorization for exploration and development activities. The well permit addresses well location; notice to landowners, owners of water supplies, coal owners and gas storage operators; distance restrictions for existing building, streams, springs and wetlands, and public resources. As referenced above in *Item 3*, each operator must have a DEP-approved Preparedness, Prevention and Contingency (PPC) Plan for every permitted oil and/or natural gas well which addresses many health and safety issues.

14. Transportation & Pipelines

The State Forest system is home to an extensive road network. There are approximately 2,500 miles of State Forest public-use roads and many hundreds of miles of administrative, logging, and gas well access roads. There are two general concerns dealing with the roads and transportation: 1) a major increase in the number of roads, and 2) the capability of the existing State Forest roads to handle the increased heavy truck traffic. Other related concerns include: traffic congestion, impacts to the road, potential road closure, and State Forest visitors safety with such an increase in traffic.

Pennsylvania's State Forest road network is adequate in accessing most areas of the State Forest system. Short access roads may need to be developed in situations where well site locations are not reasonably adjacent to existing access roads. New access roads will be constructed in conjunction with existing roads and right-of-ways, using this infrastructure wherever possible. Access roads will be built using current design standards (see Oil and Gas Lease - *Exhibit "E": Oil and Gas Lease Access Road Specifications for State Forest Lands*). Deviations from these specifications will require the written approval of the District Forester.

Existing State Forest road infrastructure can properly handle heavy truck traffic associated with natural gas exploration and development. Occasionally, State Forest roads may require slight improvement (i.e., additional road base material) to maintain a good running surface. Any improvements, when necessary, will be made at the sole expense of the Lessee to the satisfaction of the District Forester.

The types of trucks used for gas exploration are similar to that of the logging industry. There will be a noticeable increase in truck traffic due to the nature of this type

of drilling and completion operations. Specifically, heavy hauling due to the transporting of water for completion operations is a large portion of the anticipated truck traffic (approximately 1000 truck trips for a *single* well). Generally, heavy truck hauling will not be permitted from November 1 to March 30 (no-haul period). Any exceptions to the "no-haul period" must be made in writing to District Forester; upon review of said request, District Forester will respond appropriately in writing.

Additional limitations on vehicular use, including but not limited to heavy hauling, during certain times of the year may be necessary to protect the integrity of the roads or nearby ecologically significant areas such as vernal pool breeding areas. These restrictions typically occur during late-winter and early-spring (break-up), however road use may be limited at any time of the year based on due cause at the discretion of the District Forester. Bridge crossings are subject to all posted weight limits as well as the approval of the District Forester. There may be instances where the Lessee may be required to improve certain bridges or similar crossings to support vehicular traffic, especially heavy hauling. Such improvements will be completed only as necessary, and within Department standards, at the sole expense of the Lessee.

In the event that State Forest lands are used as "draft points" for obtaining water from streams, the draft point and associated roads may require significant improvements and upgrades to meet Department standards prior to the commencement of this activity. These instances will be considered on a case by case basis.

Safety concerns may necessitate that certain roads be closed to public access during drilling operations or other periods of heavy use to reduce potential safety hazards. In some situations, gates will be used or installed to limit access to the drilling sites. Signage warning of heavy track traffic must be sufficiently posted to assure public safety on State Forest roads. Road access limitations will be at the discretion of the District Forester on a case-by-case basis. Normal Bureau of Forestry protocols will remain in effect. Any vehicles traveling in excess of twenty-five-miles-per-hour (25 mph) may be subject to the issuance of a traffic citation.

Appropriate safety measures will be utilized wherever possible to protect the usage of the forest roadway by recreation-based user groups (hiking, biking, horseback riding, etc.). Certain State Forest roads have been designated as Joint-Use (JU). Prior written permission must be obtained before to using such roads. Reducing conflict between State Forest stakeholders on JU roads means activities, such as snowmobiling, horseback riding, and timber harvesting, need to be considered, and the appropriate safety measures taken, to minimize road-based conflict. Any JU road is subject is the necessary criteria outlined in the *Joint-Use Road Plowing Strategy* (November 1, 2005). Recreation safety and activities are highly important; however, in-line with timber management activities, natural gas exploration takes precedence over recreational activity in our working forests. Generally conflicts are minimal and often easily resolved.

Areas contained with a given lease tract will be accessible to the public and open for traditional uses. However, the localized well site (4-5 acres in size) and any associated

facilities (i.e., centralized water impoundments) will be closed to public access during operations. If a well is successful, the actual well site infrastructure remaining on site is off limits to the public thereby lessening pubic safety concerns and benefits the continuous function of the well site operation. Development activities on a given well are anticipated to last approximately two (2) months under normal conditions. At the end of the drilling period, any roads that were temporarily closed will be reopened.

Natural gas that is discovered and produced as a result of this lease sale will require new pipeline infrastructure construction. All pipeline activity is governed by the Oil and Gas Lease Agreement (*Section 29 – Oil and Gas Pipelines*). Gathering systems or marketing lines are permissible under the terms of the agreement. No rights for developing major transmission pipelines are granted in the lease agreement and, thereby, require a standard right-of-way application, project review, and the resulting SFER.

Typically, gathering and/or marketing pipelines are placed in and along existing corridors to minimize surface impact as well as construction and development costs. Gathering lines (steel or poly-flex pipe of varying diameter) have historically been placed along access roads - in adjacent ditches or beneath the road itself. This practice of pipeline placement is preferred by the Department. All pipeline corridors or similar routes developed for the purpose of moving natural gas to market are subject to the approval of the District Forester. Although the lease agreement explicitly grants a lessee the right to move recoverable volumes of natural gas from off the leased premises, major transmission lines are not subject to this expressed right.

Non-Lease Sale Related Pipeline Activity

Independent of whether or not State Forest land is offered for lease, DCNR will undoubtedly face requests for the construction of new major natural gas transmission lines. The recent flurry of Marcellus Shale leasing and subsequent exploration is occurring in areas that are deficient in pipeline infrastructure. Existing natural gas transmission lines currently have little to no additional capacity available for new natural gas reserves being brought to market.

In an effort to reduce the number of trucks used in water hauling, operators are beginning to design and engineer water pipelines and centralized water impoundments. It is anticipated that these water lines may either be run coincident to necessary gas pipelines within same corridor or along existing roads or right-of-ways in those instances where long-term facilities may be needed (i.e., servicing central water impoundments). For temporary use, above-ground irrigation-type water lines may be used to transport water from a centralized water impoundment to a specific well pad for a series of completion operations. Water management plans such as this will not only limit the number of trucks on the road, thereby reducing wear and tear as well as maintenance, but will also result in significant cost savings to the operators over time. Prior to laying water lines, PNDI coordination will occur to minimize the impact to species of special concern.

15. Energy Needs/Use

Machinery used in the construction, exploration and development phases of natural gas exploration will consume fuels (primarily diesel fuel). Types of machinery typically used in natural gas development include: tractor-trailers, tri-axle trucks, front-loaders, skid-steers, bulldozers, drilling rigs, personal vehicles, water trucks and generators. Fuel quantities required for these activities are unknown and will vary between operators.

The May 2010 Oil and Gas Lease Offering may add significant quantities of natural gas to the Northeastern U.S. corridor. The Northeast is the largest consumer of natural gas in the United States. Estimated ultimate recovery (EUR) from one (1) Marcellus Shale well is thought to be approximately two-billion-five-hundred-million-cubic-feet of natural gas (2.5 Bcf/well). The average U.S. household that uses natural gas to heat and cool a two-thousand-square foot (2,000 sq/ft) home consumes approximately 120,000 cubic feet per year. Thus, a single well may provide the natural gas necessary to meet the heating and cooling needs to over three-hundred-thousand (300,000) homes.

16. Existing/Potential Land Use

The Pennsylvania State Forest system represents one of the largest expanses of public forestland in the eastern United States. These forests provide an abundance of high quality forest products, varied recreational opportunities, wildlife/plant habitat, and watershed protection and use. The principles associated with ecosystem management draw upon the overarching goal of forest sustainability which, in turn, assures the array of resources, uses, and values of the state forest for current and future generations.

This region of Pennsylvania lies well within the Marcellus Shale fairway. Private landowners have been leasing property in these areas for the last few years. In light of the increase in natural gas leasing on private lands, the selected lease tracts are highly marketable and saleable. The portions of State Forest that are being offered for lease may help the private landowners capitalize on their previous decision to lease their land. DCNR has implemented several measures to minimize forest fragmentation effects through its multi-level management approach. The design of the May 2010 Oil and Gas Lease Offering was intentional in that those areas included in the upcoming lease minimize the potential for environmental impact while maximizing the potential return to meet the required revenue goals contained within the FY 2009-2010 budget.

Two (2) of the major concerns associated with the May 2010 Oil and Gas Lease Offering are impact on existing uses of the State Forests and the potential for additional forest fragmentation. Any temporary impact on the existing use of the State Forest was addressed, specifically, the sections for Recreation Sites & Opportunities (*Item 12*), Public Health and Safety (*Item 13*), and Transportation and Pipelines (*Item 14*). In summary, temporary closures and restrictions may be needed to minimize user conflicts. The need for these controls will be at the discretion of the District Forester.

Historically, there were attempts made to explore for and develop shallow natural gas reservoirs (Upper Devonian) in this region. These attempts failed as no commercial production from the Upper Devonian sandstones was established in these tracts. Please note, certain wells may have produced natural gas at one time but are no longer producing on these tracts. Forest fragmentation is most closely associated with close-spaced drilling (forty acres or less). Therefore, since there is little likelihood that economic quantities of natural gas exist in these sandstones, fragmentation of this nature is unlikely to be seen.

The planning process was used in the FY 2009-10 and September 2008 Oil and Gas Lease Sales was repeated for this current sale. This approach consisted of several key components that provided for proper assessment and analysis of on-the-ground attributes of the State Forest system. These analyses were completed using field-based reconnaissance assessments and ArcGIS-based methodology, modeling, and analysis.

These key components include, but are not limited to, aesthetic/buffer zones, geologic/spacing assessments, viewshed delineation, important recreation zones, and silvicultural/ecological considerations; all of which are summarized as follows:

Standardized Management Protocols

WILD AREA MANAGEMENT ZONE: Those areas that have been designated or are pending designation by the Department as State Forest Wild Areas. A Wild Area is defined as an extensive area which the general public will be permitted to see, use and enjoy for such activities as hiking, hunting, fishing and the pursuit of peace and solitude. No development of a permanent nature will be permitted so as to retain the undeveloped character of the area and conserve ecological resources. The guidelines governing the administration of Wild Areas are as follows:

(1) Campsite leases will be prohibited.
(2) No new public access roads will be constructed. Existing roads will remain open only where there is a public need. All motorized conveyances or vehicles shall be prohibited with the exception of licensed vehicles, which may be operated only on open public roads.
(3) Forest trail use will be restricted to foot travel, horseback riding and bicycling. Handicapped persons, in hand or electrically powered wheelchairs, or in other electrically powered vehicles adapted for this use, may operate such conveyances on designated trails.
(4) Buildings and other improvements will be restricted to the minimum required for public health, safety and interpretive aids.
(5) **Leases, mineral development, and new rights-of-way will be prohibited; however, subsurface oil and gas rights may be leased where no surface use or disturbance of any kind will take place on the Wild Area.**
(6) Overnight camping will be limited to the backpack primitive type.

NATURAL AREA MANAGEMENT ZONE: Those areas that have been designated or are pending designation by the department as State Forest Natural Areas. Natural Areas are defined as an area of unique scenic, historic, geologic or ecological value, which will be maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention. These areas are set aside to provide locations for scientific observation of natural systems to protect examples of typical and unique plant and animal communities, and to protect outstanding examples of natural interest and beauty. The guidelines governing the administration of Natural Areas are as follows:

(1) No human habitation will be permitted, except that primitive type, backpack camping may be permitted in designated areas only.
(2) Access for all but essential administrative activities will be restricted to foot travel and non-motorized watercraft, except in designated areas.
(3) Buildings and other improvements will be restricted to the minimum required for public health, safety and interpretive aids.
(4) Timber harvesting will not be permitted except as may be required for the maintenance of public safety.
(5) **Leases and mineral development are prohibited; however, subsurface oil and gas rights may be leased where no surface use or disturbance of any kind will take place on the Natural Area. New rights-of-way are prohibited except for designated utility corridors in the Bucktail Natural Area.**

LIMITED RESOURCE MANAGEMENT ZONE: Applied to areas where management alternatives are limited due to site quality or topographic constraints. Recreation, aesthetics, water, and soil retention are the primary values. Topography can be an inhibiting factor that restricts or prohibits natural gas exploration and development practices on these areas (e.g., steep slope). This zone is typically not part of the commercial forest land base. Natural gas exploration and development is usually not practical.

AESTHETICS / BUFFER MANAGEMENT ZONE: Applied to areas where connectivity, aesthetics and water quality conservation are the primary values. These areas encompass a wide array of lands and are associated with linear features such as roads, trails, and streams or encompass significant features of State Forest lands. Appropriate forest community types within this zone are considered part of the commercial forest land base, however, natural gas exploration and development is typically excluded from certain areas. It is fair to anticipate requests for "waiver of buffer zone" (specifics in *Section 23* of lease agreement). Any request for encroachment will be reviewed on a case-by-case basis to minimize impact. All requests are subject to the written approval of the district forester. This management zone includes the following areas:

A. Palustrine Wetlands and Frost Pockets

B. Parks and Picnic Area

C. Campsite Leases

D. Roads

E. Natural Areas

F. Fire Hazard Areas

G. Trails

H. Sensitive Areas

AQUATIC HABITAT BUFFERS: Areas around wetlands, vernal ponds, spring seeps, streams, lakes, ponds and impoundments should be designated as aquatic habitat buffers. These guidelines provide a standard set of operating procedures to be followed when conducting management activities in or near aquatic habitats on State Forest land. Management efforts should focus on providing connectivity, wildlife habitat and protecting water quality. The specific guidelines (see *Aquatic Buffer Appendix*) are organized as follows:

A. Streamside Forests
   Wilderness Trout Stream and Wild Rivers
   Exceptional Value (EV) Streams and Scenic Rivers
   High Quality (HQ) and All Other Perennial Streams
   Intermittent or Ephemeral Streams

B. Lakes, Ponds, and Impoundments

C. Vernal Ponds

D. Spring Seeps

E. Wetlands

2010 Oil & Gas Lease Sale Management Protocols

WELL SITE SPACING: Derivative-based well spacing will be applied throughout the lease tracts. Recent developments in drilling technology, known as horizontal drilling, have made it possible to develop well pad sites in a manner that reduces surface impact exponentially. Previous well spacing was fixed through the lease agreement using hard spacing requirements – or the acceptable distance between wells

(e.g. 40 acres, 320 acres, or 640 acres). The new derivative-spacing formula will take the total acreage of a tract divided by a reasonable drainage radius (per well). The result is the number of permissible well pad sites permitted on that lease tract. For example:

1,300 acres / 260 acres per well = 5 acceptable well pad sites

Access roads and necessary pipelines will be constructed along existing roads and rights-of-way wherever possible. Extensive consideration was given to the appropriate well spacing needed for economic recovery of natural gas from the Marcellus Shale (or deeper). The methodology used in the derivative-spacing formula appears to minimize the potential impacts to the surface while maintaining the engineering integrity required to economically recover the natural gas reserves without waste (i.e., Oil and Gas Conservation Law).

Beginning with the 2010 lease sale, two (2) additional stipulations will be included DCNR's standard lease agreement:

Centralized Water Impoundments – these facilities will be reviewed, approved, and managed as a "well pad site" due to the size, spatial extent, and prolonged use of the impoundment. An impoundment will count against the maximum number of allowable pad sites expressed in the lease agreement (Section 22.02)

Maximum Surface Disturbance – in most instances, well pad sites typically consume 3.7 to 5 acres of surface lands although the Bureau recognizes that certain variables may require that a larger area is used for a particular pad site. As a result, the lease agreement will specify the total number of acres that can be disturbed by well pad sites (to include central impoundments as above). For example:

5 acceptable well pad sites X 5 acres = 25 acres of total surface disturbance

In this case, the lessee can build 5 well pads and/or impoundments, ***or*** disturb a total of 25 acres of surface lands, **whichever occurs first**. Pipelines, access roads, and other facilities will not count towards this threshold.

VIEWSHED DELINEATION: ArcGIS was utilized for performing viewshed analysis for those areas that contain historic and/or important viewsheds (i.e., Historic Route 6). Digital elevation models (DEM) were used to clearly define those high-points on the surface where an observer stationed along and/or within a defined area. The results were applied to the lease tracts and implemented as an Area of Special Consideration – Viewshed.

RECREATION ZONES: The basis for the delineated recreation zones contained within a lease tract is the Recreation Opportunity Spectrum (ROS). ROS is an inventory system built on the premise that people expect certain types of recreational experiences on public land, and that land managers should be able to direct people to appropriate places for those experiences. ROS allows the land manager to provide recreational

opportunities across a spectrum, or continuum, of 5 land-use classes so that the user may find satisfying recreational experiences in a variety of recreation activities.

HIGH VALUE TIMBER CONSIDERATIONS: An ArcGIS-based analysis was performed to properly assess where DCNR's high-value timber is located in relation to the lease tracts. Using the current typing layer(s) for the applicable forest districts, those areas that comprised of Northern Harwood Forest (BB), Site Class 1 and/or Black Cherry – Northern Harwood Forest (BC) criteria have been delineated based on these criteria:

BB *Northern Hardwood Forest* **:** Dominant trees usually include *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *A. saccharum* (sugar maple), *Prunus serotina* (black cherry)—at less than 40% relative cover, *Betula lenta* (sweet birch), *B. alleghaniensis* (yellow birch), *B. papyrifera* (paper birch), *Q. rubra* (northern red oak), and *Fraxinus americana* (white ash). This type may contain scattered *Pinus strobus* (eastern white pine) and/or *Tsuga canadensis* (eastern hemlock), but combined conifer cover does not exceed 25% of the canopy. *Rhododendron maximum* (rosebay) may be locally abundant. Other common shrubs include *Hamamelis virginiana* (witch-hazel), *Acer pensylvanicum* (striped maple), *Viburnum lantanoides* (witch-hobble), *Ilex montana* (mountain holly), *Amelanchier laevis* (smooth serviceberry), *A. arborea* (shadbush), and *Carpinus caroliniana* (hornbeam). The herbaceous layer is generally sparse and reflects a northern affinity; common components include *Maianthemum canadense* (Canada mayflower), *Trientalis borealis* (starflower), *Thelypteris novaboracensis* (New York fern), *Dryopteris carthusiana* (fancy fern), *Lycopodium lucidulum* (shining clubmoss), *Gaultheria procumbens* (teaberry), *Mitchella repens* (partridge-berry), *Aralia nudicaulis* (wild sarsaparilla), *Medeola virginiana* (Indian cucumber-root), and *Maianthemum canadense* (Canada mayflower).

Related types: If combined relative cover by conifers approaches or exceeds 25%, please read description for the "Hemlock (white pine) - northern hardwood forest." If cover by *Prunus serotina* (black cherry) approaches or exceeds 40% of canopy, please read description for the "Black cherry - northern hardwood forest" type.

Range: Glaciated NE, Glaciated NW, Pocono Plateau, Unglaciated Allegheny Plateau.

BC *Black Cherry - Northern Hardwood Forest:* (Allegheny Hardwoods). This type is characterized by at least 40% *Prunus serotina* (black cherry) and is most characteristic of the Unglaciated Allegheny Plateau. Common associates are *Acer rubrum* (red maple), *A. saccharum* (sugar maple), *Betula lenta* (sweet birch), *B. alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and *Quercus* spp. (oaks), usually *Q. rubra* (northern red oak). *Pinus strobus* (eastern white pine) and/or *Tsuga canadensis* (eastern hemlock) may be present (at less than 25% relative cover). Shrubs include *Viburnum lantanoides* (witch hobble), *Acer*

pensylvanicum (striped maple), *Rubus allegheniensis* (Allegheny blackberry), *Ilex montana* (mountain holly), *Hamamelis virginiana* (witch-hazel), and *Amelanchier arborea* (shadbush). Common herbaceous species include *Dennstaedtia punctilobula* (hayscented fern), *Thelypteris novaboracensis* (New York fern), *Dryopteris intermedia* (common wood fern), *Lycopodium* spp. (ground pine), *Aster acuminatus* (wood aster), *Viola* spp. (violets), *Medeola virginiana* (Indian cucumber-root), *Uvularia sessilifolia* (wild-oats), *Brachyelytrum erectum* (brachyelytrum), *Maianthemum canadense* (Canada mayflower), and *Oxalis acetosella* (common wood-sorrel).

Related types: The "Northern hardwood forest" may contain *Prunus serotina* (black cherry) as a component, but it does not generally exceed 40% relative cover. This type is most characteristic of the Unglaciated Allegheny Plateau.

Range: Glaciated NE, Glaciated NW, Unglaciated Allegheny Plateau.

Site Class 1 (SC1): SC1 is characterized by moist, well-drained, fairly deep soils that usually occur in protected coves, along streams, or in bottomlands that remain moist throughout the year. On northern exposures, Site 1 may extend higher up a slope than on southern exposures because of more favorable soil moisture conditions. In addition to the usual beech-birch-maple-cherry of northern and Allegheny hardwoods, white pine, hemlock, ash and basswood are generally present. In the oak types where red oak and white oak along with hemlock form the major portion of the stand, the presence of tuliptree (yellow poplar) and ash indicates Site 1. Dominant and co-dominant trees have a projected merchantable main stem of > 50 feet at maturity (> three 16-foot logs). Total tree heights average > 80 feet at maturity.

Additionally, those areas that have gone through extensive regeneration projects and are now protected by the installation and maintenance of deer exclosures have been delineated. Based on the input from the District Forester, certain projects were retained and integrated into appropriate lease agreement as an area of special consideration.

ECOLOGICAL CONSIDERATIONS: The Pennsylvania Natural Diversity Inventory was queried to determine where ecological conflicts might occur in the future should a Lessee wish to explore for natural gas. More specifically, an ArcGIS-based analysis was performed for those areas contained in or immediately adjacent to the lease tracts. Given the developing comprehensive nature of these databases, the information assembled and delineated as having *ecological importance* are not intended to serve as restrictions (except as outlined below) but rather a notification that conflicts may exist within portions of a given lease tract. These conflicts may require a survey to determine species or habitat presence, and that monitoring, mitigation or avoidance measures be required as a result of exploration and development activities. This proactive approach serves as a communication tool between Lessor and Lessee whereby the Lessee is made aware that, in advance of obtaining a lease, additional consideration will be given to

activities that disrupt habitats, plants, or wildlife prior to approving development activities.

The survey results were placed into two (2) categories and displayed accordingly in the SFER Map Appendix. Generalized categories for the five (5) State Forest districts are as follows:

Non-Development - Ecological: an area of ecological significance where no surface development will be permitted due known flora and/or fauna complexes

Area of Special Consideration – Ecological: an area known to contain plants or animals of significance or special interest

** *Examples of Important species include: timber rattlesnake (Crotalus horridus), wood rats (Neotmoa magester), lupine (Lupinus perennis), or Northeastern Bulrush (Scirpus ancistrochaetus)*

Certain animal and plant species have been listed and given protected status by the U.S. Fish and Wildlife Service, the Pennsylvania Game Commission, the Pennsylvania Fish and Boat Commission and the Pennsylvania Department of Conservation and Natural Resources.

The Pennsylvania Natural Diversity Inventory (PNDI) information system contains information on known locations of listed species as well as significant natural communities and other ecological features. PNDI is a public/private partnership between DCNR, the Western Pennsylvania Conservancy, PA-Fish and Boat Commission and PA-Game Commission. All activities associated with oil and gas development undergo a PNDI review prior to a well permit being issued.

All potential lessees have been notified through the tract analysis maps (see Item 16 above), as well as specific language in the lease agreement, of known areas of special consideration for plants, animals, and habitats. The lessee will perform a PNDI screening using the PNDI ER Tool. The entire earth disturbance area will be included in the screening, which will include the pad site and any associated impoundments, pipelines and/or access roads. If potential impacts exist as a result of the screening, the lessee will coordinate with the agency/agencies listed on the PNDI Receipt. If requested, a survey should be performed during the appropriate time of year for target species. The project will require PNDI clearance before any earth disturbance activity commences. Projects that will have an adverse effect on any of the important species or critical habitats should be avoided. Where there is potential to impact a species of special concern or their habitat, the lessee may be required to provide necessary avoidance buffers, mitigation, habitat enhancement, and/or monitoring.

The likelihood that purposeful damage to, or destruction of, a species of special concern and their habitat is unlikely; however, the possibility of inadvertent impacts could occur during construction and development of wells sites, centralized impoundments, road and pipelines. Bureau of Forestry personnel will do their best to

educate the lessee and their contractors on best management practices in avoiding inadvertent impacts to species or their habitats.

18. Habitat Diversity and Interspersion

Habitats are classified as either terrestrial, wetland, aquatic or riparian. The Bureau's management strategies, in most cases, are designed to optimize diversity within and between these habitats, primarily by promoting various habitat components. Habitat is species dependent. Any management activity, including no activity, will affect some species positively, some will not be affected, and still others will be negatively impacted.

Aside from critical plant and animal species, which are covered in *Item 17*, the maintenance and/or restoration of eco-regional biological diversity is a key consideration in resource management efforts on State Forest lands.

Wildlife and plant habitat will be protected and managed through the implementation of the multi-level management approach. Environmental safeguards have been established through a tiered approach to ensure the protection of critical habitats and species. First-level environmental safeguards involved the establishment of "non-development" areas, such as State Parks and State Forest wild and natural areas, where no surface activity is permitted. Non-development portions of a lease tract state that no surface activity or development will be permitted. More specifically, no well sites, pipelines, roads or related disturbances will be permitted in these areas.

Additional habitat protections have been outlined above. Please refer to *Environmental Safeguards* and *Existing/Potential Land Use (Item 16)* for specifics.

19. Biological Productivity

Vegetation will be cleared due to construction of well sites, roads, and pipelines. Specific clearing areas cannot be delineated at this time; however, approximately four (4) to five (5) acres may require clearing for a well site Additional clearing areas will be associated with the development of necessary access roads and/or pipelines. No clearing will take place in non-development areas.

Most of the considerations, impacts, and mitigation efforts covered in *Protected Animals and Plants (Item 17) and Habitat Diversity and Interspersion (Item 18)* apply specifically to biological productivity. Although the clearings will result in a temporary loss of forest cover, well site and pipelines will be re-vegetated to benefit targeted wildlife species and decrease the impact of invasive species invasion.

20. Vegetation

The Bureau of Forestry is very active in the effort to control and prevent the spread of invasive species on State Forest land. Invasive plant or animal species can be transported by natural methods (i.e., animal excretion), vehicles, by spraying or mowing, during construction or through erosion controls where planting non-native mixes,

mulching, or using imported soil are applied. Therefore, an appropriate re-vegetation plan has been established for natural gas related disturbances.

The Lessee will pay double-stumpage for all timber harvested as part of natural gas exploration and development activity. All timber to be removed is marked and tallied by a management forester within the appropriate forest district. Additionally, the Lessee will be required to follow the *Invasive Plants and Revegetation Guidelines (Exhibit D)* of the lease agreement. Protocols call for implementation and adherence including, but not limited to, the following:

> -- Lessee shall make provisions to monitor for invasive species within the area disturbed by the construction activity for a period of five (5) years following construction or until invasive plants are not observed on-site for two consecutive years, whichever is longer.
>
> -- Post-construction invasive species surveys along access roads shall be limited to areas where gravel was placed or the existing road was widened for Lessee use. After a period of two growing seasons, any new invasive populations will be assumed to be the result of outside sources other than Lessee construction materials and equipment. Control and monitoring of invasive species found along access roads within two growing seasons post-construction will continue until populations are eradicated.
>
> -- The results of all Lessee annual invasive surveys shall be summarized into a report that shall include the following elements: methods, a summary of invasive species detected, abundance of each species, number of new populations per species, number of eradicated populations by species, and management recommendations for management and control. Report and raw electronic observation data shall be submitted to District Forester. Submission of any electronic data should occur simultaneously with the report submission. Data recording and management should be consistent year to year so data can be easily compared by grid cell number. The department reserves the right to audit the findings of the Lessee's reports and as a result of any audit, Department may require alternate methods of management and control.
>
> -- Management and control of established invasive plant populations shall be planned on a species by species basis to determine the best method of control. Lessee and/or its consultant shall submit a "Management and Control Plan" to District Forester no less than three (3) months after the conclusion of all construction activity.

Revegetation of disturbed areas will be completed using DCNR-accepted standards and in a manner that promotes the management goals of the Bureau of Forestry as well as the applicable forest district. The lessee shall utilize a native grass and herb mix for cover and stabilization wherever possible within the disturbed work areas. The required seed mix will provide for immediate stabilization and reduce the chance of

invasive species establishment. The grass and herb mix shall be applied at fifteen pounds (15 lbs) per acre.

Additionally, seeds necessary to establish a cover crop will be mixed in with the native grass and herb mix. The cover crop will either be oats or barley (spring months) or wheat or grain rye (fall months). This can be applied at the same time with the mix below and can be done with the hydro-seeder. The cover crop should be applied at thirty pounds (30 lbs) per acre.

The detail components of the native grass and herb mix as well as shrub planting are listed below:

Native Grass and Herb Mix

20% Little Bluestem PA ecotype (Andropogon scorparius)
10% Big Bluestem variety "Niagara" (Andropogon gerardii) (genetic origin is NY)
15% Virginia Wild Rye PA ecotype (Elymus virginicus)
l0% Indiangrass PA ecotype (Sorghastrum nutans)
l0% Deertongue variety "Tioga" (Panicum clandestinum)
5% Swithchgrass variety "Shelter" (Panicum virgatum) (genetic origin is WV)
5% Partridge Pea PA ecotype (Chamaecrista fasciculate)
3% Showy Tick Trefoil PA ecotype (Desmodium canadense)
5% Ox-eye sunflower PA ecotype (Heliopsis helianthoides)
2% Autumn bentgrass PA ecotype (Agrostis perennans)
2% Woolgrass PA ecotype (Scirpus cyperinus)
3% Soft Rush PA ecotype (Juncus effuses)
5% Pennsylvania smartweed PA ecotype (Polygonum pensylvanicum)
5% Common Milkweed PA ecotype (Asclepias syriaca)

All re-vegetation plans or other specific vegetative treatments shall be performed to the satisfaction of the District Forester. Local requirements may dictate that alternative treatments or strategies be developed to meet local management goals.

21. Non-Native Species

The Bureau of Forestry is very active in the effort to control and prevent the spread of invasive species on our lands. Invasive plant or animal species can be moved by vehicles, by spraying or mowing, during construction and through erosion controls where planting non-native mixes, mulching, or using imported soil are applied.

Non-Native Species specifics are addressed in greater detail in *Vegetation* (*Item 20*) above. Additional criteria for non-native species are also addressed in *Invasive Plants and Revegetation Guidelines* (*Exhibit D*) of the lease agreement.

22. Other

Economic Considerations

It is not possible for DCNR to predict at this time how many leases will be successfully obtained nor how many wells will be drilled as a result of the new leases. The Commonwealth receives money from three (3) unique revenue streams when leasing subsurface oil and gas rights. These distinct payments are:

Bonus Bid: The first year's rentals, on ten (10) tracts have been fixed at four-thousand dollars ($4,000) per acre. One (1) tract, Tract 009, has a fixed two-thousand dollar ($2,000) per acre rental payment due to significantly complex geology. Total bonus bid revenues generated by this sale are $120,162,000.00

Annual Rentals: After the first year, leased acreage requires a twenty-dollar, per-acre, per-year ($20/acre/year) rental, payable in advance of that year, for years two, three, and four of the lease. Years five (5) and beyond requires a thirty-five-dollar, per acre, per year ($35/acre/year) rental, payable in advance.

Royalties: Royalty is paid on the natural gas produced from each individual well. The royalty rate for the May 2010 Oil and Gas Lease Offering has been established at sixteen-percent (18%) of the gross volume of natural gas produced and metered at the well head. Market rates per thousand cubic feet (Mcf) of natural gas prevail. A sharp increase in market rate may cause revenues to rise albeit temporarily regardless of the decline in production.

All revenues from oil and gas activities (except pipeline rights of way) are required to be deposited in the Oil and Gas Lease Fund. By law, these funds are earmarked for recreation, conservation, and flood control projects.

***** Please note – ALL revenues generated from the bonus bid payments described above will be allocated to the General Fund and <u>will not</u> be deposited into the Oil and Gas Lease Fund.***

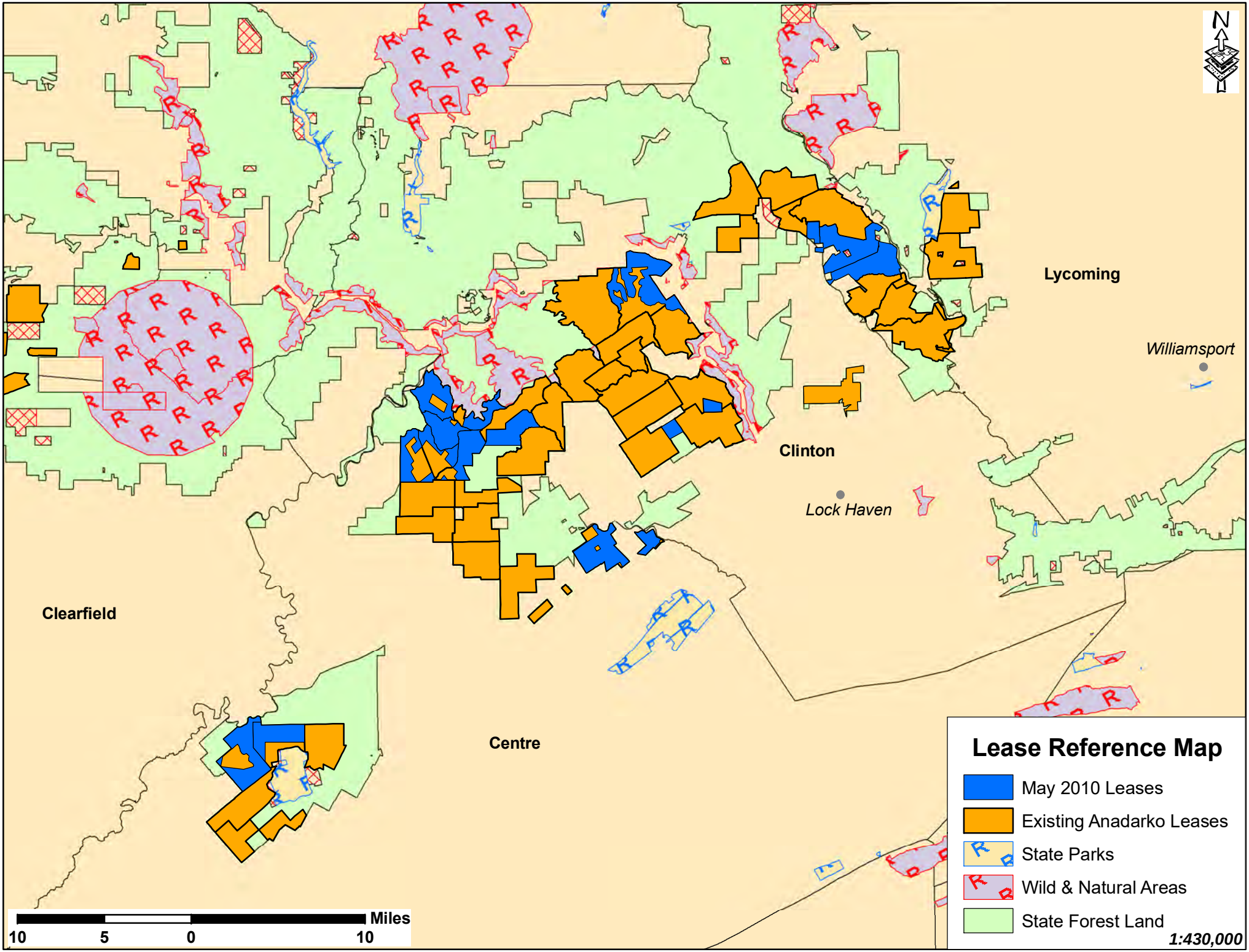
23. Permits

Natural gas exploration and development are subject to the substantial conditions of the DCNR oil and gas lease (*see Lease Appendix*). Additionally, all oil and natural gas exploration and development activities within Pennsylvania are subject to DEP permitting requirements.

Lessees are required to abide by all applicable Federal, State, and Local laws, rules and/or regulations. DCNR has no responsibility to aid an operator in obtaining the necessary permits. Furthermore, DCNR is not required to obtain any permits to allow these activities to occur.

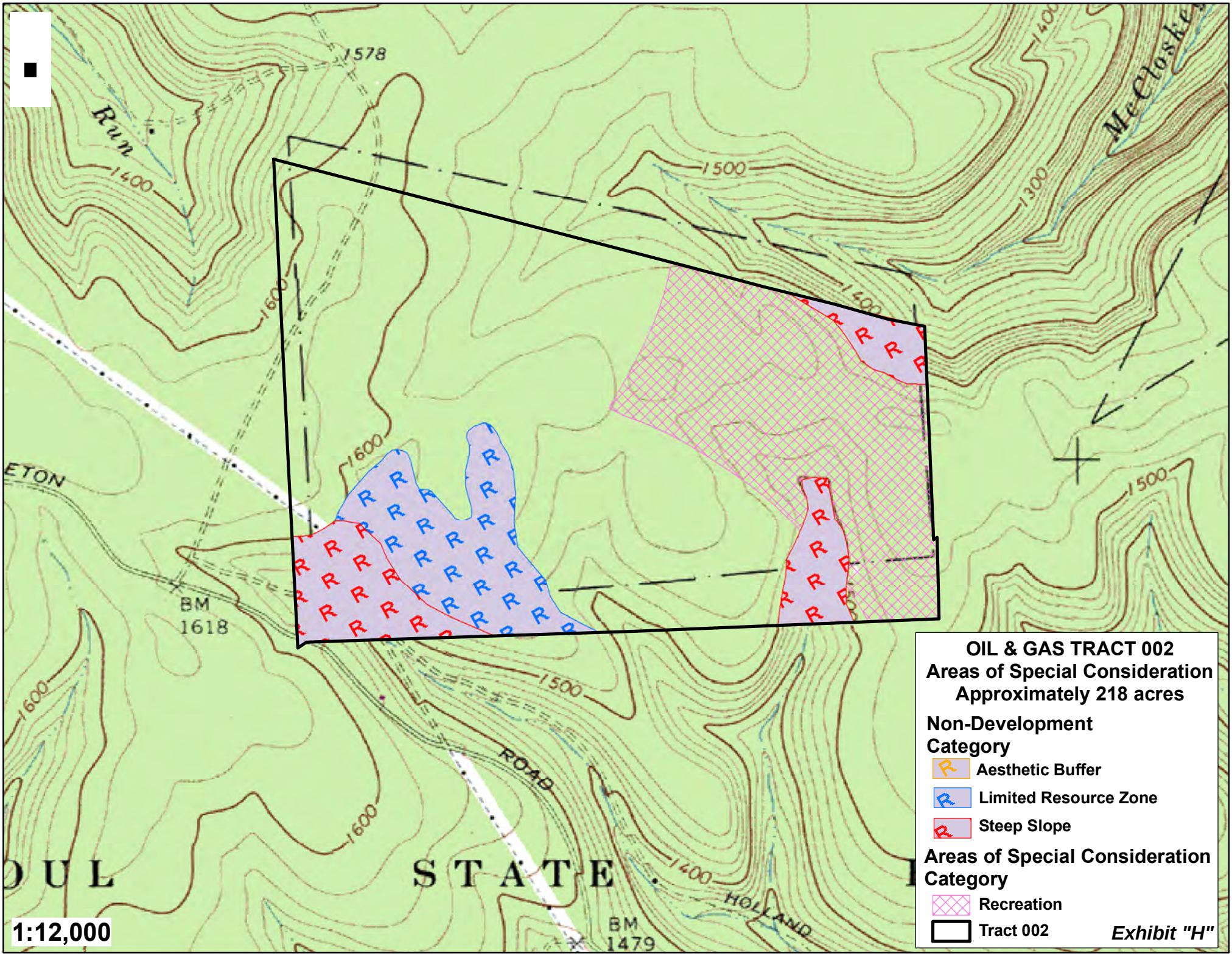
APPENDIX A

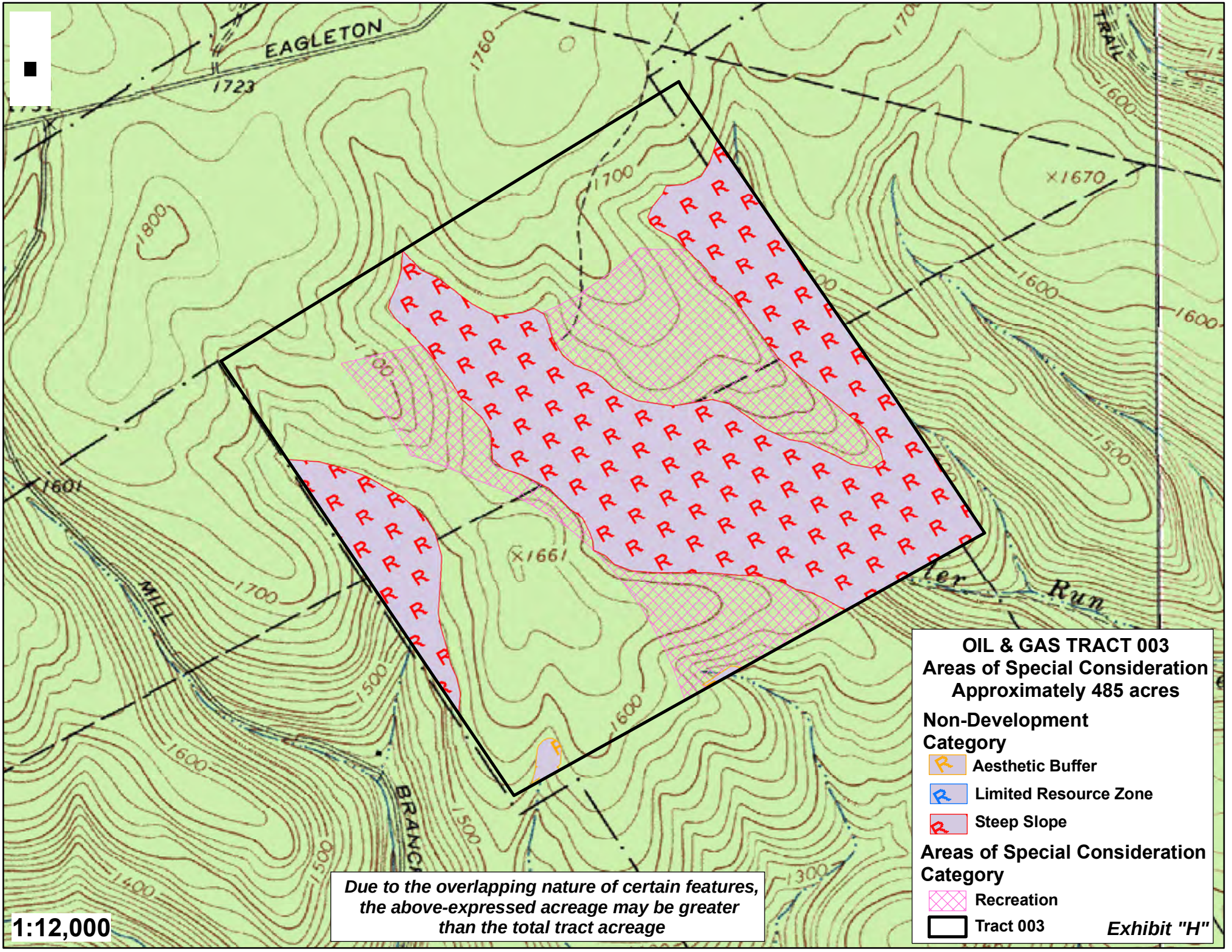
Lease Reference Map

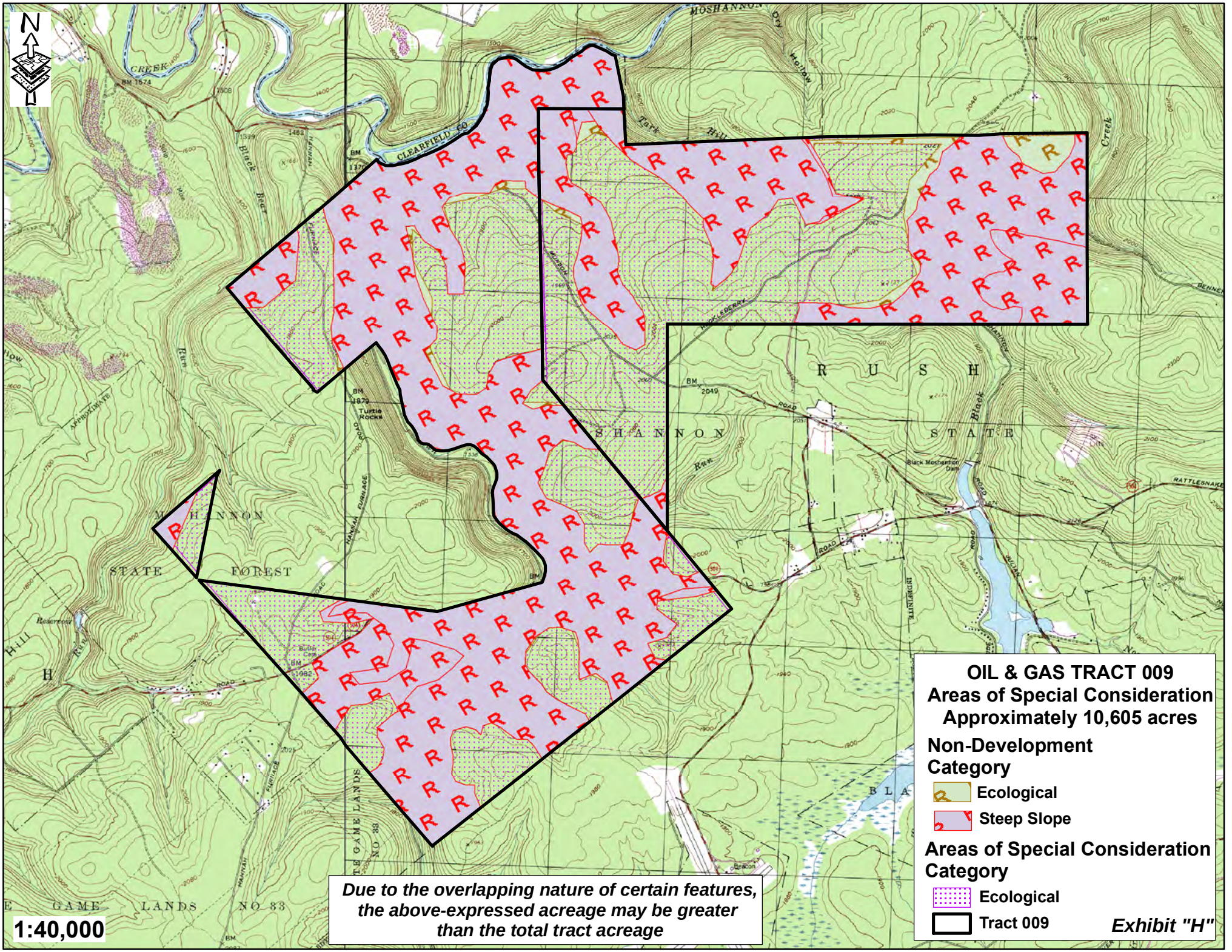

N
Lycoming
Williamsport
Clinton
Lock Haven
Clearfield
Centre
Lease Reference Map
May 2010 Leases
Existing Anadarko Leases
State Parks
Wild & Natural Areas
State Forest Land
1:430,000
Miles
10
5
0
10

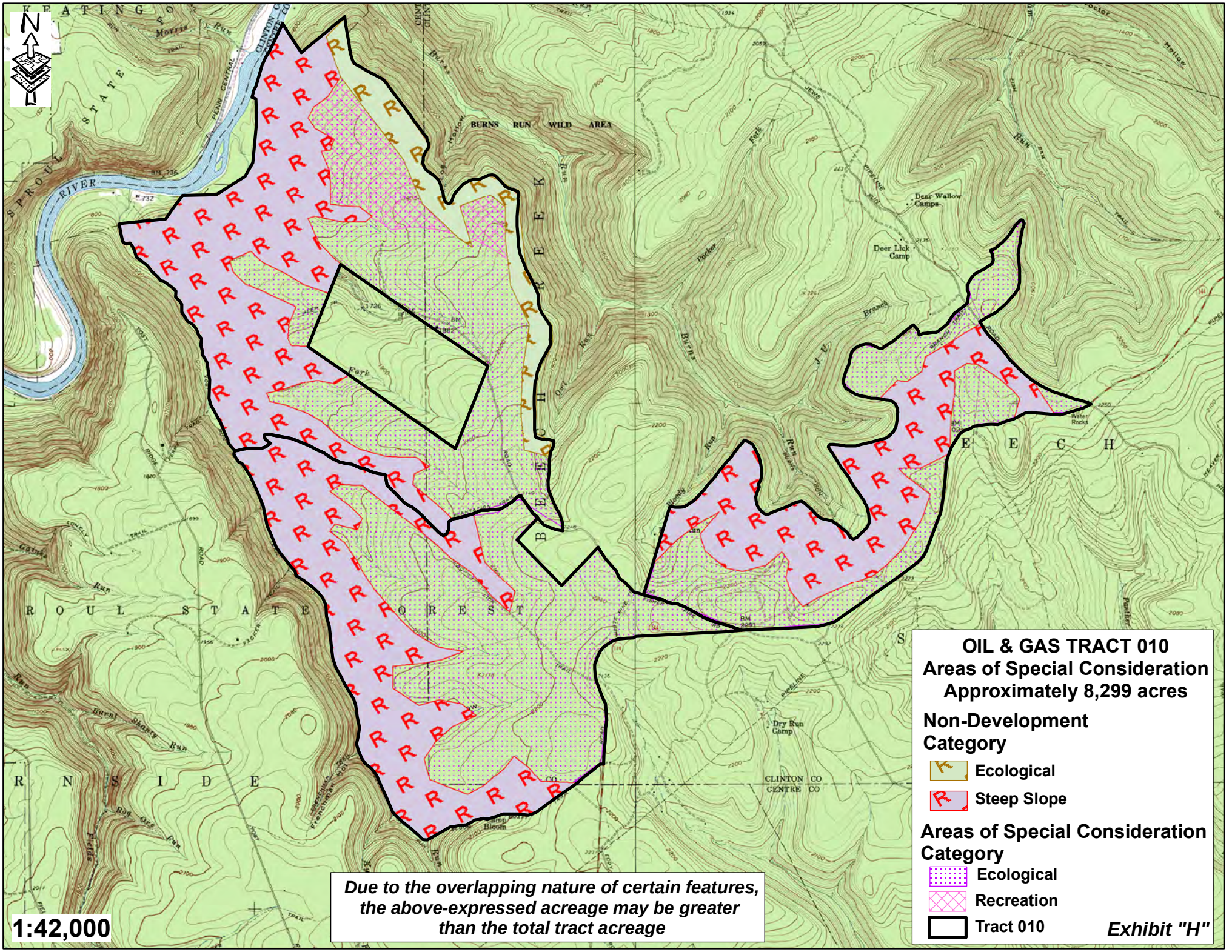
APPENDIX B

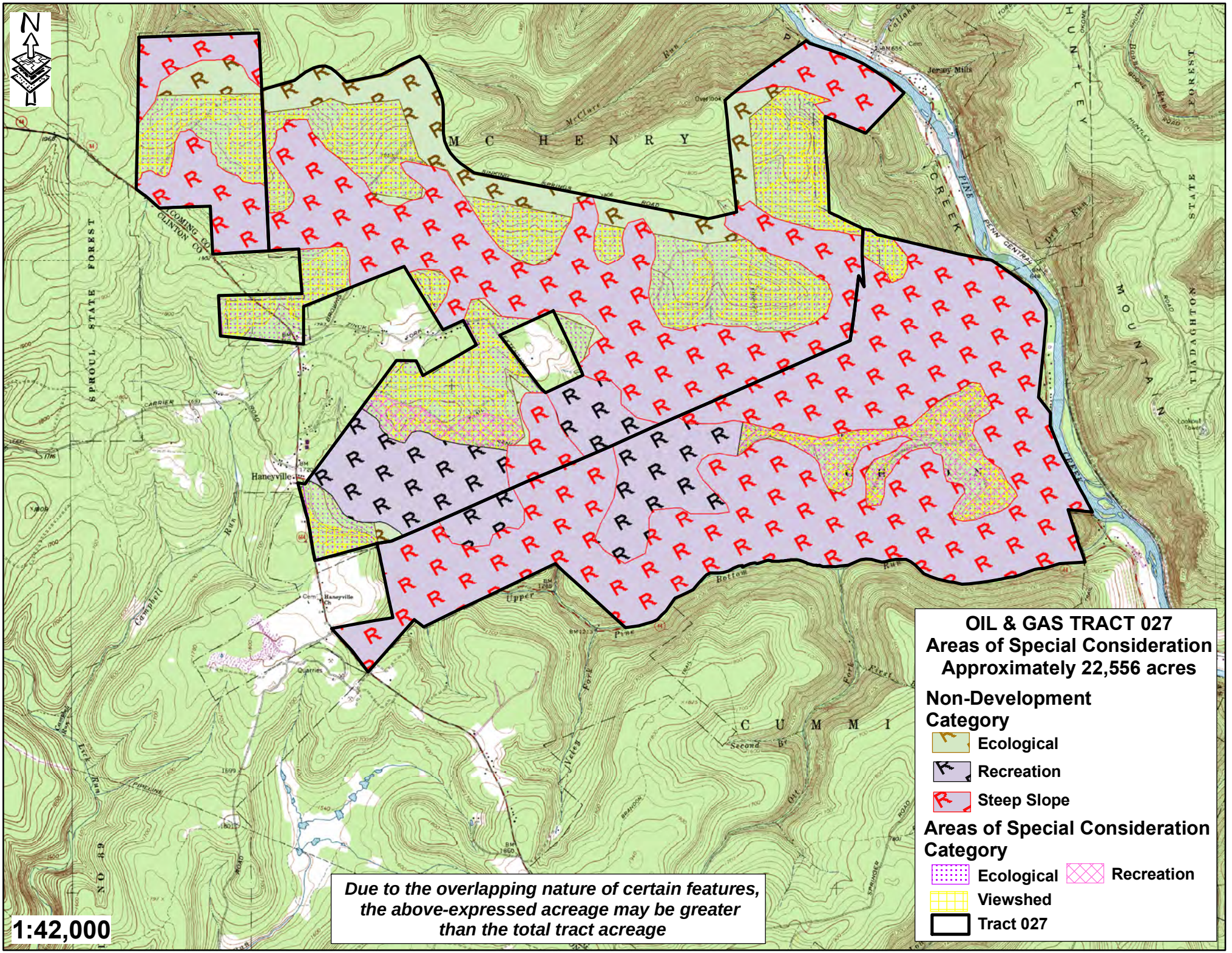
Lease Restrictions Map

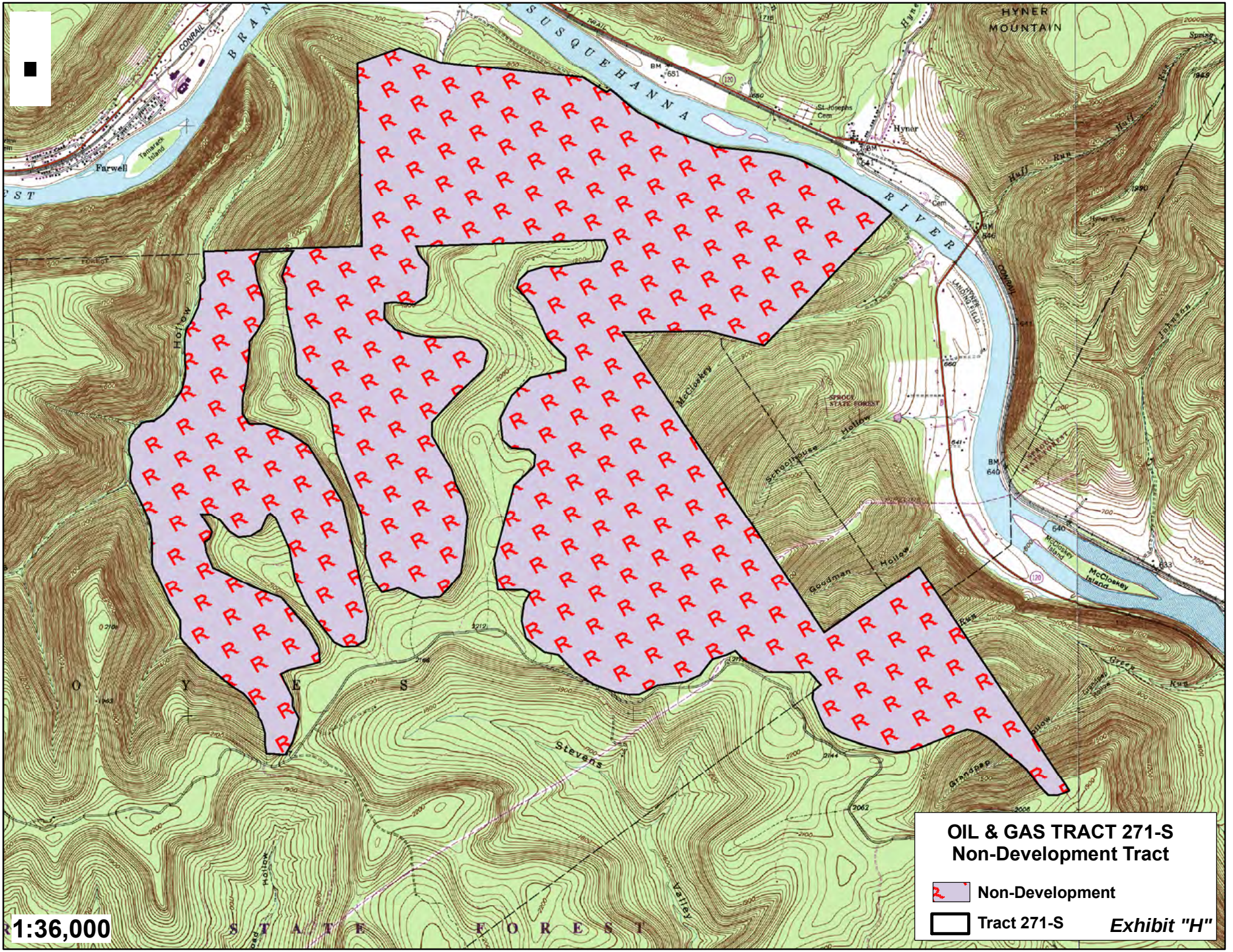

OIL & GAS TRACT 002
Areas of Special Consideration
Approximately 218 acres
Non-Development Category
Aesthetic Buffer
Limited Resource Zone
Steep Slope
Areas of Special Consideration Category
Recreation
Tract 002
Exhibit "H"
1:12,000
1578
1500
1400
1600
1300
BM 1618
BM 1479
ROAD
STATE
HOLLAND

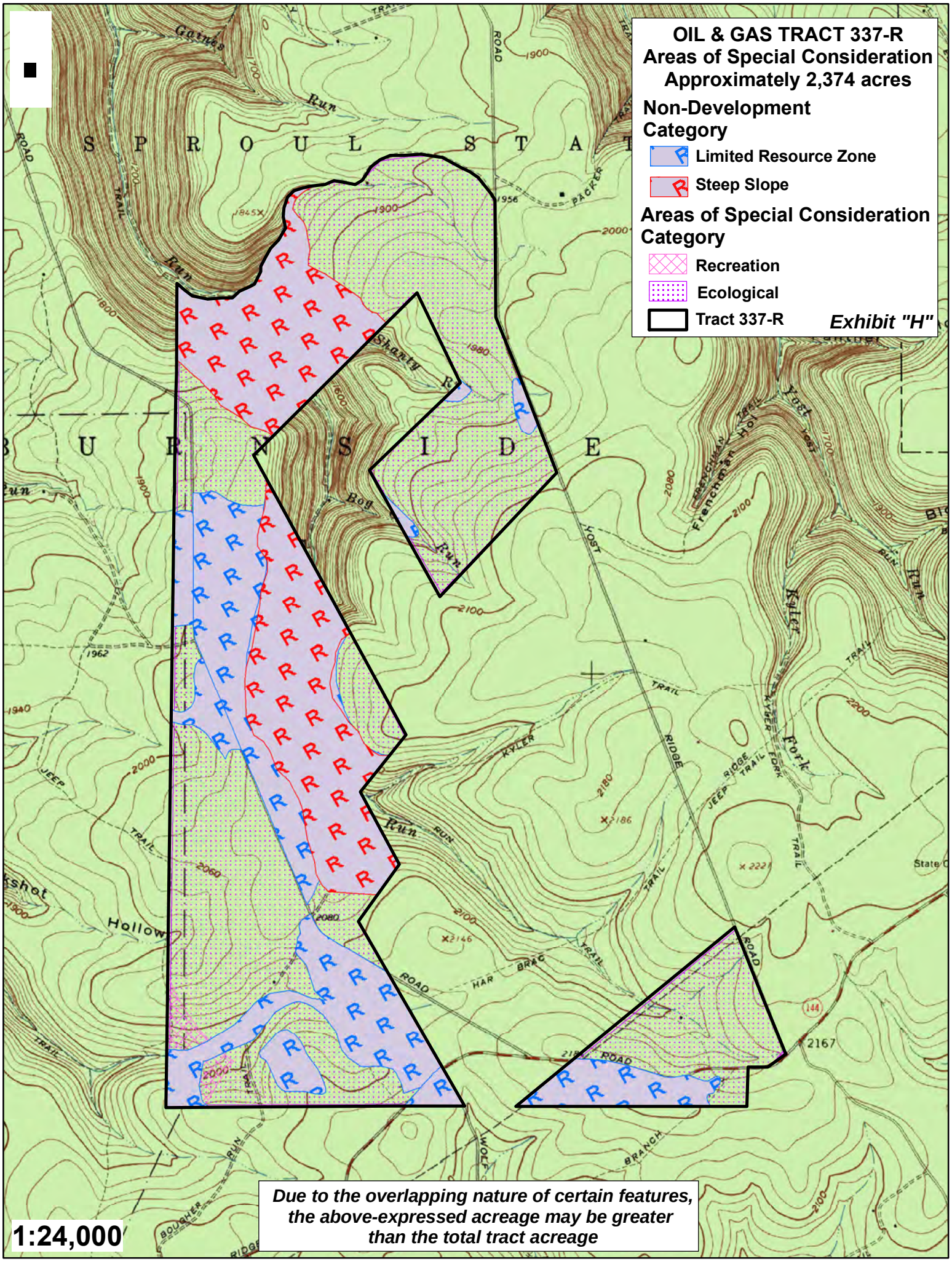

EAGLETON
1723
1760
1700
1600
1500
1400
1300
1800
1601
1661
1670
TRAIL
MILL
Run
BRANCH
OIL & GAS TRACT 003
Areas of Special Consideration
Approximately 485 acres
Non-Development Category
Aesthetic Buffer
Limited Resource Zone
Steep Slope
Areas of Special Consideration Category
Recreation
Tract 003
Exhibit "H"
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:12,000

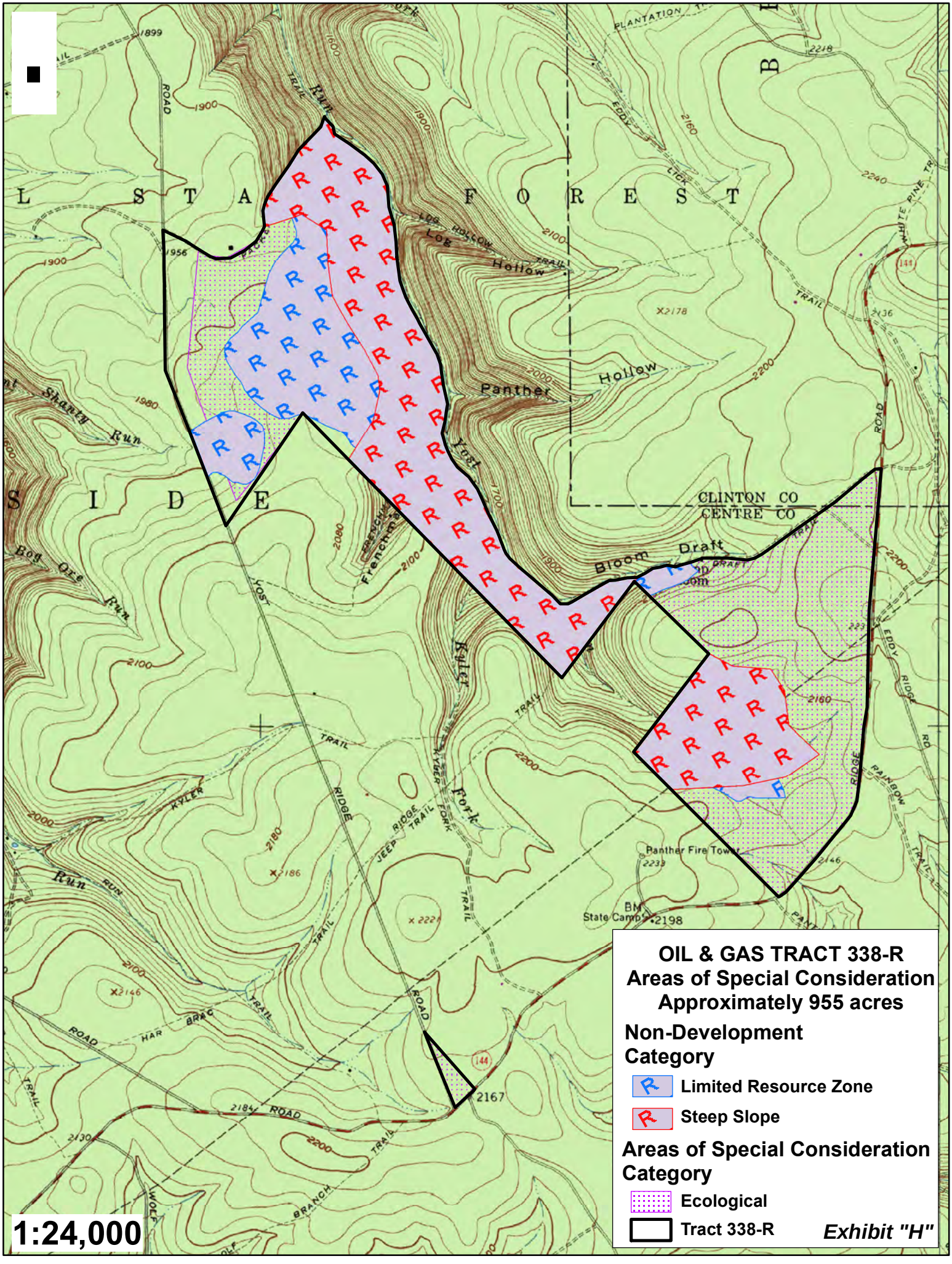

N
OIL & GAS TRACT 009
Areas of Special Consideration
Approximately 10,605 acres
Non-Development Category
Ecological
Steep Slope
Areas of Special Consideration Category
Ecological
Tract 009
Exhibit "H"
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:40,000
SHANNON STATE FOREST
RUSH
GAME LANDS NO 33

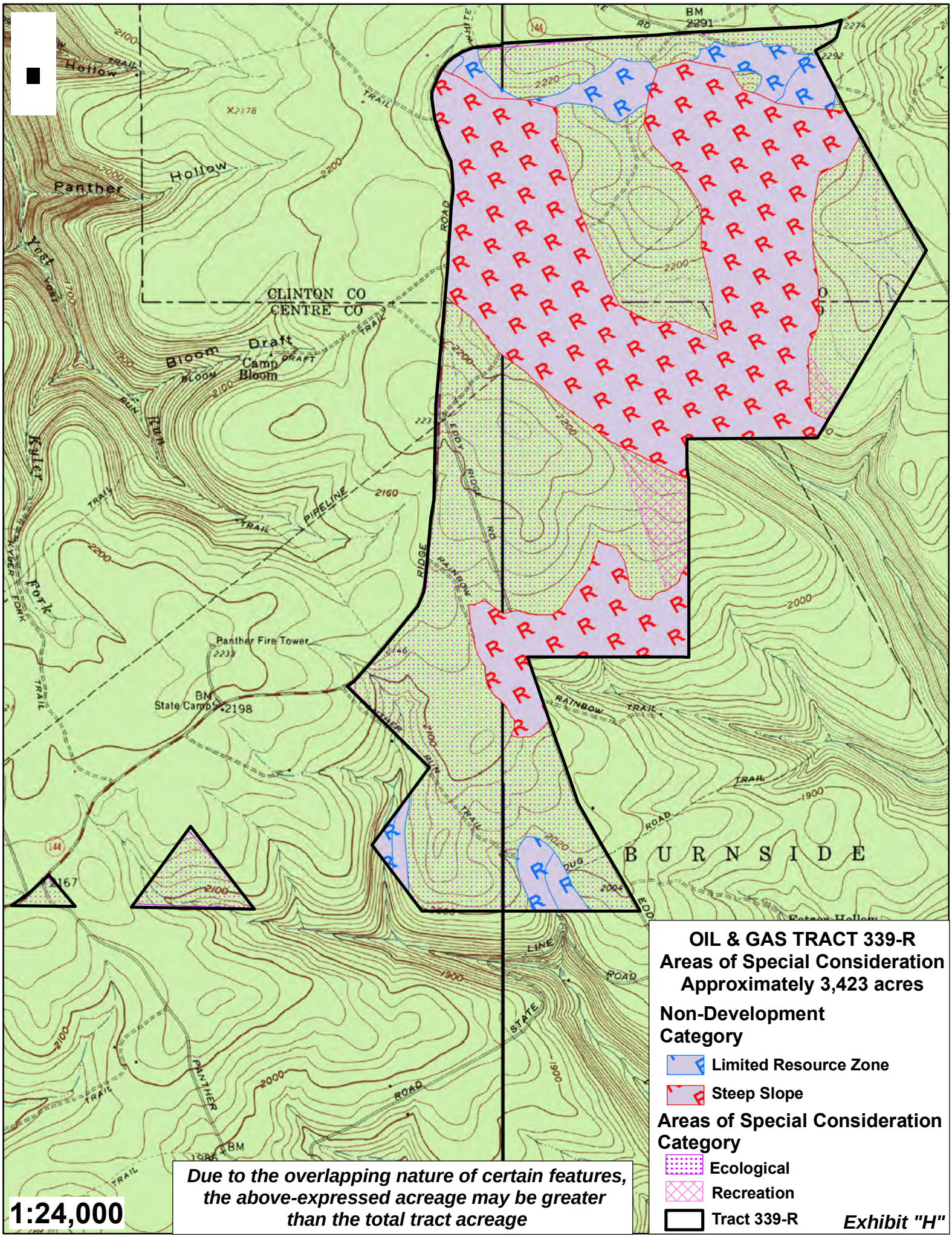

N
BURNS RUN WILD AREA
BEECH
R O U L S T A T E F O R E S T
R N S I D E
Bear Wallow Camps
Deer Lick Camp
Dry Run Camp
CLINTON CO
CENTRE CO
1:42,000
OIL & GAS TRACT 010
Areas of Special Consideration
Approximately 8,299 acres
Non-Development Category
Ecological
Steep Slope
Areas of Special Consideration Category
Ecological
Recreation
Tract 010
Exhibit "H"
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage

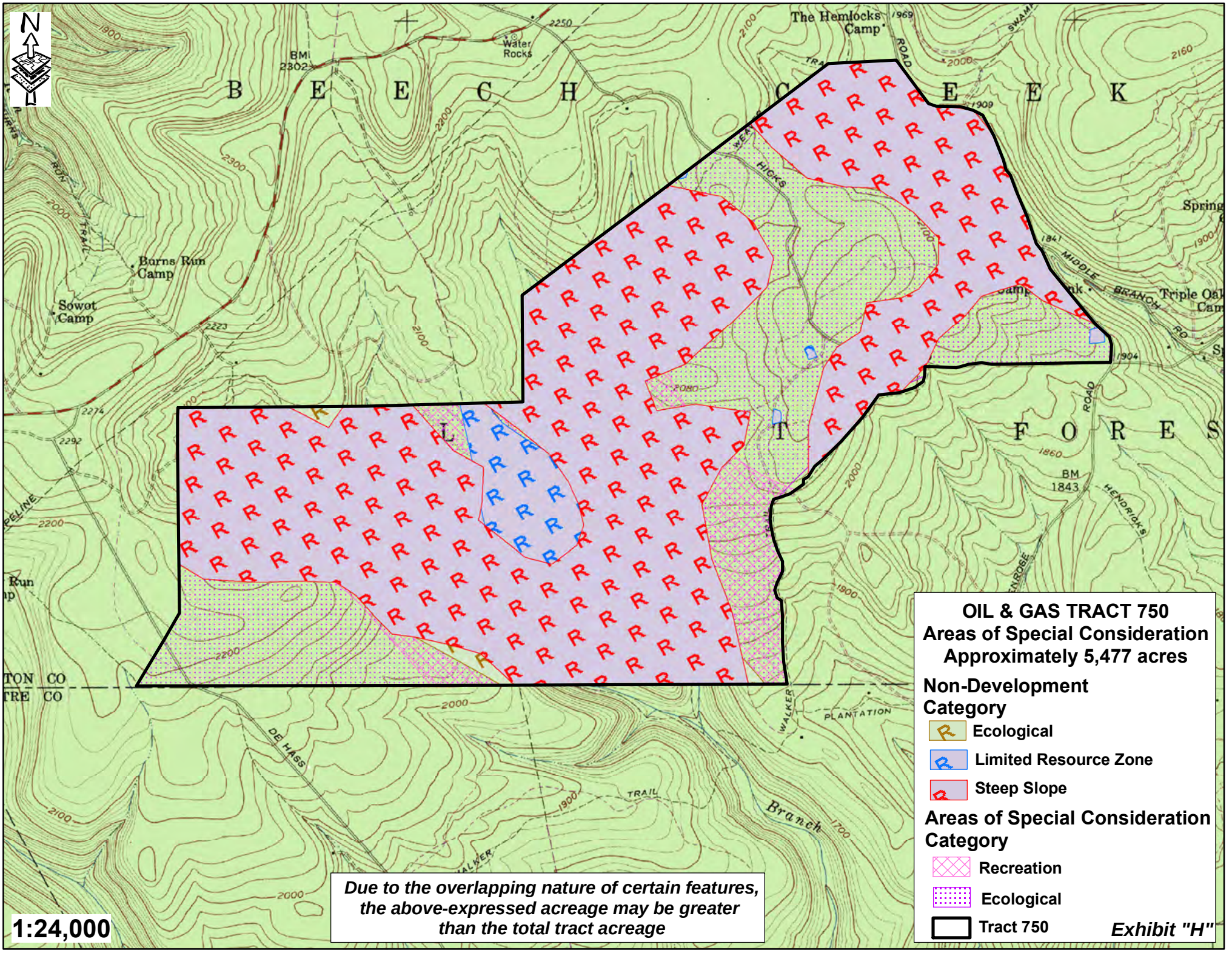

N
M C H E N R Y
SPROUL STATE FOREST
HUNTLEY STATE FOREST
Haneyville
Jersey Mills
Quarries
C U M M I
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:42,000
OIL & GAS TRACT 027
Areas of Special Consideration
Approximately 22,556 acres
Non-Development Category
Ecological
Recreation
Steep Slope
Areas of Special Consideration Category
Ecological
Recreation
Viewshed
Tract 027

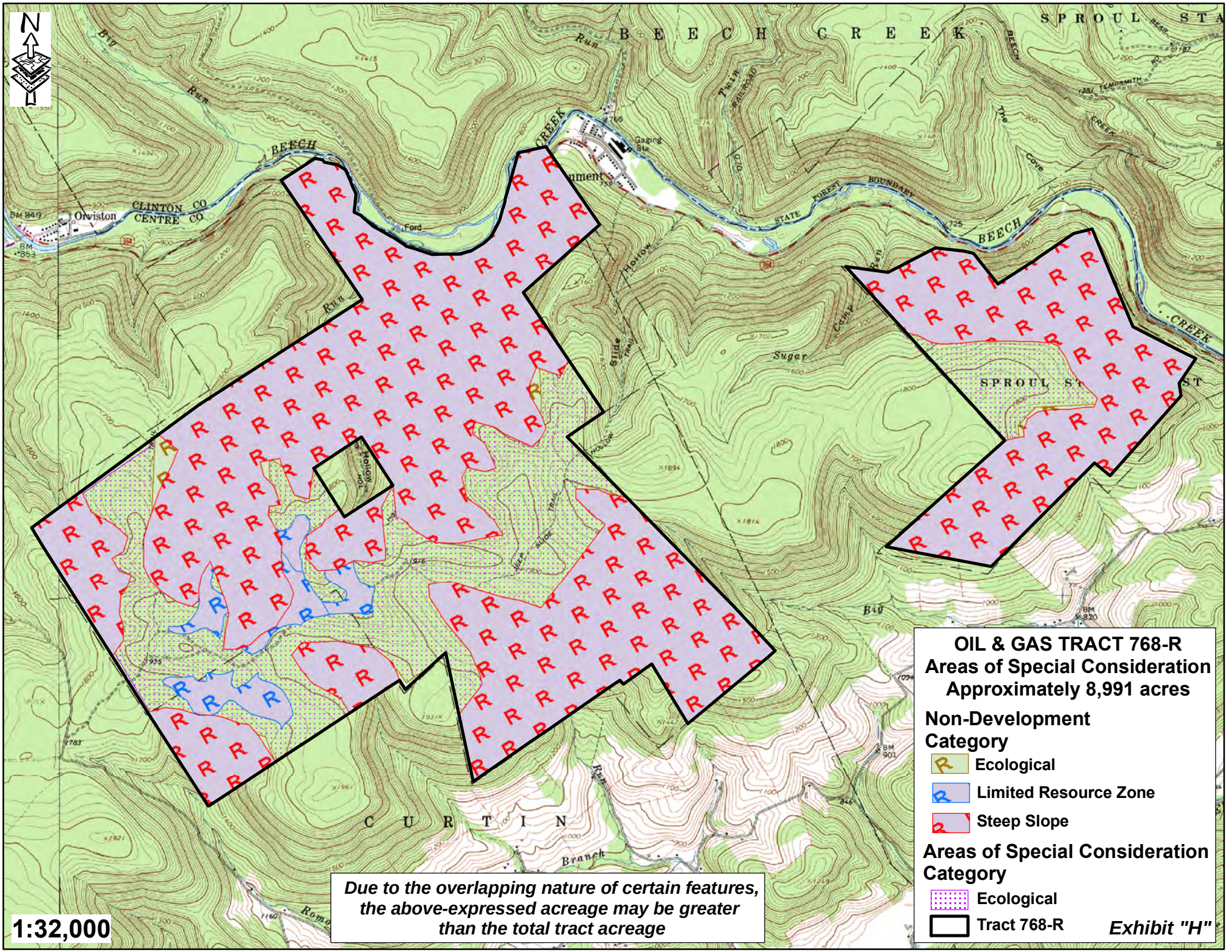

HYNER MOUNTAIN
SUSQUEHANNA RIVER
BRANCH
Farwell
Tamarack Island
Hyner
St. Joseph's Cem
CONRAIL
McCloskey Hollow
Schoolhouse Hollow
Goodman Hollow
McCloskey Island
Stevens Hollow
Grandpap Valley
Grass Run
SPROUL STATE FOREST
STATE FOREST
OIL & GAS TRACT 271-S
Non-Development Tract
Non-Development
Tract 271-S
Exhibit "H"
1:36,000


OIL & GAS TRACT 337-R
Areas of Special Consideration
Approximately 2,374 acres
Non-Development Category
Limited Resource Zone
Steep Slope
Areas of Special Consideration Category
Recreation
Ecological
Tract 337-R
Exhibit "H"
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:24,000


OIL & GAS TRACT 338-R
Areas of Special Consideration
Approximately 955 acres
Non-Development Category
Limited Resource Zone
Steep Slope
Areas of Special Consideration Category
Ecological
Tract 338-R
Exhibit "H"
1:24,000
CLINTON CO
CENTRE CO
Panther Hollow
Bloom Draft
Panther Fire Tower
Shanty Run
Bog Ore Run
Kyler Run
Log Hollow
Eddy Ridge
Rainbow Ridge
Jeep Trail
Kyler Fork
Wolf Branch
Har Brac
Frenchman
Lost
Trail
Road
2167
2198
2146
2186
2178


CLINTON CO
CENTRE CO
Panther Hollow
Bloom Draft Camp Bloom
Kyler Fork
Panther Fire Tower
BM 2198
BM 2291
RAINBOW TRAIL
RIDGE ROAD
PIPELINE
BURNSIDE
1:24,000
OIL & GAS TRACT 339-R
Areas of Special Consideration
Approximately 3,423 acres
Non-Development Category
Limited Resource Zone
Steep Slope
Areas of Special Consideration Category
Ecological
Recreation
Tract 339-R
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
Exhibit "H"


N
BEECH CREEK
The Hemlocks Camp
Water Rocks
BM 2302
Burns Run Camp
Sowot Camp
Triple Oak Camp
BM 1843
PLANTATION
TRAIL
Branch
OIL & GAS TRACT 750
Areas of Special Consideration
Approximately 5,477 acres
Non-Development Category
Ecological
Limited Resource Zone
Steep Slope
Areas of Special Consideration Category
Recreation
Ecological
Tract 750
Exhibit "H"
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:24,000


N
BEECH CREEK
SPROUL STA
Big Run
BEECH Run
CLINTON CO
CENTRE CO
Oriviston
BM 849
BM 853
Ford
Gaging Sta
Twin Railroad
The Cove
STATE FOREST BOUNDARY
BEECH CREEK
Hollow
Slide
Camp Run
Sugar
SPROUL ST
Big
BM 820
BM 901
CURTIN
Branch
OIL & GAS TRACT 768-R
Areas of Special Consideration
Approximately 8,991 acres
Non-Development Category
Ecological
Limited Resource Zone
Steep Slope
Areas of Special Consideration Category
Ecological
Tract 768-R
Exhibit "H"
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:32,000

COMMONWEALTH OF PENNSYLVANIA
Department of Conservation and Natural Resources
May 10, 2010
717-783-0387

SUBJECT: Environmental Review **SFER – 001001**
May 2010 Oil and Gas Lease Offering

TO: Daniel A. Devlin
State Forester

FROM: Craig A. Chapman
Forest Resource Planner

This review was placed in circulation for critical analysis on April 26, 2010. No negative comments were received.

Please approve or disapprove this project based on the information in the attached packet. Any amendments to the packet will require another critical analysis and resubmission of this form for your review and signature.

If you decide to disapprove this project please list the conditions that need to be met for the project to meet your approval, or why the project cannot be approved at this time.

Daniel A Devlin 5/20/10
APPROVED **DATE**

_____
DISAPPROVED **DATE**

Comments on Disapproval:

☐ The project will be reconsidered after the following items are addressed:
☐ The project cannot be approved at this time because:

_____

_____

_____

_____

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

BUREAU OF FORESTRY

FY 2009-10 OIL & GAS LEASE SALE STATE FOREST ENVIRONMENTAL REVIEW

Prepared by:

Bureau of Forestry
Department of Conservation
and Natural Resources

November 9, 2009

FY 2009-10 OIL & GAS LEASE SALE
STATE FOREST ENVIRONMENTAL REVIEW

PURPOSE

The purpose of this report is to describe the FY 2009-10 Oil and Gas Lease Sale currently scheduled to occur on Tuesday January 12, 2010 at 2 pm. The project review criteria include a description of the project, the proposed lease area, project assessment related to a number of ecological, operational and stakeholder considerations as well as any actions necessary to ensure that the lease sale upholds the principles associated with sustainable ecosystem management.

The Bureau of Forestry typically conducts an environmental review for any project on State Forest lands that may or will disrupt or otherwise modify the existing land use. The planning process for the FY 2009-10 Oil and Gas Lease Sale began approximately ten (10) months ago. Based on the preliminary results of this review and subsequent discussions within the agency, the Department determined it was adequately prepared to meet the terms of the budget legislation enacted in mid-October for FY 2009-10 (July 1, 2009 through June 30, 2010) while still minimizing environmental impacts and maximizing revenue.

For most projects, the appropriate district forester or district staff completes the environmental review. As a result of size and scope of this project, the Bureau of Forestry utilized a planning process for the FY 2009-10 Oil and Gas Lease Sale, which was identical to that used for the September 2008 lease sale, and consolidated the results into a single document. The environmental review and all associated information will be made available to the public via the Internet.

BACKGROUND

Exploration and development of natural gas resources has been ongoing for more than 60 years on State Forest land as part of the array of resources, uses, and values of the State Forest. Since 1947, DCNR has held 73 lease sales offering the oil and gas industry the opportunity to access State Forest lands in a controlled manner while providing the mechanism for the recovery of hydrocarbon resources. As a result of this comprehensive history, approximately 1,400 wells have been drilled on *fee simple* State Forest lands. Currently, there are approximately 700 producing wells.

DCNR lease sales consistently have been predicated by oil and gas industry nominations. Industry expresses an interest in natural gas exploration on State Forest land by submitting written nominations specifying certain tracts of land for consideration in an upcoming lease sale. The Bureau of Forestry reviews and acknowledges these confidential nominations while periodically offering nominated tracts of State Forest land for lease by competitive bid. DCNR last held an oil and gas lease sale in September 2008.

Industry interest in leasing State Forest land has significantly increased since the initial Marcellus Shale-focused lease sale in 2008. Currently, 5 million acres of State Forest land has been nominated (i.e., tracts have been nominated more than once by separate companies). State Forest land is attractive to outside parties due to the

subsurface geology as well as the size and contiguous nature of our State Forests. Large blocks of land with a single land owner are heavily sought after due to the ease associated in dealing with one entity rather than many as is the case throughout most of the state.

Arguably, the biggest development in domestic natural gas plays in recent years has been the Appalachian-based Middle-Devonian aged Marcellus Shale. Over the last eighteen (18) months, numerous companies have experienced success drilling moderately deep Marcellus Shale wells throughout portions of Pennsylvania. A large majority of the exploration and development activity in the Marcellus Shale has occurred in two distinct regions within the Commonwealth - the southwestern and northeastern corners.

The Marcellus Shale is the basal member of the Hamilton Group and is characterized as thick, organic-rich black shale ranging in depth from approximately 5,500 – 8,500 feet below the surface throughout a majority of Pennsylvania. Regionally uniform, the Marcellus stretches from New York to West Virginia and into portions of Kentucky. The organic composition (total organic carbon as high as ten percent [10%]) of this shale has long been thought to be the source of natural gas found within numerous sandstone reservoirs throughout Appalachia.

The known geologic parameters of the Marcellus lend itself to supplying large quantities of natural gas in north-central Pennsylvania. Much of the Marcellus fairway happens to be coincident to State Forest land. Additionally, State Forest lands in north-central Pennsylvania are also prospective for the potential Tuscarora, Utica and Trenton-Black River reservoirs many geoscientists believe exist in this region. Nominations for potential leasing indicate that there is a high level of interest by the oil and gas industry to pursue exploration for the Marcellus Shale, as well as deeper potential reservoirs, beneath State Forest land.

Although this environmental review is based on the Bureau's deliberations on the scope, potential impacts and benefits of these deep gas plays, the legislated directives expressed in this year's budget frame the importance of this comprehensive review. Based on these deliberations, the Department decided to pursue this opportunity under a portion of the State Forests where our management protocols will support natural gas exploration and development as well as satisfy our legal mandates to offer State Forest land for this purpose.

DCNR plans to hold a natural gas lease sale (auction) at which time the Department will accept bids from pre-qualified bidders for the leasing of six (6) tracts of State Forest land, comprising thirty-one-thousand-nine-hundred-sixty-seven (31,967) acres in Cameron, Clearfield, Clinton, Potter, and Tioga counties (*Appendix A-Tract Maps*). The lands contained in the lease sale auction are being proposed for the controlled leasing of subsurface oil and gas rights only.

PROJECT OVERVIEW

Approximately 32,000 acres of State Forest lands are included in the FY 2009-10 Oil and Gas Lease Sale. Although the subsurface natural gas rights provide for the exploration and development of the entire area, only a small portion of the total acreage would be used for well site locations, pipeline development or access roads. Drilling moderately deep to deep natural gas wells is expensive due to the depths of these

formations as well as the technologies required to prudently develop the natural gas resources.

Appalachia's oil and gas industry is currently undergoing tremendous growth (a boom). The current boom is best characterized by the need for a lease position quickly followed by a sharp increase in drilling permits. Based on the current market demands, the Bureau of Forestry has estimated that at least ninety percent (90%) of State Forest land will be successfully leased through competitive bidding during the FY 2009-10 Oil and Gas Lease Sale. Operators ante up the first year's rentals through a bonus bid process where the highest-dollar-per-acre rate obtains the lease for an individual tract of State Forest land. The following years' rental payments are fixed per the lease agreement.

It is extremely difficult to predict the number of well sites that will be developed as a result of a successful FY 2009-10 Oil and Gas Lease Sale. Estimates have ranged from zero (0) to more than seven-hundred (700) due to multiple wells per well pad. However, at this time, DCNR is projecting between one-hundred-fifty (150) and three-hundred (300) wells – between twenty-five (25) and fifty (50) well pad sites - will be developed on State Forest land as a result of this lease offering. This estimate is based on:

- The expected nature of the Marcellus reservoirs with "sweet spots" being developed over time;
- An estimated six (6) to eight (8) wells per well pad;
- The estimated drainage area per horizontal well bore (~80-100 acres);
- Drilling costs associated with the depth of the gas likely to be found in the Marcellus Shale or deeper reservoirs; and
- Amount of land excluded from surface activity including non-development areas (18,402 acres w/ overlapping features), viewsheds and other environmental considerations.

Based on the Departments' best estimate of thirty-five (35) to fifty (50) well pad sites, each well pad's "footprint" will be about four (4) to five (5) acres. During drilling, a rig will be onsite for about twenty (20) to thirty-five (35) days per well, after which time a successful well will be fitted with a wellhead and hooked up to a pipeline. Marcellus operators have determined that multiple gas wells collocated on a single well pad site are required to achieve economic gas recovery from the Marcellus Shale. An individual well may produce gas for several decades or more.

ENVIRONMENTAL SAFEGUARDS

DCNR has adopted a multi-level approach for managing potential impacts to the environment when leasing State Forest lands for oil and natural gas exploration and development.

First-level environmental safeguards involved the establishment of "non-development" areas, such as State Parks and State Forest wild and natural areas, where no surface activity is permitted. Non-development portions of a lease tract state that no surface activity or development will be permitted. More specifically, no well sites, pipelines, roads or related disturbances will be permitted in these areas. Detailed buffer zones have been devised to protect areas of ecological, recreational and aesthetic

importance, such as water bodies, roads, trails and buildings. Non-development areas total approximately eighteen-thousand-four-hundred-two (18,402) acres; fifty-seven and six-tenths percent (57.6 %) of the acreage being offered for lease. Please note that this acreage total is cumulative and is not differentiated within overlapping non-development zones (*Appendix B – SFER Maps*).

Site-specific second-level safeguards include, but are not limited to, requiring Pennsylvania Natural Diversity Inventory (PNDI) coordination for disturbances associated with well locations, well spacing and construction specifications for roads and pipelines. These specifications are contained in the *Oil and Gas Lease for State Forest and Park Lands* (Appendix A) and are administered on the ground by the Bureau of Forestry's district foresters. Specific environmental and ecological protections and safeguards can be found in the lease agreement.

Third-level environmental safeguards require compliance with all applicable Department of Environmental Protection (DEP) regulations. These laws and regulations are solely administered by DEP and are distinct and separate from DCNR requirements.

PROJECT AREA DESCRIPTION

DCNR is proposing to hold a natural gas lease sale for the leasing of six (6) oil and gas lease tracts, comprising thirty-one-thousand-nine-hundred-sixty-seven (31,967) acres of State Forest land in Cameron, Clearfield, Clinton, Potter, and Tioga Counties (*Appendix A*). The proposal includes the subsurface oil* and natural gas rights beneath State Forest land in the Elk, Moshannon, Sproul, Susquehannock and Tioga State Forests.

** - It is highly unlikely that oil will be encountered during routine exploration for natural gas in this region; including the oil rights is standard business practice as the substances are often found together when both are present.*

PROJECT REVIEW ITEMS:

1. Consistency with State Forest Resource Management Plan

The overarching goal for the management of State Forest lands is: To manage state forests sustainably under sound ecosystem management, to retain their wild character and maintain biological diversity while providing pure water, emphasizing opportunities for dispersed recreation, habitats for forest plants and animals, sustained yields of quality timber, and environmentally sound utilization of mineral resources.

Our current policy statement contained in the State Forest Resource Management Plan (2008) states: Geology is a critical component of State Forest management. The mineral resources associated with State Forest lands will be managed for the long-term good of the citizens of the Commonwealth of Pennsylvania. All exploration, development, and utilization will incorporate environmentally and financially sound methods.

This lease sale is a direct result of certain line items contained within the budget agreement and fiscal code for FY 2009-10. Following the success of the September 2008 Lease Sale, DCNR and the Bureau of Forestry had decided to not to offer additional lands for lease but rather study the Marcellus play and the operational developments and requirements on the 660,000 acres within the Marcellus fairway subject to valid lease agreements. Although the FY 2009-10 Oil and Gas Lease Sale will satisfy the legislated requirements, the impending sale still meets the Bureau's management guidelines and protocols.

In summary, the FY 2009-10 Oil and Gas Lease Sale conforms to the Bureau's stated policy and goals. Furthermore, this sale effort is designed to meet the legislated requirements to generate bonus bid revenues, totaling $60,000,000, for inclusion in the General Fund in FY 2009-10.

2. Erosion and Sedimentation

Potential surface disturbances associated with oil and gas well activities include well site clearing, well pad construction, access road construction, multi-phase construction of pipeline gathering/marketing systems, site restoration and activities associated with geophysical or "seismic" surveys.

Runoff and erosion with subsequent sedimentation are potential impacts to adjacent and surrounding forests, wetlands and streams. Potential for erosion and sedimentation depends on many factors such as terrain, soil type, rain events and length of time of bare soil exposure. Erosion and sedimentation controls are addressed in *Exhibit "C*" (*Stipulations for Protection and Conservation of State Forest and Park Lands*) of the Oil and Gas Lease. More specifically, Section 7 (Siltation) of *Exhibit "C"* designates that a Lessee must have an approved site-specific Erosion and Sedimentation Control Plan

that meets the criteria set by DEP's Title 25, Chapter 102 regulations. This plan is required to be available on-location during all exploration and development activities.

Intermittent soil erosion and sedimentation may be expected to occur with surface clearing activities. However, these impacts will be minimized through certain lease provisions as well as adherence to federal and state laws and regulations including Federal Clean Water Act, National Pollutant Discharge Elimination System permit requirements, PA Clean Streams Law, and various DEP regulations.

All earth disturbances of one (1) acre to less than five (5) acres in extent that have a point source discharge to surface waters (channel of conveyance) are required to have a National Pollution Discharge Elimination System (NPDES) permit (25 Pa. Code § 92). The only exceptions to this requirement are earth disturbances that are part of agricultural plowing or tilling, road maintenance and timber harvesting activities. An individual permit (25 Pa. Code § 92.83.9) is required if the activities are in a High-Quality/Exception Value watershed (Chapter 93). These permits necessitate special protection requirements as outlined in Chapter 102, Section 102.4(b)(6).

Oil and natural gas operators proposing earth disturbance activities that are five (5) or more acres at one time over the life of the project, must complete DEP's Notice of Intent (NOI) authorization for the Erosion and Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing, or Treatment Operations or Transmission Facilities (ESCGP-1)

DEP regulates and enforces other laws and regulations (provisions) to which an operator is legally bound. These provisions include, but are not limited to, the Oil and Gas Act (Act 223), Oil and Gas Conservation Law (Act 359), Coal and Gas Resource Coordination Act (Act 214), Clean Streams Law (Chapter 91), Solid Waste Management Act (Act 97), and Non-Coal Surface Mining Conservation and Reclamation Act (Chapter 77).

3. Surface Water Quality

Degradation of water quality can result from possible sedimentary, thermal and chemical pollution of surface waters. The potential for sedimentation and the appropriate mitigating environmental controls were discussed above under Erosion and Sedimentation. Additional provisions are included in *Exhibit "C"* (*Section 8 - Waters*) of the lease agreement.

Thermal pollution, or increases in water temperature, can result if vegetation (shade) is removed from streamside or riparian zones. These concerns are addressed in *Section 23* (*Drilling Restrictions*) of the oil and gas lease agreement. Specifically, the lease states that no drilling or wellsite clearing is permitted within two-hundred (200) feet of a stream or body of water. Furthermore, no drilling or wellsite clearing is permitted within three-hundred (300) feet of any exceptional value (EV) stream or body of water.

These standoffs exceed the criteria established in the Bureau's Aquatic Buffer Guidelines (Effective January 1, 2007).

Although unlikely, the potential exists for chemical pollution from recovery of drilling fluids (including brine), or from a spill of fluids used in the construction of wells such as gasoline, diesel fuel and various oils and lubricants. Additionally, accidental or unintentional spills of hydrocarbon fluids, although rare, are possible. The adverse impact associated with a pollution event depends on the amount of fluids spilled and released (concentration and time), the surficial geology, and soil type associated with the specific sites. Each permitted well will have a Preparedness, Prevention and Contingency Plan (PPCP) approved by DEP to address these concerns. All applicable laws, regulations and appropriate mitigation strategies apply.

Marcellus wells throughout Pennsylvania have (to date) not been found to produce reservoir-brine. The formation is considered "dry". Fluids encountered during well drilling and completion activities must be handled, treated, and disposed of according to DEP regulations (i.e. DEP-Chapter 78, Chapter 95, Chapter 16; Act 223-Sections 204 through 210, 215; EPA UIC 40 CFR Parts 144, 146, & 147).

4. Air Quality

Exploration, development, and production activities associated with drilling, completing, and producing natural gas wells have the potential to temporarily contribute internal combustion engine exhaust, dust, smoke, and other gaseous pollution to the atmosphere. The use of machinery and/or heavy equipment will produce emissions such as carbon monoxide, nitrogen oxide, and sulfur dioxide. Equipment operated or transported along dirt/gravel road or pad sites may result in temporary increases in dust or particulate matter. These emissions are covered by the Air Pollution Control Act (P.L. 2119, 35 P.S. 4001, et seq.) as well as *Exhibit "C"* (*Section 1-Environmental Quality Control*) of the lease agreement.

Compression facilities will be required within the leased premises. Today's compressors typically utilize electricity, natural gas, or a combination thereof (e.g., gas-powered generators) as operating fuel. Compressors are generally housed within a shed-like structure equipped with proper sound-proofing and ventilation devices. Limited emissions produced from compression facilities are not expected to have an adverse effect on air quality due to the clean-burning fuel used for power as well as the open, non-populated landscapes where these facilities will be located.

The potential emissions resulting from all phases of natural gas exploration, development, and production will be well within the acceptable environmental standards. Excessive dust resulting from use of dirt and gravel roads will be handled using normal Forest District procedures. The use of water and/or other similar suppression mechanisms/treatments on a periodic basis greatly reduces dust levels.

5. Water Quantity

The Bureau was established, in part, to protect those watersheds integral to the growth and viability of the Commonwealth. Municipalities and other forest users rely on the State Forests not only for a source of water but also to provide the necessary protections for other downstream users. A decline in water quantity can be detrimental to aquatic communities, local fisheries and potable water sources.

Pennsylvania's surface waters are monitored and regulated by DEP's Bureau of Watershed Management (BWM). Act 220 was created in 2002 to provide for the identification of a "significant hydrologic unit where existing or future demands exceed or threaten to exceed the safe yield of available water resources" also known as Critical Water Planning Areas (CWPAs). The demand on water resources were assessed on several criteria which include the following: Size of Hydrologic Unit; Time Horizon; Existing and Future Demands including Population Projections; Withdrawal and Non-Withdrawal Uses; and Safe Yield of Available Resources including developing Watershed Water Budgets, Water Quality, Aquatic Resource Uses and Other Critical Uses.

Act 220 created a statewide water withdrawal and use registration and reporting system. More specifically, Act 220 requires any person, organization, or entity that withdraws or uses 10,000 or more gallons of water per day, over a 30-day period, from one or more points of withdrawal in a watershed operated as a system, to register and then periodically report their water withdrawal and usage to DEP. Annual reporting, of withdrawals and use, is also required (DEP, Sept. 2007). Additional reporting and/or filing is required by the Susquehanna River Basin Commission (SRBC) and the Delaware River Basin Commission (DRBC).

The SRBC has exercised its authority to review, approve, control, and monitor any consumptive use within the river basin specifically relating to surface water withdrawals, as well as groundwater withdrawals, for oil and gas completion operations (*Please note: due to the absence of an Ohio River Basin Commission, DEP applies the SRBC standards and protocols for those water withdrawals contained within this river basin – e.g., Tract 416*). Working in conjunction with DEP, an operator must have a SRBC-approved water source(s) for use during completion operations prior to an oil and gas permit being issued. The water permitting process is explicit and complex. More specifically, the SRBC requires that certain biological and hydrologic assessments and surveys are completed and included within the permit application. Based on the hydrologic characteristics of a given (surface) watercourse, the SRBC may typically allow a fraction (e.g., 10%) of the seven (7) day, ten (10) year average-discharge (e.g., stream flow) (Q7-10) for a surface withdrawal from a stream. Similar protocols, such as a seventy-two (72) hour aquifer test, are required for permitting groundwater withdrawals.

Unlike Appalachia's conventional oil and natural gas reservoirs, the Marcellus Shale requires the use of massive induced hydraulic fractures (fracs) for the strata to produce economic quantities of natural gas. In addition to proppant (typically sand used

to keep the fractures open), Marcellus fracs contain massive amounts of water and gel. This is known as a "slick-water frac". The water when mixed with the non-toxic gel forms a jello-like substance that is forced down the well bore and into the underlying rock at very high pressures. This process does not pose any threat to the surface attributes as fracing is completely underground.

Frac techniques are currently being honed and tweaked to determine what method(s) produce the best results for the least amount of capital investment. To date, the preferred frac technique(s) uses approximately three- to five-million (3-5,000,000) gallons of water to perform. Water use is dependent on the number of frac stages as well as the size of a given stage. These variables are determined on a well by well basis once formation heterogeneities and rock mechanics are properly delineated and accounted for. The most commonly utilized source(s) of water are typically surface streams and/or commercial suppliers with on-site storage via frac tanks or centralized impoundments. Regulation and compliance are subject to the provisions of Act 220 as well as Act 223 (Chapter 4, pg 73a-81).

The SRBC, as part of the water withdrawal permitting process, that the applicant submit a signed "surface access agreement" (between applicant and surface owner) clearly stating that the applicant has the express permission of the landowner to utilize said surface lands as a "take-point" for obtaining water from a surface stream. This provision is required regardless of ownership (i.e., public or private). Therefore, although DCNR has no regulatory authority to approve or deny a water withdrawal application, the opportunity exists to approve all proposed take-points prior to a withdrawal permit being issued. Therefore, by default, surface landowners have been given "defacto" regulatory authority.

Future water withdraws will be coordinated with the appropriate agencies (i.e., DEP, SRBC, PAFBC) to ensure that the watershed and associated wetlands will not be negatively impacted.

6. Groundwater

The Bureau maintains strict protocols that govern the protection and sustainable use of the groundwater resources beneath State Forest lands. *Exhibit "C"* (*Section 17-Water Wells*) of the lease agreement provides the Lessee with the option to drill and develop water wells, subject to the written approval of the Bureau, for use in natural gas exploration and development on that lease tract. Water well development for this purpose is subject to Act 610 (P.L. 1840) which provides for the orderly development of ground water resources.

Wells developed under the above lease provision are not intended to provide the massive volume(s) of water required for a Marcellus Shale frac. Although the original intention of this provision was to provide a Lessee with access to water for use in traditional frac process associated with shallow Upper Devonian natural gas development, a properly sited groundwater well, exuding a consistent and sustainable

yield, may be able to supplement water withdrawals from surface waters and/or commercial sources. These water wells may also be drilled and developed for dust suppression or other uses such as potable water source for drilling crews.

Chapter 4 of Act 223 (pg 73-81) specifies DEP's casing requirements for the protection of groundwater resources. All drilling, casing, cementing, and well completion practices (including fracs) are to be carried out in such a manner that protects fresh ground water. A lessee's well casing program must be designed in accordance with 25 PA Code § 78.81 – 78.86 and 25 PA Code § 78.62 and § 78.63 while accounting for a) Burst Strength, b) Tension, and c) Collapse. All top-hole water must be kept free of pollution or contamination by additives, brine, oil, and anthropogenic-induced conditions.

Future water withdraws will be coordinated with the appropriate agencies (i.e., DEP, SRBC, Army Corps) to ensure that groundwater/aquifers and associated wetlands will not be negatively impacted.

7. Soils

Surface disturbances associated with oil and gas well activities include well site clearing, well pad construction, centralized impoundment construction, access road construction, pipeline construction and site restoration activities associated with geophysical surveys. Potential problems associated with these activities include soil compaction or chemical pollution associated with spills or mishandling of industrial fluids.

Compaction, resulting from repeated use by heavy equipment, affects soil moisture regimes and drainage thereby affecting vegetative productivity. Equipment is present during the construction phase of gas well development and is typically removed following the successful completion of a natural gas well. The lease requires preparation of an Erosion and Sedimentation Control Plan as outline in Item 2 above however the following procedures are highly recommended:

> *Soil Compaction Mitigation* – Test topsoil and subsoil for compaction at regular intervals in areas disturbed by construction activities; Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate pre-construction conditions; Use penetrometers or other appropriate devices to conduct compaction tests.
>
> *Topsoil Segregation* – Prevent the mixing of topsoil with subsoil by stripping topsoil from the full work area and subsoil storage area; Maintain separation of salvaged topsoil and subsoil throughout all construction activities; In areas where topsoil has been segregated, plow the subsurface before replacing the segregated topsoil; Perform appropriate soil compaction mitigation.

Pollution from fluid spills could impact soil productivity and depending on extent, could reach groundwater resources. The potential for chemical spills, subsequent

mitigation, and groundwater protection are discussed above in Items # 3 and #6 respectively.

8. Unique and Unusual Geologic Features

DCNR's Bureau of Topographic and Geologic Survey published a two-volume book titled "Outstanding Scenic Geologic Features of Pennsylvania" (1979). This comprehensive work documents outstanding geologic and topographic features throughout the Commonwealth. These sites have been incorporated into the Pennsylvania Natural Heritage Program (PNHP) and Pennsylvania Natural Diversity Inventory (PNDI) information systems. All activities associated with oil and gas development undergo a PNDI review prior to the commencement of earth moving activities. Surface use of these areas for gas activities will be avoided.

9. **Aesthetics**

The aesthetic qualities of the State Forest system play a key role in attracting forest users. State Forests provide a large serene wooded landscape for public use and enjoyment.

Non-development areas have been delineated to preserve certain aesthetic features of the State Forest system. Surface disturbance is prohibited in any area that has been designated as non-development. For example, all State Forest wild and natural areas are non-development.

Development and construction of well sites, roads and other related infrastructure may negatively impact the visual aspect of some portions of the State Forest. Viewscapes (or viewsheds) are the scenic portions of the landscape that can be seen primarily from a transportation corridor (i.e., road or trail). Any visual impact will depend on proximity of gas wells to viewshed features such as vistas, public use roads, trails, State Parks, or other high-use areas.

Impact on publicly viewed areas has been considered prior to implementing forest management activities associated with natural gas exploration. Viewsheds have been specifically investigated throughout the lease sale analysis process. Any future well site will minimize, to the extent possible, any adverse affect on the visual experience of the State Forest user as well as the aesthetic values of the viewshed. Important viewsheds (i.e., Historic Route 6 viewshed) have been identified and zoned as areas of special consideration where surface disturbance is extremely limited and reviewed on a case-by-case basis.

The landscapes where most activity may occur have been actively managed in the past. These areas typically contain roads, trails, pipelines, and log landings as well as a variety of forest conditions. The regional landscapes contain forest stands of varying species composition and ages, reflecting the Bureau of Forestry's past forest management activities.

DCNR has several control measures contained within the lease agreements to minimize visual impacts. Well site spacing is limited to the derivative-based formula (as outlined below in *Item 16*), whereas the total number of permissible well pads has been predetermined and clearly stated within the lease agreement. All applicable buffers, as designated in Oil and Gas Lease Agreement as well as the Aesthetic Buffer and Aquatic Habitat guidelines (roads, trails, and streams) shall be adhered to unless the a written waiver is applied for and subsequently granted by the District Forester (certain buffer variances require a SFER).

The District Forester will maintain a record of all such requests and specifically notate whether or not said waiver was granted (or denied) and the reason for doing so. Existing openings, roads and rights-of-way will be utilized wherever possible. Any impacts on visual resources from seismic activity should be slight and temporary.

10. **Noise and Light Levels**

Noise levels will temporarily increase as a result of activities associated with the exploration and development of Marcellus Shale (or deeper) gas on State Forest lands. Potential impacts include temporary increases in noise levels as a result of seismic exploration, construction of well sites, compressors, roads or pipelines, well drilling, and truck traffic.

Adverse impacts from an increase in noise levels depend on distance from noise source, weather, topography and vegetation. The primary increases in noise level will result from well drilling, compression facilities, truck traffic, and road and pipeline construction. Seismic and maintenance activity may also result in localized, very short term increases in the ambient noise level within the State Forests.

Noise level will be a considered throughout the well location approval process by the appropriate program area(s) within the Bureau of Forestry. Wherever possible, well site locations will be located in a manner to alleviate temporary increases in background noise levels in high use areas such State Park campsites or State Forest Picnic Areas.

The use of lighting may temporarily impact the night sky as a result of drilling activities. Natural gas drilling is a twenty-four (24) hour per day activity that requires proper illumination for the health and safety of the drilling crews. This impact should occur in a limited fashion and last no longer than the time required to properly drill and complete a natural gas well (i.e., two or three weeks).

In those areas where current pipeline infrastructure may be lacking, well flaring, immediately following completion activities, will be required. Well flaring is the method by which an operator burns natural gas during frac flowback whereby frac water is flowed back to the surface (via the wellbore) in an attempt remove as much water as possible from target formation as quickly as possible. During a flare, a vertical stack is placed away from the wellhead and any produced gas is burned. The stack and corresponding flame is very similar to a super-sized candle burning for a prolonged (i.e., up to two weeks) period of time.

Coordination with the operator(s) will be required to minimize or eliminate (light-induced) impacts during Dark Sky events. These strategic planning activities will require the involvement of both the bureaus of Forestry and State Parks.

11. **Archeological Sites and Historic Sites**

The Pennsylvania Historic and Museum Commission maintains information relevant to the Commonwealth's significant historic and archeological sites. Information on the known locations of these sites on State Forest lands has been shared with the Bureau of Forestry. The Bureau has initiated a system to identify these sites and notify the Commission of any action that may disrupt these resources.

All earth disturbance activities associated with oil and gas development undergo an archeological review prior to siting. Use of these sites for natural gas activities will be avoided as provided by law. Discovery of potential new sites or artifacts will be forwarded to the Historic and Museum Commission for their review and documentation.

12. **Recreation Sites and Opportunities**

Natural gas (Marcellus Shale or deeper) exploration and development activities could affect some recreational experiences on State Forest lands. Increased noise levels and potential visual impacts could affect the recreational experiences of State Forest visitors'. Any potential impact directly depends on the visitor's activity and location within the State Forest as well as their expectation of a particular experience.

Although it is not anticipated, some roads may be temporarily closed during drilling operations or other peak periods of heavy use to reduce potential safety hazards. Actions to limit road access will be made on a case-by-case basis at the discretion of the District Forester. Drilling periods on any given well are anticipated to last three to four weeks under normal conditions. At the end of the drilling period, if roads are closed, they will be reopened.

Areas under lease will be open for traditional uses; however the immediate well site (4 to 5 acres) will be closed to the public during drilling operations. If a well is successful, only the immediate surrounding area will continue to be restricted to the public. Public access is restricted to the well location during the drilling and completion phase of operations. The well site is normally occupied twenty-four (24) hours a day, seven (7) days a week during well drilling. The lessee (operator) provides the necessary security during these operations at no cost to DCNR.

Historically, the natural gas drilling season on State Forest lands typically lasted from mid-March through November 1. This seasonal window allowed Lessees to explore for and develop natural gas reserves prior to the on-set of Pennsylvania's major hunting season(s) and inclement weather. There may be instances where, due to equipment limitations, timing to avoid ecological impacts, logistical snafus, or due to an acceptable operational plan that limits road impacts and preserves the hunting traditions, that a Lessee is permitted to operate beyond the November 1 date. These types of exceptions

will be reviewed on a case-by-case basis. Furthermore, actions to limit hunter access to reduce potential safety hazards will be made where necessary.

DCNR has implemented several measures to minimize impacts on the recreating visitor. State Parks and State Forest Wild and Natural Areas are "non-development areas" and, therefore, are excluded from all surface activity. As mentioned above, a buffer system has been developed to protect parks, natural and wild areas, streams, roads, trails, and other recreational features.

Additional areas of special consideration have been delineated using a GIS-based analysis. The Recreational Opportunity Spectrum (ROS) delineates certain recreational experiences available to a forest user based on current, existing surface use. Two (2) such delineations exist with those areas designated by ROS as Semi-Primitive Non-Motorized. These areas have been zoned "non-development" (2,856 acres) or "area of special consideration" (7,546 acres) thereby protecting these unique recreational experiences. The major difference between these zoning classes within the same ROS designation is a result of the presence of existing haul roads or other anthropogenic features.

ROS Semi-Primitive Non-Motorized Class Definition

Semi-Primitive Non-Motorized areas are normally 500 acres in size or larger and located at least one-half (1/2) mile from all non-gated (open to the general public) roads, railroads, and trails with motorized use. Accessible only by foot or equine, there is no motorized use by the public although administrative use may be conducted by motor vehicle. Interaction between forest visitors is low resulting in the high probability of experiencing isolation, remoteness, independence, and closeness to nature. These areas are sought after by visitors seeking self-reliance and the possibility of challenge and risk. Openings in the forest canopy may be the result of either natural or anthropogenic occurrences. Management goals for this ROS class include providing a non-motorized semi-primitive recreational experience as well as necessary forest management.

Other recreation-based areas of special consideration specifically pertain to those hiking trails previously identified as either State Forest Hiking Trails or National Scenic Trails. The following guidelines apply.

State Forest Hiking Trails (SFHTs)

DCNR-Forestry gave special recognition to a discreet number of hiking trails that were designated primarily for foot travel only. Currently, there are eighteen (18) trails totaling seven-hundred-ninety-one (791) miles carrying this designation. A large majority of the SFHT mileage is located on State Forest land; however these trails also traverse other public and private lands. SFHTs are subject to a 100-foot "non-development" buffer on both sides of the trail. Any proposed disturbance activity within a SFHT buffer zone requires written approval prior to commencement.

National Scenic Trails (NST)

The National Park Service designates the National Scenic Trail (NST) system. Currently, there are sixty (60) miles of NSTs on State Forest land. All sixty (60) miles are

encompassed within three (3) trails: Appalachian, North Country, and Laurel Highlands. NSTs are subject to a two-hundred (200) foot aesthetic/non-development buffer zone on both sides of the trail.

13. Public Health and Safety

Public health and safety concerns center on fire hazard, pollution potential, and well blowouts. Safety requirements are contained in the DCNR Oil and Gas Lease; more specifically, Section 24 (*Drilling Operations*) and Section 18 (*Deep Well Control Insurance and Safety*).

Public access is restricted to the well location during the drilling and completion phase of operations. The well site is normally occupied twenty-four (24) hours a day, seven (7) days a week during well drilling. The lessee (operator) provides the necessary security during these operations at no cost to DCNR.

If and when economic natural gas production is established, public access will continue to be restricted to the immediate area around the well and its equipment until production ceases. Vandalism has been minimal throughout the history of the natural gas leasing program. Although isolated, lessees are encouraged to document, to the best of their ability with pictures and prose, any vandalism that occurs and provide said documentation to the District Forester.

State and Federal regulations require compliance with the U.S. Department of Labor's Occupational Health and Safety Administration (OSHA) (http://www.osha.gov/SLTC/etools/oilandgas/index.html). Specific OSHA standards for oil and natural gas drilling, servicing, and storage can be found here: http://www.osha.gov/SLTC/oilgaswelldrilling/standards.html. The Federal Environmental Protection Agency (EPA), through the Underground Injection Control Program (Safe Drinking Water Act, 42 U.S.C.A. Section 300 F et seq.; 40 CFR Part 147), provides protection for the protection of public drinking water.

Further safeguards that ensure the protection of public health and safety involve specific rules and regulations of the PA-Department of Labor and Industry (37 Pa. Code, Chapter 11 and 13), PA-Department of Transportation (PA Vehicle Code Title 75, Chapter 49 and 189; 67 Pa. Code, Chapter 403), and the PA-Department of Environmental Protection (Solid Waste Management Act, Act 97, 35 P.S. §6018.101 et seq.; Oil and Gas Act, Act 223, 25 Pa. Code Chapter 78)

A DEP-issued oil and/or natural gas well permit is the primary authorization for exploration and development activities. The well permit addresses well location; notice to landowners, owners of water supplies, coal owners and gas storage operators; distance restrictions for existing building, streams, springs and wetlands, and public resources. As referenced above in *Item 3*, each operator must have a DEP-approved Preparedness, Prevention and Contingency (PPC) Plan for every permitted oil and/or natural gas well which addresses many health and safety issues.

14. Transportation & Pipelines

The State Forest system is home to an extensive road network. There are approximately 2,500 miles of State Forest public-use roads and many hundreds of miles of administrative, logging, and gas well access roads. There are two general concerns dealing with the roads and transportation: 1) a major increase in the number of roads, and 2) the capability of the existing State Forest roads to handle the increased heavy truck traffic. Other related concerns include: traffic congestion, impacts to the road, potential road closure, and State Forest visitors safety with such an increase in traffic.

Pennsylvania's State Forest road network is adequate in accessing most areas of the State Forest system. Short access roads may need to be developed in situations where well site locations are not reasonably adjacent to existing access roads. New access roads will be constructed in conjunction with existing roads and right-of-ways, using this infrastructure wherever possible. Access roads will be built using current design standards (see Oil and Gas Lease - *Exhibit "E": Oil and Gas Lease Access Road Specifications for State Forest Lands*). Deviations from these specifications will require the written approval of the District Forester.

Existing State Forest road infrastructure can properly handle heavy truck traffic associated with natural gas exploration and development. Occasionally, State Forest roads may require slight improvement (i.e., additional road base material) to maintain a good running surface. Any improvements, when necessary, will be made at the sole expense of the Lessee to the satisfaction of the District Forester.

The types of trucks used for gas exploration are similar to that of the logging industry. There will be a noticeable increase in truck traffic due to the nature of this type of drilling and completion operations. Specifically, heavy hauling due to the transporting of water for completion operations is a large portion of the anticipated truck traffic (approximately 800 truck trips for a *single* well). Generally, heavy truck hauling will not be permitted from November 1 to March 30 (no-haul period). Any exceptions to the "no-haul period" must be made in writing to District Forester; upon review of said request, District Forester will respond appropriately in writing.

Additional limitations on vehicular use, including but not limited to heavy hauling, during certain times of the year may be necessary to protect the integrity of the roads or nearby ecologically significant areas such as vernal pool breeding areas. These restrictions typically occur during late-winter and early-spring (break-up), however road use may be limited at any time of the year based on due cause at the discretion of the District Forester. Bridge crossings are subject to all posted weight limits as well as the approval of the District Forester. There may be instances where the Lessee may be required to improve certain bridges or similar crossings to support vehicular traffic, especially heavy hauling. Such improvements will be completed only as necessary, and within Department standards, at the sole expense of the Lessee.

In the event that State Forest lands are used as "draft points" for obtaining water from streams, the draft point and associated roads may require significant improvements and upgrades to meet Department standards prior to the commencement of this activity. These instances will be considered on a case by case basis.

Safety concerns may necessitate that certain roads be closed to public access during drilling operations or other periods of heavy use to reduce potential safety hazards. In some situations, gates will be used or installed to limit access to the drilling sites. Signage warning of heavy track traffic must be sufficiently posted to assure public safety on State Forest roads. Road access limitations will be at the discretion of the District Forester on a case-by-case basis. Normal Bureau of Forestry protocols will remain in effect. Any vehicles traveling in excess of twenty-five-miles-per-hour (25 mph) may be subject to the issuance of a traffic citation.

Appropriate safety measures will be utilized wherever possible to protect the usage of the forest roadway by recreation-based user groups (hiking, biking, horseback riding, etc.). Certain State Forest roads have been designated as Joint-Use (JU). Prior written permission must be obtained before to using such roads. Reducing conflict between State Forest stakeholders on JU roads means activities, such as snowmobiling, horseback riding, and timber harvesting, need to be considered, and the appropriate safety measures taken, to minimize road-based conflict. Any JU road is subject is the necessary criteria outlined in the *Joint-Use Road Plowing Strategy* (November 1, 2005). Recreation safety and activities are highly important; however, in-line with timber management activities, natural gas exploration takes precedence over recreational activity in our working forests. Generally conflicts are minimal and often easily resolved.

Areas contained with a given lease tract will be accessible to the public and open for traditional uses. However, the localized well site (4-5 acres in size) and any associated facilities (i.e., centralized water impoundments) will be closed to public access during operations. If a well is successful, the actual well site infrastructure remaining on site is off limits to the public thereby lessening pubic safety concerns and benefits the continuous function of the well site operation. Development activities on a given well are anticipated to last approximately two (2) months under normal conditions. At the end of the drilling period, any roads that were temporarily closed will be reopened.

Natural gas that is discovered and produced as a result of this lease sale will require new pipeline infrastructure construction. All pipeline activity is governed by the Oil and Gas Lease Agreement (*Section 29 – Oil and Gas Pipelines*). Gathering systems or marketing lines are permissible under the terms of the agreement. No rights for developing major transmission pipelines are granted in the lease agreement and, thereby, require a standard right-of-way application, project review, and the resulting SFER.

Typically, gathering and/or marketing pipelines are placed in and along existing corridors to minimize surface impact as well as construction and development costs. Gathering lines (steel or poly-flex pipe of varying diameter) have historically been placed along access roads - in adjacent ditches or beneath the road itself. This practice of

pipeline placement is preferred by the Department. All pipeline corridors or similar routes developed for the purpose of moving natural gas to market are subject to the approval of the District Forester. Although the lease agreement explicitly grants a lessee the right to move recoverable volumes of natural gas from off the leased premises, major transmission lines are not subject to this expressed right.

Non-Lease Sale Related Pipeline Activity

Independent of whether or not State Forest land is offered for lease, DCNR will undoubtedly face requests for the construction of new major natural gas transmission lines. The recent flurry of Marcellus Shale leasing and subsequent exploration is occurring in areas that are deficient in pipeline infrastructure. Existing natural gas transmission lines currently have little to no additional capacity available for new natural gas reserves being brought to market.

In an effort to reduce the number of trucks used in water hauling, operators are beginning to design and engineer water pipelines and centralized water impoundments. It is anticipated that these water lines may either be run coincident to necessary gas pipelines within same corridor or along existing roads or right-of-ways in those instances where long-term facilities may be needed (i.e., servicing central water impoundments). For temporary use, above-ground irrigation-type water lines may be used to transport water from a centralized water impoundment to a specific well pad for a series of completion operations. Water management plans such as this will not only limit the number of trucks on the road, thereby reducing wear and tear as well as maintenance, but will also result in significant cost savings to the operators over time. Prior to laying water lines, PNDI coordination will occur to minimize the impact to species of special concern.

15. Energy Needs/Use

Machinery used in the construction, exploration and development phases of natural gas exploration will consume fuels (primarily diesel fuel). Types of machinery typically used in natural gas development include: tractor-trailers, tri-axle trucks, front-loaders, skid-steers, bulldozers, drilling rigs, personal vehicles, water trucks and generators. Fuel quantities required for these activities are unknown and will vary between operators.

The FY 2009-10 Oil and Gas Lease Sale proposal may add significant quantities of natural gas to the Northeastern U.S. corridor. The Northeast is the largest consumer of natural gas in the United States. Estimated ultimate recovery (EUR) from one (1) Marcellus Shale well is thought to be approximately two-billion-five-hundred-million-cubic-feet of natural gas (2.5 Bcf/well). The average U.S. household that uses natural gas to heat and cool a two-thousand-square foot (2,000 sq/ft) home consumes approximately 120,000 cubic feet per year. Thus, a single well may provide the natural gas necessary to meet the heating and cooling needs to over three-hundred-thousand (300,000) homes.

16. Existing/Potential Land Use

The Pennsylvania State Forest system represents one of the largest expanses of public forestland in the eastern United States. These forests provide an abundance of high quality forest products, varied recreational opportunities, wildlife/plant habitat, and watershed protection and use. The principles associated with ecosystem management draw upon the overarching goal of forest sustainability which, in turn, assures the array of resources, uses, and values of the state forest for current and future generations.

This region of Pennsylvania lies well within the Marcellus Shale fairway. Private landowners have been leasing property in these areas for the last few years. In light of the increase in natural gas leasing on private lands, the selected lease tracts are highly marketable and saleable. The portions of State Forest that are being offered for lease may help the private landowners capitalize on their previous decision to lease their land. DCNR has implemented several measures to minimize forest fragmentation effects through its multi-level management approach. The design of the FY 2009-10 Oil and Gas Lease Sale was intentional in that those areas included in the upcoming lease minimize the potential for environmental impact while maximizing the potential return to meet the required revenue goals contained within the FY 2009-2010 budget.

Two (2) of the major concerns associated with the FY 2009-10 Oil and Gas Lease Sale are impact on existing uses of the State Forests and the potential for additional forest fragmentation. Any temporary impact on the existing use of the State Forest was addressed, specifically, the sections for Recreation Sites & Opportunities (*Item 12*), Public Health and Safety (*Item 13*), and Transportation and Pipelines (*Item 14*). In summary, temporary closures and restrictions may be needed to minimize user conflicts. The need for these controls will be at the discretion of the District Forester.

Historically, there were attempts made to explore for and develop shallow natural gas reservoirs (Upper Devonian) in this region. These attempts failed as no commercial production from the Upper Devonian sandstones exist in these areas. Forest fragmentation is most closely associated with close-spaced drilling (forty acres or less). Therefore, since there is little likelihood that economic quantities of natural gas exist in these sandstones, fragmentation of this nature is unlikely to be seen.

The planning process was used in the September 2008 Oil and Gas Lease Sale was repeated for this current sale. This approach consisted of several key components that provided for proper assessment and analysis of on-the-ground attributes of the State Forest system. These analyses were completed using field-based reconnaissance assessments and ArcGIS-based methodology, modeling, and analysis which are ultimately captured by comprehensive lease tract analysis whose results are captured in a series of maps (*Appendix B*).

These key components include, but are not limited to, aesthetic/buffer zones, geologic/spacing assessments, viewshed delineation, important recreation zones, and silvicultural/ecological considerations; all of which are summarized as follows:

Standardized Management Protocols

WILD AREA MANAGEMENT ZONE: Those areas that have been designated or are pending designation by the Department as State Forest Wild Areas. A Wild Area is defined as an extensive area which the general public will be permitted to see, use and enjoy for such activities as hiking, hunting, fishing and the pursuit of peace and solitude. No development of a permanent nature will be permitted so as to retain the undeveloped character of the area and conserve ecological resources. The guidelines governing the administration of Wild Areas are as follows:

(1) Campsite leases will be prohibited.
(2) No new public access roads will be constructed. Existing roads will remain open only where there is a public need. All motorized conveyances or vehicles shall be prohibited with the exception of licensed vehicles, which may be operated only on open public roads.
(3) Forest trail use will be restricted to foot travel, horseback riding and bicycling. Handicapped persons, in hand or electrically powered wheelchairs, or in other electrically powered vehicles adapted for this use, may operate such conveyances on designated trails.
(4) Buildings and other improvements will be restricted to the minimum required for public health, safety and interpretive aids.
(5) **Leases, mineral development, and new rights-of-way will be prohibited; however, subsurface oil and gas rights may be leased where no surface use or disturbance of any kind will take place on the Wild Area.**
(6) Overnight camping will be limited to the backpack primitive type.

NATURAL AREA MANAGEMENT ZONE: Those areas that have been designated or are pending designation by the department as State Forest Natural Areas. Natural Areas are defined as an area of unique scenic, historic, geologic or ecological value, which will be maintained in a natural condition by allowing physical and biological processes to operate, usually without direct human intervention. These areas are set aside to provide locations for scientific observation of natural systems to protect examples of typical and unique plant and animal communities, and to protect outstanding examples of natural interest and beauty. The guidelines governing the administration of Natural Areas are as follows:

(1) No human habitation will be permitted, except that primitive type, backpack camping may be permitted in designated areas only.
(2) Access for all but essential administrative activities will be restricted to foot travel and non-motorized watercraft, except in designated areas.
(3) Buildings and other improvements will be restricted to the minimum required for public health, safety and interpretive aids.

(4) Timber harvesting will not be permitted except as may be required for the maintenance of public safety.

(5) **Leases and mineral development are prohibited; however, subsurface oil and gas rights may be leased where no surface use or disturbance of any kind will take place on the Natural Area. New rights-of-way are prohibited except for designated utility corridors in the Bucktail Natural Area.**

LIMITED RESOURCE MANAGEMENT ZONE: Applied to areas where management alternatives are limited due to site quality or topographic constraints. Recreation, aesthetics, water, and soil retention are the primary values. Topography can be an inhibiting factor that restricts or prohibits natural gas exploration and development practices on these areas (e.g., steep slope). This zone is typically not part of the commercial forest land base. Natural gas exploration and development is usually not practical.

Approximately twelve-thousand eight-hundred fifty-five (12,855) acres have been delineated as *Non-Development-Steep Slope*. No surface disturbance will be permitted.

AESTHETICS / BUFFER MANAGEMENT ZONE: Applied to areas where connectivity, aesthetics and water quality conservation are the primary values. These areas encompass a wide array of lands and are associated with linear features such as roads, trails, and streams or encompass significant features of State Forest lands. Appropriate forest community types within this zone are considered part of the commercial forest land base, however, natural gas exploration and development is typically excluded from certain areas. It is fair to anticipate requests for "waiver of buffer zone" (specifics in *Section 23* of lease agreement). Any request for encroachment will be reviewed on a case-by-case basis to minimize impact. All requests are subject to the written approval of the district forester. This management zone includes the following areas:

A. Palustrine Wetlands and Frost Pockets

B. Parks and Picnic Area

C. Campsite Leases

D. Roads

E. Natural Areas

F. Fire Hazard Areas

G. Trails

H. Sensitive Areas

AQUATIC HABITAT BUFFERS: Areas around wetlands, vernal ponds, spring seeps, streams, lakes, ponds and impoundments should be designated as aquatic habitat buffers. These guidelines provide a standard set of operating procedures to be followed when conducting management activities in or near aquatic habitats on State Forest land. Management efforts should focus on providing connectivity, wildlife habitat and protecting water quality. The specific guidelines (see *Aquatic Buffer Appendix*) are organized as follows:

A. Streamside Forests
- Wilderness Trout Stream and Wild Rivers
- Exceptional Value (EV) Streams and Scenic Rivers
- High Quality (HQ) and All Other Perennial Streams
- Intermittent or Ephemeral Streams

B. Lakes, Ponds, and Impoundments

C. Vernal Ponds

D. Spring Seeps

E. Wetlands

2010 Oil & Gas Lease Sale Management Protocols

WELL SITE SPACING: Derivative-based well spacing will be applied throughout the lease tracts. Recent developments in drilling technology, known as horizontal drilling, have made it possible to develop well pad sites in a manner that reduces surface impact exponentially. Previous well spacing was fixed through the lease agreement using hard spacing requirements – or the acceptable distance between wells (e.g. 40 acres, 320 acres, or 640 acres). The new derivative-spacing formula will take the total acreage of a tract divided by a reasonable drainage radius (per well). The result is the number of permissible well pad sites permitted on that lease tract. For example:

1,300 acres / 260 acres per well = 5 acceptable well pad sites

Access roads and necessary pipelines will be constructed along existing roads and rights-of-way wherever possible. Extensive consideration was given to the appropriate well spacing needed for economic recovery of natural gas from the Marcellus Shale (or deeper). The methodology used in the derivative-spacing formula appears to minimize the potential impacts to the surface while maintaining the engineering integrity required to economically recover the natural gas reserves without waste (i.e., Oil and Gas Conservation Law).

Beginning with the 2010 lease sale, two (2) additional stipulations will be included DCNR's standard lease agreement:

Centralized Water Impoundments – these facilities will be reviewed, approved, and managed as a "well pad site" due to the size, spatial extent, and prolonged use of the impoundment. An impoundment will count against the maximum number of allowable pad sites expressed in the lease agreement (Section 2X.XX)

Maximum Surface Disturbance – in most instances, well pad sites typically consume 3.7 to 5 acres of surface lands although the Bureau recognizes that certain variables may require that a larger area is used for a particular pad site. As a result, the lease agreement will specify the total number of acres that can be disturbed by well pad sites (to include central impoundments as above). For example:

5 acceptable well pad sites X 5 acres = 25 acres of total surface disturbance

In this case, the lessee can build 5 well pads and/or impoundments, ***or*** disturb a total of 25 acres of surface lands, **whichever occurs first**. Pipelines, access roads, and other facilities will not count towards this threshold.

VIEWSHED DELINEATION: ArcGIS was utilized for performing viewshed analysis for those areas that contain historic and/or important viewsheds (i.e., Historic Route 6). Digital elevation models (DEM) were used to clearly define those high-points on the surface where an observer stationed along and/or within a defined area. The results were applied to the lease tracts and implemented as an Area of Special Consideration – Viewshed.

Approximately six-thousand six-hundred seventy-nine (6,679) acres have been appropriately delineated as *Area of Special Consideration - Viewshed.* A significant portion of this area is also contained within the *Non-Development-Steep Slope* areas.

RECREATION ZONES: The basis for the delineated recreation zones contained within a lease tract is the Recreation Opportunity Spectrum (ROS). ROS is an inventory system built on the premise that people expect certain types of recreational experiences on public land, and that land managers should be able to direct people to appropriate places for those experiences. ROS allows the land manager to provide recreational opportunities across a spectrum, or continuum, of 5 land-use classes so that the user may find satisfying recreational experiences in a variety of recreation activities.

Zones that meet the appropriate criteria to be considered "Semi-Primitive, Non-Motorized" have been delineated as such and subsequently have been classed into either *Non-Development - Recreation* or *Area of Special Consideration - Recreation* according to the Department's standard ROS guidelines. Approximately ten-thousand four-hundred two (10,402) acres meet these criteria. There were no "Primitive" zones contained within the lease tracts.

HIGH VALUE TIMBER CONSIDERATIONS: An ArcGIS-based analysis was performed to properly assess where DCNR's high-value timber is located in relation to the lease tracts. Using the current typing layer(s) for the applicable forest districts, those areas that comprised of Northern Harwood Forest (BB), Site Class 1 and/or Black Cherry – Northern Harwood Forest (BC) criteria have been delineated based on these criteria:

BB *Northern Hardwood Forest* **:** Dominant trees usually include *Fagus grandifolia* (American beech), *Acer rubrum* (red maple), *A. saccharum* (sugar maple), *Prunus serotina* (black cherry)—at less than 40% relative cover, *Betula lenta* (sweet birch), *B. alleghaniensis* (yellow birch), *B. papyrifera* (paper birch), *Q. rubra* (northern red oak), and *Fraxinus americana* (white ash). This type may contain scattered *Pinus strobus* (eastern white pine) and/or *Tsuga canadensis* (eastern hemlock), but combined conifer cover does not exceed 25% of the canopy. *Rhododendron maximum* (rosebay) may be locally abundant. Other common shrubs include *Hamamelis virginiana* (witch-hazel), *Acer pensylvanicum* (striped maple), *Viburnum lantanoides* (witch-hobble), *Ilex montana* (mountain holly), *Amelanchier laevis* (smooth serviceberry), *A. arborea* (shadbush), and *Carpinus caroliniana* (hornbeam). The herbaceous layer is generally sparse and reflects a northern affinity; common components include *Maianthemum canadense* (Canada mayflower), *Trientalis borealis* (starflower), *Thelypteris novaboracensis* (New York fern), *Dryopteris carthusiana* (fancy fern), *Lycopodium lucidulum* (shining clubmoss), *Gaultheria procumbens* (teaberry), *Mitchella repens* (partridge-berry), *Aralia nudicaulis* (wild sarsaparilla), *Medeola virginiana* (Indian cucumber-root), and *Maianthemum canadense* (Canada mayflower).

Related types: If combined relative cover by conifers approaches or exceeds 25%, please read description for the "Hemlock (white pine) - northern hardwood forest." If cover by *Prunus serotina* (black cherry) approaches or exceeds 40% of canopy, please read description for the "Black cherry - northern hardwood forest" type.

Range: Glaciated NE, Glaciated NW, Pocono Plateau, Unglaciated Allegheny Plateau.

BC *Black Cherry - Northern Hardwood Forest:* (Allegheny Hardwoods). This type is characterized by at least 40% *Prunus serotina* (black cherry) and is most characteristic of the Unglaciated Allegheny Plateau. Common associates are *Acer rubrum* (red maple), *A. saccharum* (sugar maple), *Betula lenta* (sweet birch), *B. alleghaniensis* (yellow birch), *Fagus grandifolia* (American beech), and *Quercus* spp. (oaks), usually *Q. rubra* (northern red oak). *Pinus strobus* (eastern white pine) and/or *Tsuga canadensis* (eastern hemlock) may be present (at less than 25% relative cover). Shrubs include *Viburnum lantanoides* (witch hobble), *Acer pensylvanicum* (striped maple), *Rubus allegheniensis* (Allegheny blackberry), *Ilex montana* (mountain holly), *Hamamelis virginiana* (witch-hazel), and *Amelanchier arborea* (shadbush). Common herbaceous species include *Dennstaedtia*

punctilobula (hayscented fern), *Thelypteris novaboracensis* (New York fern), *Dryopteris intermedia* (common wood fern), *Lycopodium* spp. (ground pine), *Aster acuminatus* (wood aster), *Viola* spp. (violets), *Medeola virginiana* (Indian cucumber-root), *Uvularia sessilifolia* (wild-oats), *Brachyelytrum erectum* (brachyelytrum), *Maianthemum canadense* (Canada mayflower), and *Oxalis acetosella* (common wood-sorrel).

Related types: The "Northern hardwood forest" may contain *Prunus serotina* (black cherry) as a component, but it does not generally exceed 40% relative cover. This type is most characteristic of the Unglaciated Allegheny Plateau.

Range: Glaciated NE, Glaciated NW, Unglaciated Allegheny Plateau.

Site Class 1 (SC1): SC1 is characterized by moist, well-drained, fairly deep soils that usually occur in protected coves, along streams, or in bottomlands that remain moist throughout the year. On northern exposures, Site 1 may extend higher up a slope than on southern exposures because of more favorable soil moisture conditions. In addition to the usual beech-birch-maple-cherry of northern and Allegheny hardwoods, white pine, hemlock, ash and basswood are generally present. In the oak types where red oak and white oak along with hemlock form the major portion of the stand, the presence of tuliptree (yellow poplar) and ash indicates Site 1. Dominant and co-dominant trees have a projected merchantable main stem of > 50 feet at maturity (> three 16-foot logs). Total tree heights average > 80 feet at maturity.

Additionally, those areas that have gone through extensive regeneration projects and are now protected by the installation and maintenance of deer exclosures have been delineated. Based on the input from the District Forester, certain projects were retained and integrated into appropriate lease agreement as an area of special consideration.

The results of the stand analysis were compiled on a tract by tract basis and classed as either *Area of Special Consideration – Timber, Area of Special Consideration – Timber-Black Cherry Stand, or Area of Special Consideration – Regeneration Project.* Although these areas, totaling approximately three-thousand one-hundred ninety (3,190) acres, two-thousand eight-hundred eighteen (2,818) acres, and six-hundred eighty-eight (688) acres respectively, are not entirely off-limits, natural gas exploration and development activity will require careful coordination between the Department and the Lessee. In some instances, avoidance measures will be required. All Lessees will pay stumpage rates as prescribed in the lease agreement (Exhibit C – Section 9).

ECOLOGICAL CONSIDERATIONS: The Pennsylvania Natural Diversity Inventory was queried to determine where ecological conflicts might occur in the future should a Lessee wish to explore for natural gas. More specifically, an ArcGIS-based analysis was performed for those areas contained in or immediately adjacent to the lease tracts. Given the developing comprehensive nature of these databases, the information

assembled and delineated as having *ecological importance* are not intended to serve as restrictions (except as outlined below) but rather a notification that conflicts may exist within portions of a given lease tract. These conflicts may require a survey to determine species or habitat presence, and that monitoring, mitigation or avoidance measures be required as a result of exploration and development activities. This proactive approach serves as a communication tool between Lessor and Lessee whereby the Lessee is made aware that, in advance of obtaining a lease, additional consideration will be given to activities that disrupt habitats, plants, or wildlife prior to approving development activities.

The survey results were placed into two (2) categories and displayed accordingly in the SFER Map Appendix. Generalized categories for the five (5) State Forest districts are as follows:

Non-Development - Ecological: an area of ecological significance where no surface development will be permitted due known flora and/or fauna complexes

Area of Special Consideration – Ecological: an area known to contain plants or animals of significance or special interest

*** Examples of Important species include: bald eagles (Haliateeus leucocephalus), timber rattlesnake (Crotalus horridus), wood rats (Neotmoa magester), or water shrew (Sorex palustris alibarbis).*

*** Examples of Plant Assemblages include*: *creeping snowberry (Gaultheria hispisdula), northeastern bulrush (Scirpus ancitrochaetus), or great-spurred violet (Viola selkirkii)*

The inclusion of this pre-lease survey data is in no manner construed as a waiver of the PNDI requirement for permitting a natural gas well or constructing any ancillary facilities (i.e., pipelines, roads, etc.). The results of the survey have been compiled on a tract by tract basis and classed as *Non-Development – Ecological (913 acres)* or *Area of Special Consideration – Ecological (14,635 acres)*.

17. Protected Animals and Plants

Certain animal and plant species have been listed and given protected status by the U.S. Fish and Wildlife Service, the Pennsylvania Game Commission, the Pennsylvania Fish and Boat Commission and the Pennsylvania Department of Conservation and Natural Resources.

The Pennsylvania Natural Diversity Inventory (PNDI) information system contains information on known locations of listed species as well as significant natural communities and other ecological features. PNDI is a public/private partnership between DCNR, the Western Pennsylvania Conservancy, PA-Fish and Boat Commission and PA-Game Commission. All activities associated with oil and gas development undergo a PNDI review prior to a well permit being issued.

All potential lessees have been notified through the tract analysis maps (see Item 16 above), as well as specific language in the lease agreement, of known areas of special consideration for plants, animals, and habitats. The lessee will perform a PNDI screening using the PNDI ER Tool. The entire earth disturbance area will be included in the screening, which will include the pad site and any associated impoundments, pipelines and/or access roads. If potential impacts exist as a result of the screening, the lessee will coordinate with the agency/agencies listed on the PNDI Receipt. If requested, a survey should be performed during the appropriate time of year for target species. The project will require PNDI clearance before any earth disturbance activity commences. Projects that will have an adverse effect on any of the important species or critical habitats should be avoided. Where there is potential to impact a species of special concern or their habitat, the lessee may be required to provide necessary avoidance buffers, mitigation, habitat enhancement, and/or monitoring.

The likelihood that purposeful damage to, or destruction of, a species of special concern and their habitat is unlikely; however, the possibility of inadvertent impacts could occur during construction and development of wells sites, centralized impoundments, road and pipelines. Bureau of Forestry personnel will do their best to educate the lessee and their contractors on best management practices in avoiding inadvertent impacts to species or their habitats.

18. Habitat Diversity and Interspersion

Habitats are classified as either terrestrial, wetland, aquatic or riparian. The Bureau's management strategies, in most cases, are designed to optimize diversity within and between these habitats, primarily by promoting various habitat components. Habitat is species dependent. Any management activity, including no activity, will affect some species positively, some will not be affected, and still others will be negatively impacted.

Aside from critical plant and animal species, which are covered in *Item 17*, the maintenance and/or restoration of eco-regional biological diversity is a key consideration in resource management efforts on State Forest lands.

Wildlife and plant habitat will be protected and managed through the implementation of the multi-level management approach. Environmental safeguards have been established through a tiered approach to ensure the protection of critical habitats and species. First-level environmental safeguards involved the establishment of "non-development" areas, such as State Parks and State Forest wild and natural areas, where no surface activity is permitted. Non-development portions of a lease tract state that no surface activity or development will be permitted. More specifically, no well sites, pipelines, roads or related disturbances will be permitted in these areas.

Additional habitat protections have been outlined above. Please refer to *Environmental Safeguards* and *Existing/Potential Land Use (Item 16)* for specifics.

19. **Biological Productivity**

Vegetation will be cleared due to construction of well sites, roads, and pipelines. Specific clearing areas cannot be delineated at this time; however, approximately four (4) to five (5) acres may require clearing for a well site Additional clearing areas will be associated with the development of necessary access roads and/or pipelines. No clearing will take place in non-development areas.

Most of the considerations, impacts, and mitigation efforts covered in *Protected Animals and Plants (Item 17) and Habitat Diversity and Interspersion (Item 18)* apply specifically to biological productivity. Although the clearings will result in a temporary loss of forest cover, well site and pipelines will be re-vegetated to benefit targeted wildlife species and decrease the impact of invasive species invasion.

20. **Vegetation**

The Bureau of Forestry is very active in the effort to control and prevent the spread of invasive species on State Forest land. Invasive plant or animal species can be transported by natural methods (i.e., animal excretion), vehicles, by spraying or mowing, during construction or through erosion controls where planting non-native mixes, mulching, or using imported soil are applied. Therefore, an appropriate re-vegetation plan has been established for natural gas related disturbances.

The Lessee will pay double-stumpage for all timber harvested as part of natural gas exploration and development activity. All timber to be removed is marked and tallied by a management forester within the appropriate forest district. Additionally, the Lessee will be required to follow the *Invasive Plants and Revegetation Guidelines (Exhibit D)* of the lease agreement. Protocols call for implementation and adherence including, but not limited to, the following:

-- Lessee shall make provisions to monitor for invasive species within the area disturbed by the construction activity for a period of five (5) years following construction or until invasive plants are not observed on-site for two consecutive years, whichever is longer.

-- Post-construction invasive species surveys along access roads shall be limited to areas where gravel was placed or the existing road was widened for Lessee use. After a period of two growing seasons, any new invasive populations will be assumed to be the result of outside sources other than Lessee construction materials and equipment. Control and monitoring of invasive species found along access roads within two growing seasons post-construction will continue until populations are eradicated.

-- The results of all Lessee annual invasive surveys shall be summarized into a report that shall include the following elements: methods, a summary of invasive species detected, abundance of each species, number of new populations per species, number of eradicated populations by species, and management recommendations for management and control. Report and raw electronic

observation data shall be submitted to District Forester. Submission of any electronic data should occur simultaneously with the report submission. Data recording and management should be consistent year to year so data can be easily compared by grid cell number. The department reserves the right to audit the findings of the Lessee's reports and as a result of any audit, Department may require alternate methods of management and control.

-- Management and control of established invasive plant populations shall be planned on a species by species basis to determine the best method of control. Lessee and/or its consultant shall submit a "Management and Control Plan" to District Forester no less than three (3) months after the conclusion of all construction activity.

Revegetation of disturbed areas will be completed using DCNR-accepted standards and in a manner that promotes the management goals of the Bureau of Forestry as well as the applicable forest district. The lessee shall utilize a native grass and herb mix for cover and stabilization wherever possible within the disturbed work areas. The required seed mix will provide for immediate stabilization and reduce the chance of invasive species establishment. The grass and herb mix shall be applied at fifteen pounds (15 lbs) per acre.

Additionally, seeds necessary to establish a cover crop will be mixed in with the native grass and herb mix. The cover crop will either be oats or barley (spring months) or wheat or grain rye (fall months). This can be applied at the same time with the mix below and can be done with the hydro-seeder. The cover crop should be applied at thirty pounds (30 lbs) per acre.

The detail components of the native grass and herb mix as well as shrub planting are listed below:

Native Grass and Herb Mix

20% Little Bluestem PA ecotype (Andropogon scorparius)
10% Big Bluestem variety "Niagara" (Andropogon gerardii) (genetic origin is NY)
15% Virginia Wild Rye PA ecotype (Elymus virginicus)
l0% Indiangrass PA ecotype (Sorghastrum nutans)
l0% Deertongue variety "Tioga" (Panicum clandestinum)
5% Swithchgrass variety "Shelter" (Panicum virgatum) (genetic origin is WV)
5% Partridge Pea PA ecotype (Chamaecrista fasciculate)
3% Showy Tick Trefoil PA ecotype (Desmodium canadense)
5% Ox-eye sunflower PA ecotype (Heliopsis helianthoides)
2% Autumn bentgrass PA ecotype (Agrostis perennans)
2% Woolgrass PA ecotype (Scirpus cyperinus)
3% Soft Rush PA ecotype (Juncus effuses)
5% Pennsylvania smartweed PA ecotype (Polygonum pensylvanicum)
5% Common Milkweed PA ecotype (Asclepias syriaca)

All re-vegetation plans or other specific vegetative treatments shall be performed to the satisfaction of the District Forester. Local requirements may dictate that alternative treatments or strategies be developed to meet local management goals.

21. Non-Native Species

The Bureau of Forestry is very active in the effort to control and prevent the spread of invasive species on our lands. Invasive plant or animal species can be moved by vehicles, by spraying or mowing, during construction and through erosion controls where planting non-native mixes, mulching, or using imported soil are applied.

Non-Native Species specifics are addressed in greater detail in *Vegetation* (*Item 20*) above. Additional criteria for non-native species are also addressed in *Invasive Plants and Revegetation Guidelines* (*Exhibit D*) of the lease agreement.

22. Other

Economic Considerations

It is not possible for DCNR to predict at this time how many leases will be successfully obtained nor how many wells will be drilled as a result of the new leases. The Commonwealth receives money from three (3) unique revenue streams when leasing subsurface oil and gas rights. These distinct payments are:

Bonus Bid: The first year's rentals, which are set at a minimum bid of two-thousand dollars ($2000) per acre, are used in determining the winning bidder. The highest dollar-per-acre-bid obtains a given lease. Any combination of higher/lower bids and acreages will affect this estimate accordingly.

Annual Rentals: After the first year, leased acreage requires a twenty-dollar, per-acre, per-year ($20/acre/year) rental, payable in advance of that year, for years two, three, and four of the lease. Years five (5) and beyond requires a thirty-five-dollar, per acre, per year ($35/acre/year) rental, payable in advance.

Royalties: Royalty is paid on the natural gas produced from each individual well. The royalty rate for the 2010 Oil and Gas Lease Sale offering has been established at sixteen-percent (18%) of the gross volume of natural gas produced and metered at the well head. Market rates per thousand cubic feet (Mcf) of natural gas prevail. A sharp increase in market rate may cause revenues to rise albeit temporarily regardless of the decline in production.

All revenues from oil and gas activities (except pipeline rights of way) are required to be deposited in the Oil and Gas Lease Fund. By law, these funds are earmarked for recreation, conservation, and flood control projects.

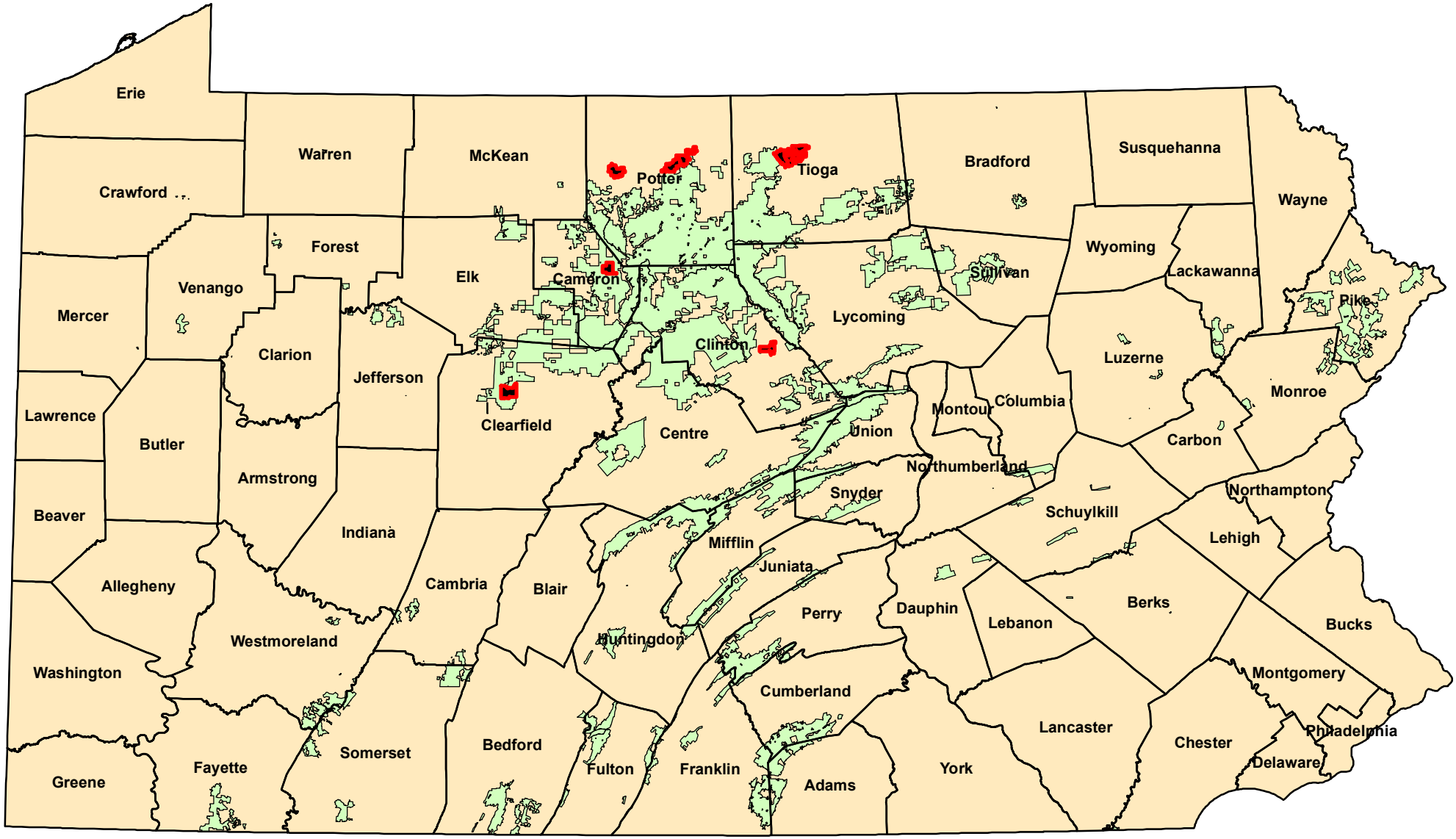
***** Please note – $60,000,000 generated from the bonus bid payments described above will be allocated to the General Fund and <u>will not</u> be deposited into the Oil and Gas Lease Fund.***

23. Permits

Natural gas exploration and development are subject to the substantial conditions of the DCNR oil and gas lease (*see Lease Appendix*). Additionally, all oil and natural gas exploration and development activities within Pennsylvania are subject to DEP permitting requirements.

Lessees are required to abide by all applicable Federal, State, and Local laws, rules and/or regulations. DCNR has no responsibility to aid an operator in obtaining the necessary permits. Furthermore, DCNR is not required to obtain any permits to allow these activities to occur.

FY 2009-10 Lease Sale Reference Map

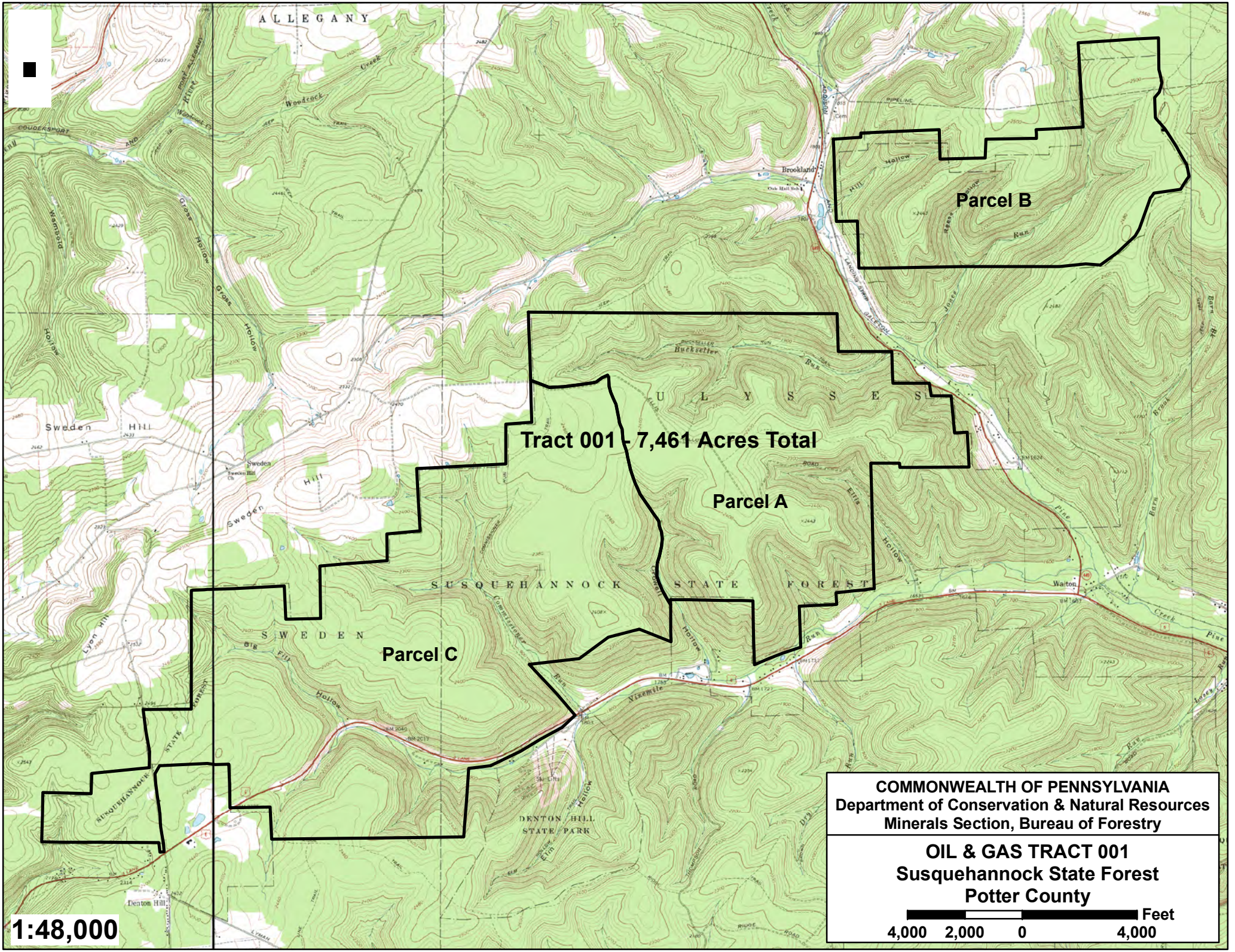


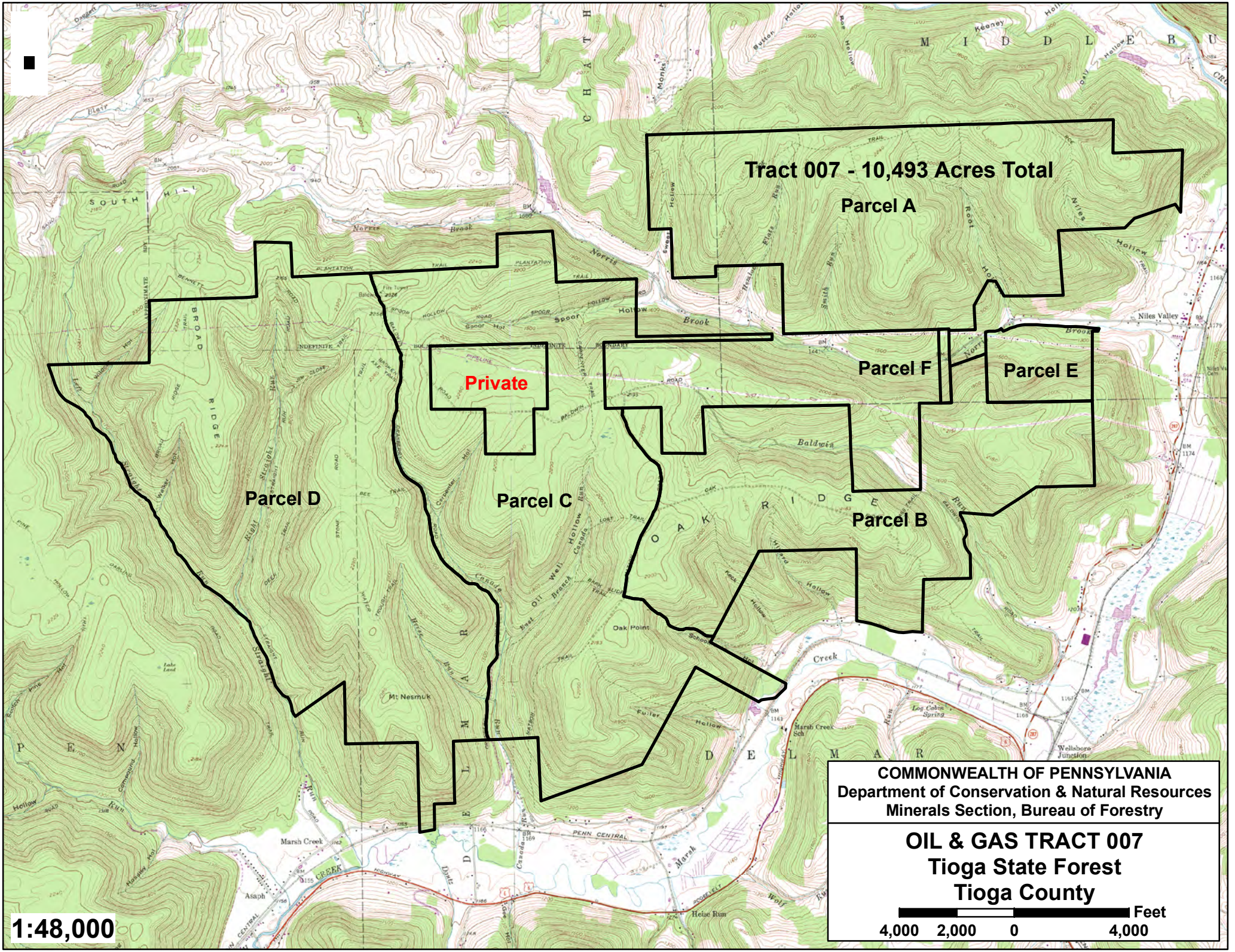
Oil & Gas Lease Tract

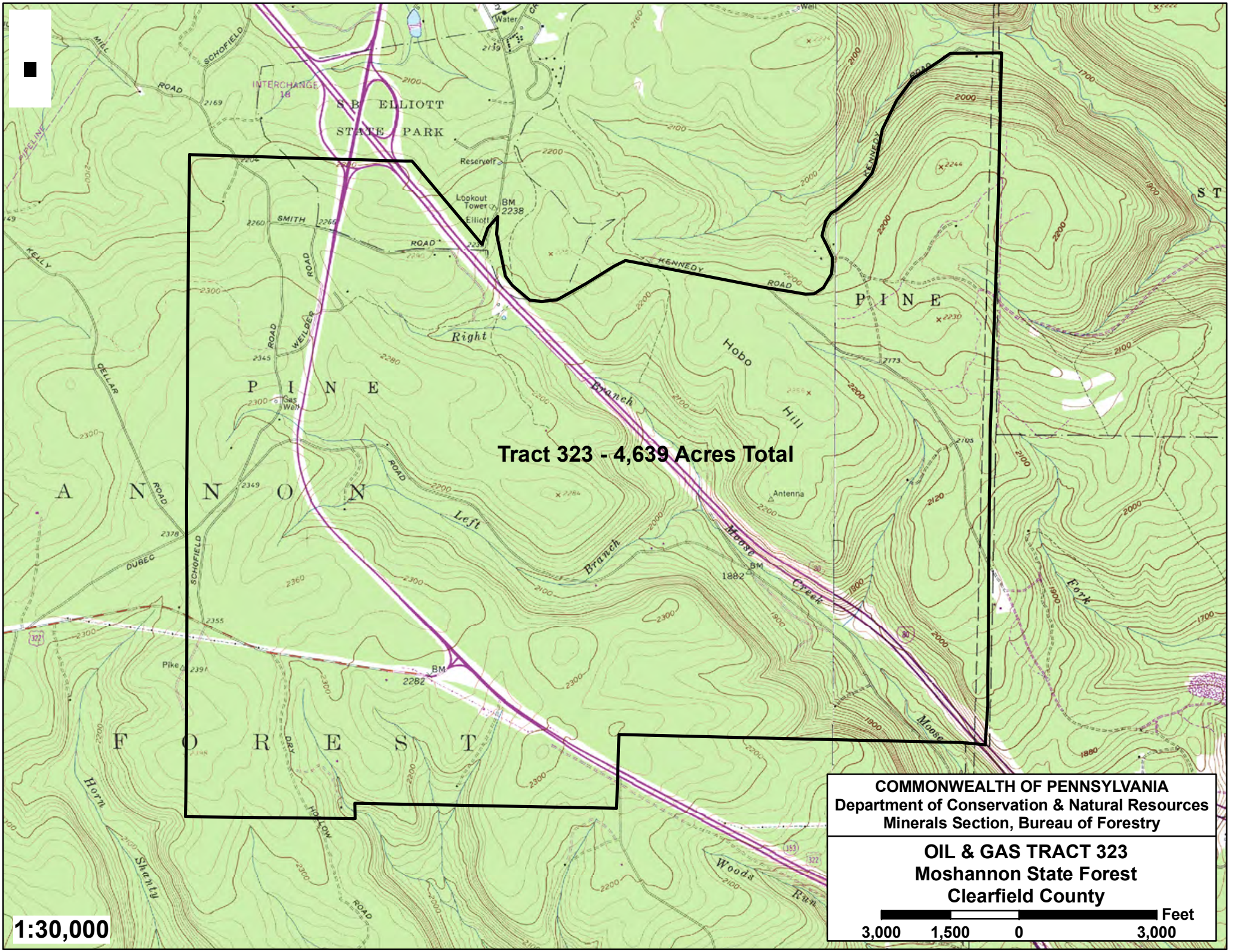
State Forest Lands

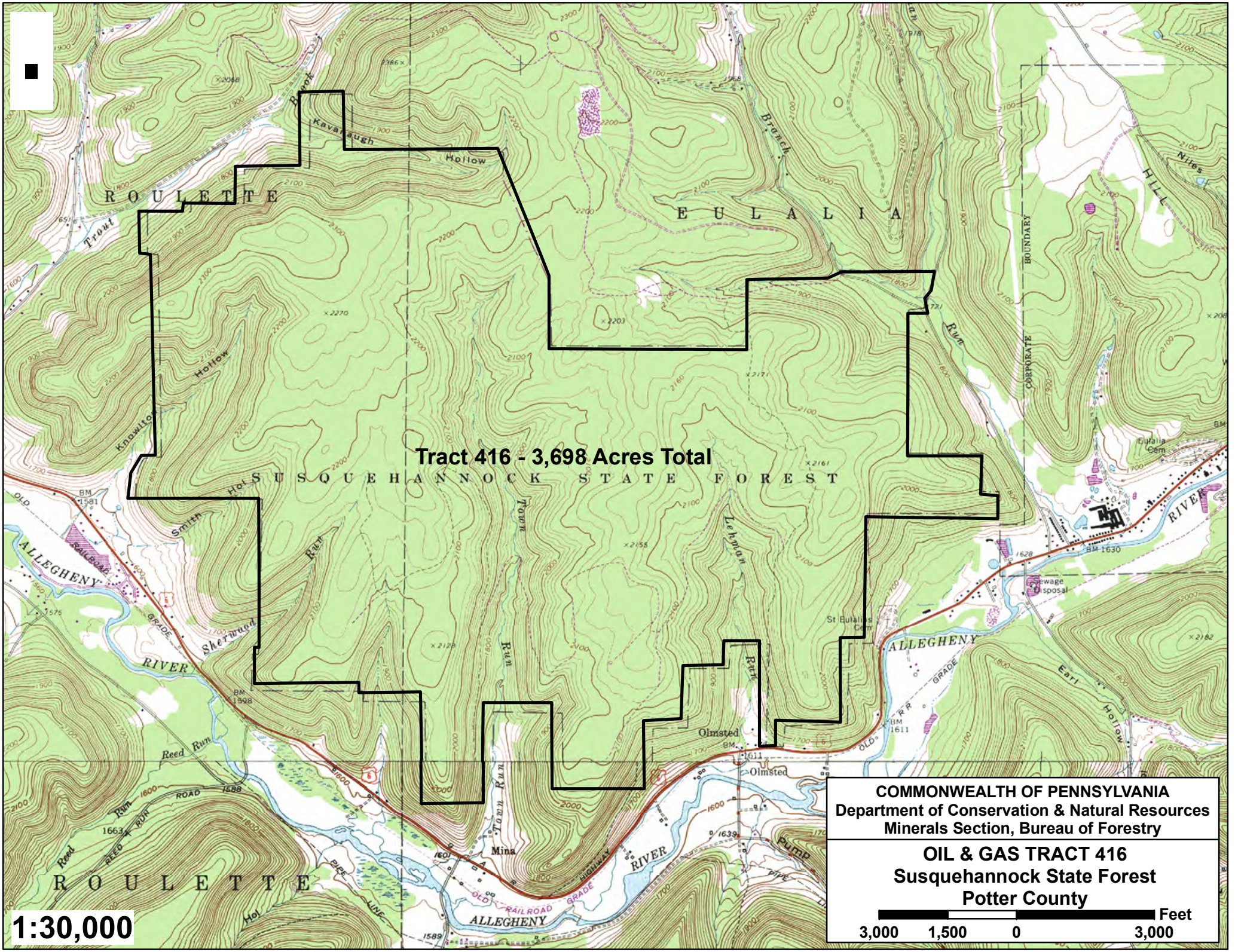
1:1,900,000

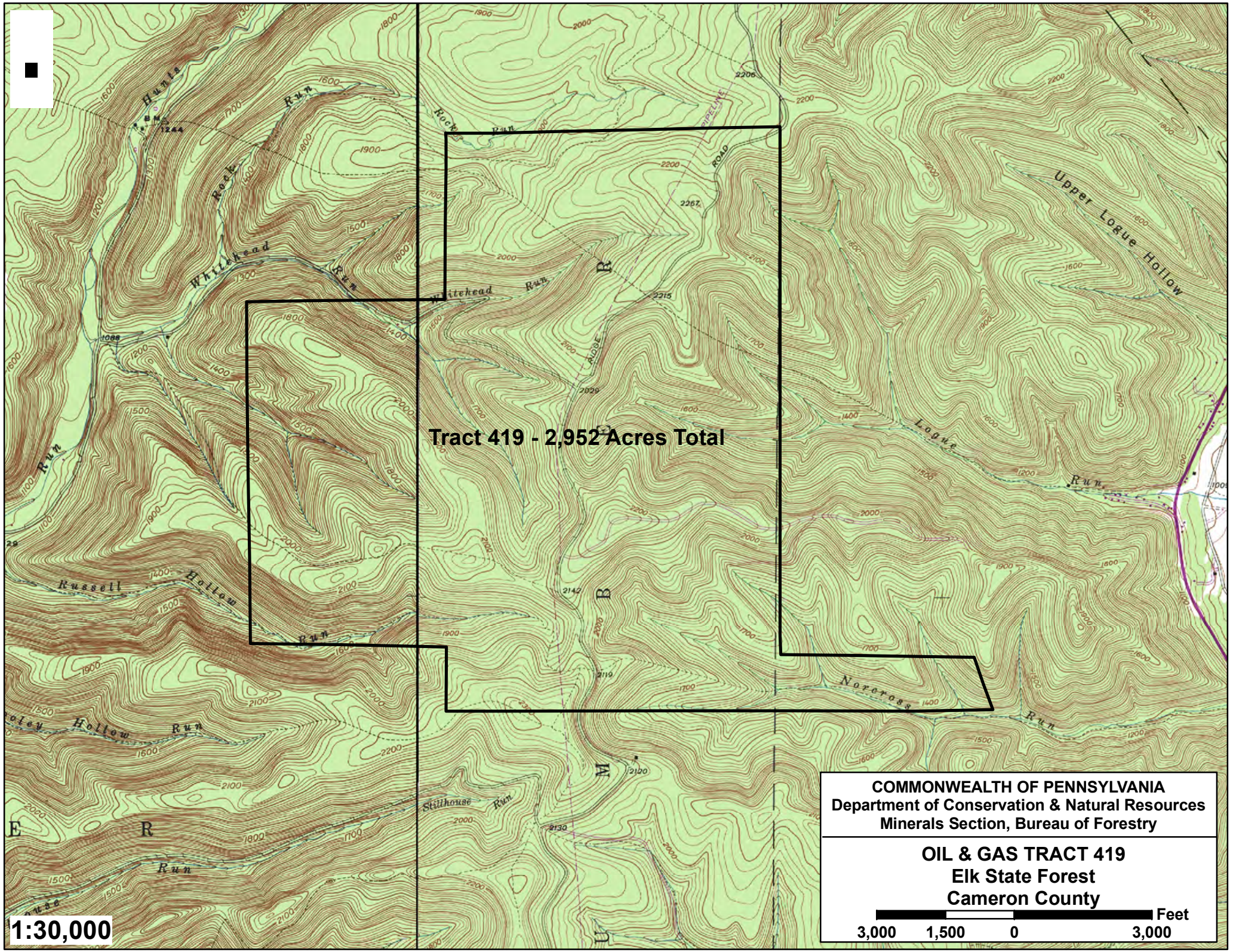
APPENDIX A -TRACT MAPS

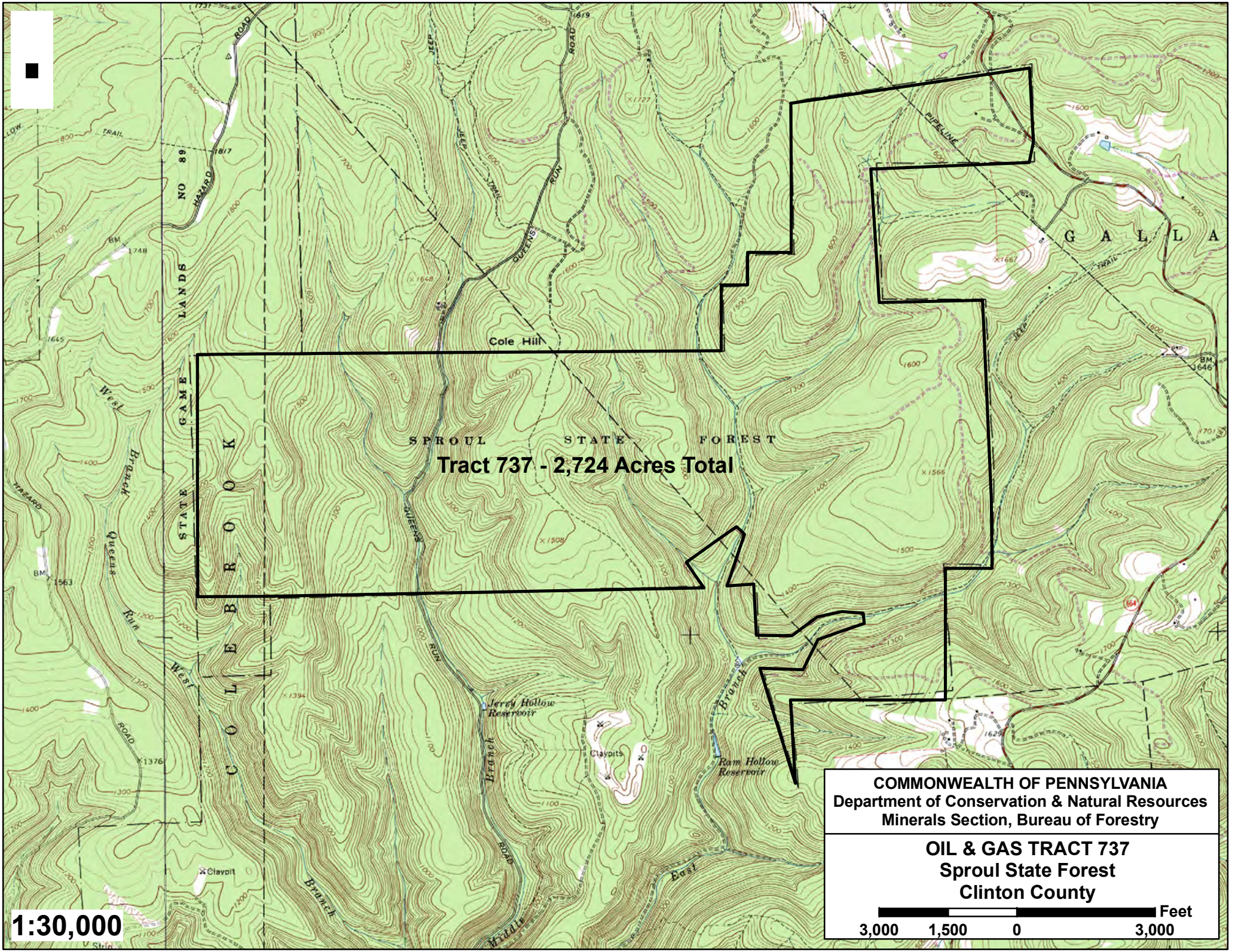

Tract 001 - 7,461 Acres Total
Parcel A
Parcel B
Parcel C
ALLEGANY
ULYSSES
SWEDEN
SUSQUEHANNOCK STATE FOREST
DENTON HILL STATE PARK
Sweden Hill
Buckaloons Run
Woodcock Creek
Brooklard
Walton
Denton Hill
1:48,000
COMMONWEALTH OF PENNSYLVANIA
Department of Conservation & Natural Resources
Minerals Section, Bureau of Forestry
OIL & GAS TRACT 001
Susquehannock State Forest
Potter County
Feet
4,000 2,000 0 4,000


Tract 007 - 10,493 Acres Total
Parcel A
Parcel B
Parcel C
Parcel D
Parcel E
Parcel F
Private
COMMONWEALTH OF PENNSYLVANIA
Department of Conservation & Natural Resources
Minerals Section, Bureau of Forestry
OIL & GAS TRACT 007
Tioga State Forest
Tioga County
Feet
4,000 2,000 0 4,000
1:48,000

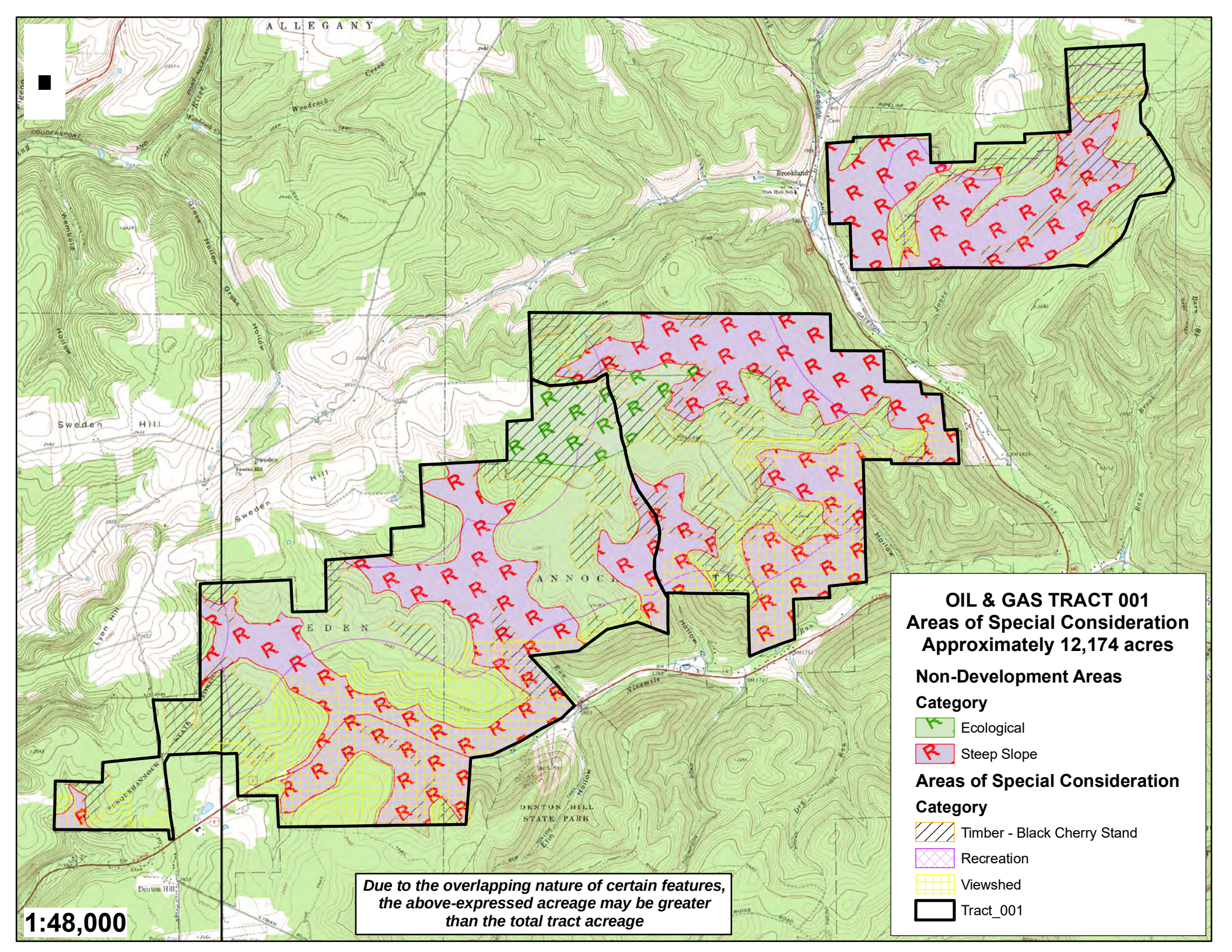

Tract 323 - 4,639 Acres Total
COMMONWEALTH OF PENNSYLVANIA
Department of Conservation & Natural Resources
Minerals Section, Bureau of Forestry
OIL & GAS TRACT 323
Moshannon State Forest
Clearfield County
Feet
3,000 1,500 0 3,000
1:30,000
S B ELLIOTT STATE PARK
A N N O N
P I N E
F O R E S T
Right Branch
Left Branch
Moose Creek
Hobo Hill
Woods Run
Horn Shanty
Dry Hollow
Lookout Tower
Reservoir
Antenna
Gas Well
Water
Schofield Road
Smith Road
Kennedy Road
Weilder Road
Dubec Road
Kelly Road
Mill Road
Pipeline
Interchange 18
BM 2238
BM 1882
BM 2282

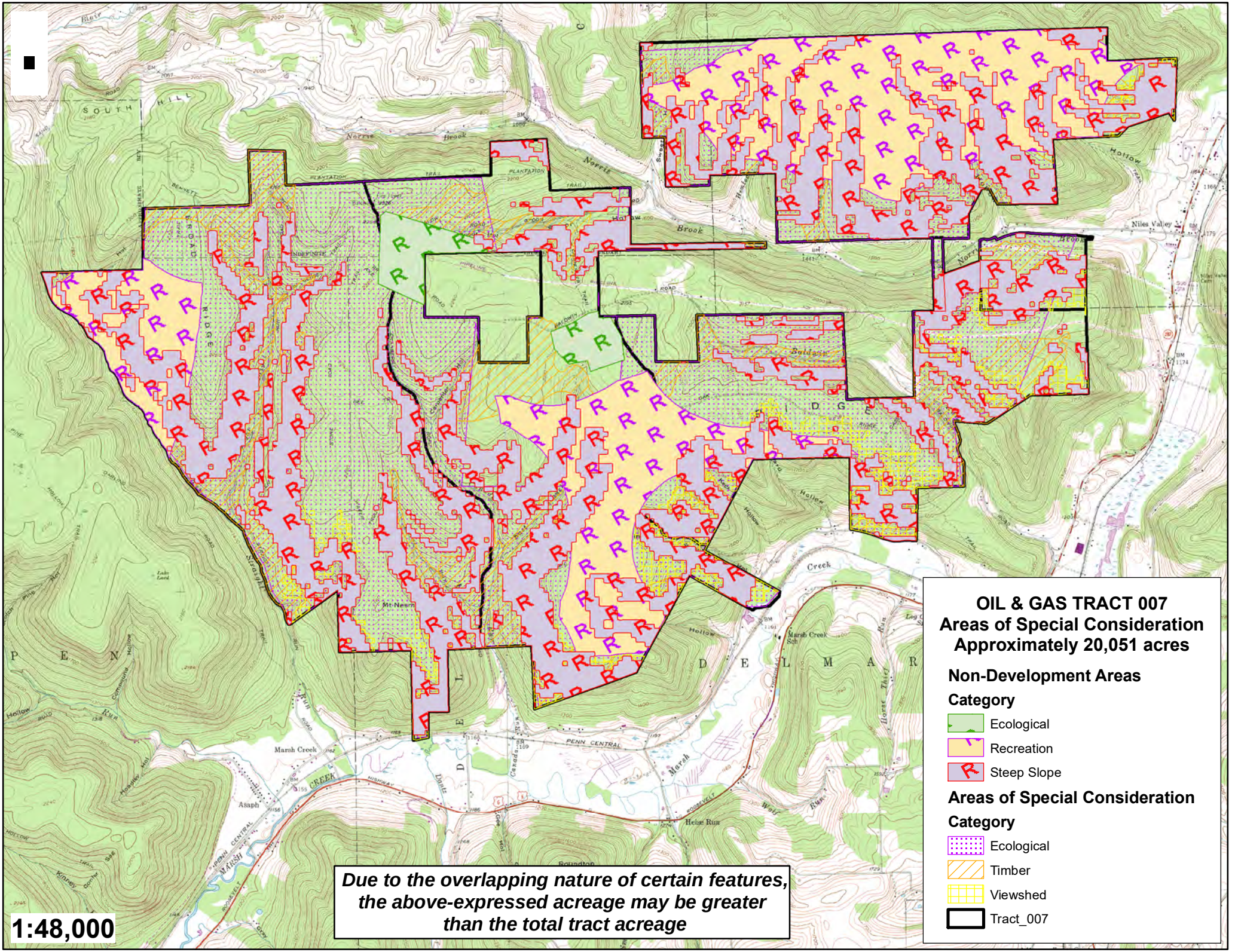

Tract 416 - 3,698 Acres Total
SUSQUEHANNOCK STATE FOREST
ROULETTE
EULALIA
ROULETTE
Kavanaugh Hollow
Trout Brook
Knowlton Hollow
Smith Run
Town Run
Lehman Run
Reed Run
Branch
Niles Hollow
Run
BOUNDARY
CORPORATE
Eulalia Cem
St Eulalia Cem
Sewage Disposal
Olmsted
Mina
Pump
ALLEGHENY RIVER
OLD RAILROAD GRADE
HIGHWAY
ROAD
PIPE LINE
Earl Hollow
BM 1581
BM 1598
BM 1611
BM 1630
1663
1601
1639
1628
1588
1589
1:30,000
COMMONWEALTH OF PENNSYLVANIA
Department of Conservation & Natural Resources
Minerals Section, Bureau of Forestry
OIL & GAS TRACT 416
Susquehannock State Forest
Potter County
Feet
3,000 1,500 0 3,000

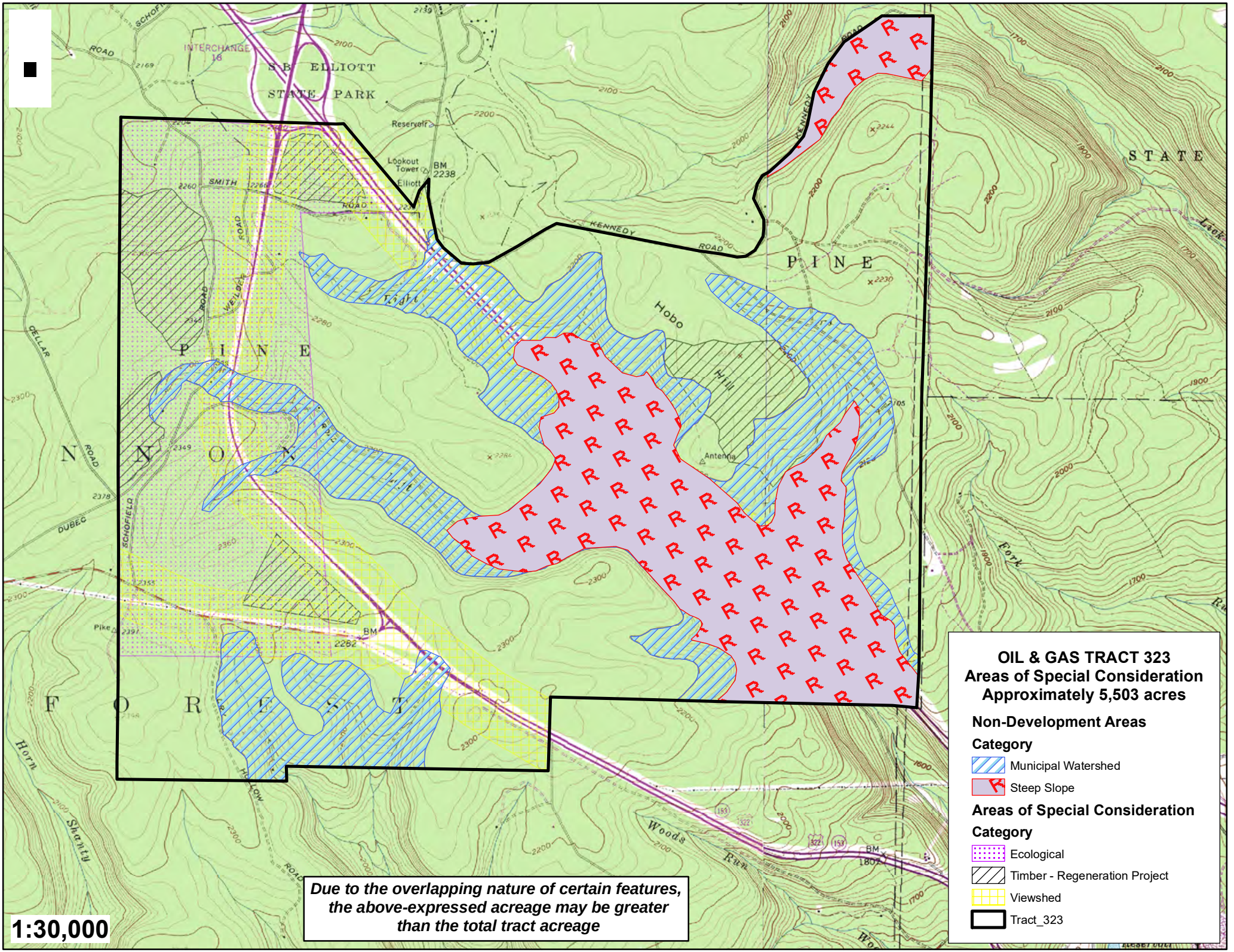

Tract 419 - 2,952 Acres Total
Rocky Run
Whitehead Run
Upper Logue Hollow
Logue Run
Russell Hollow Run
Stillhouse Run
Norcross Run
PIPELINE
ROAD
RIDGE
1:30,000
COMMONWEALTH OF PENNSYLVANIA
Department of Conservation & Natural Resources
Minerals Section, Bureau of Forestry
OIL & GAS TRACT 419
Elk State Forest
Cameron County
Feet
3,000 1,500 0 3,000

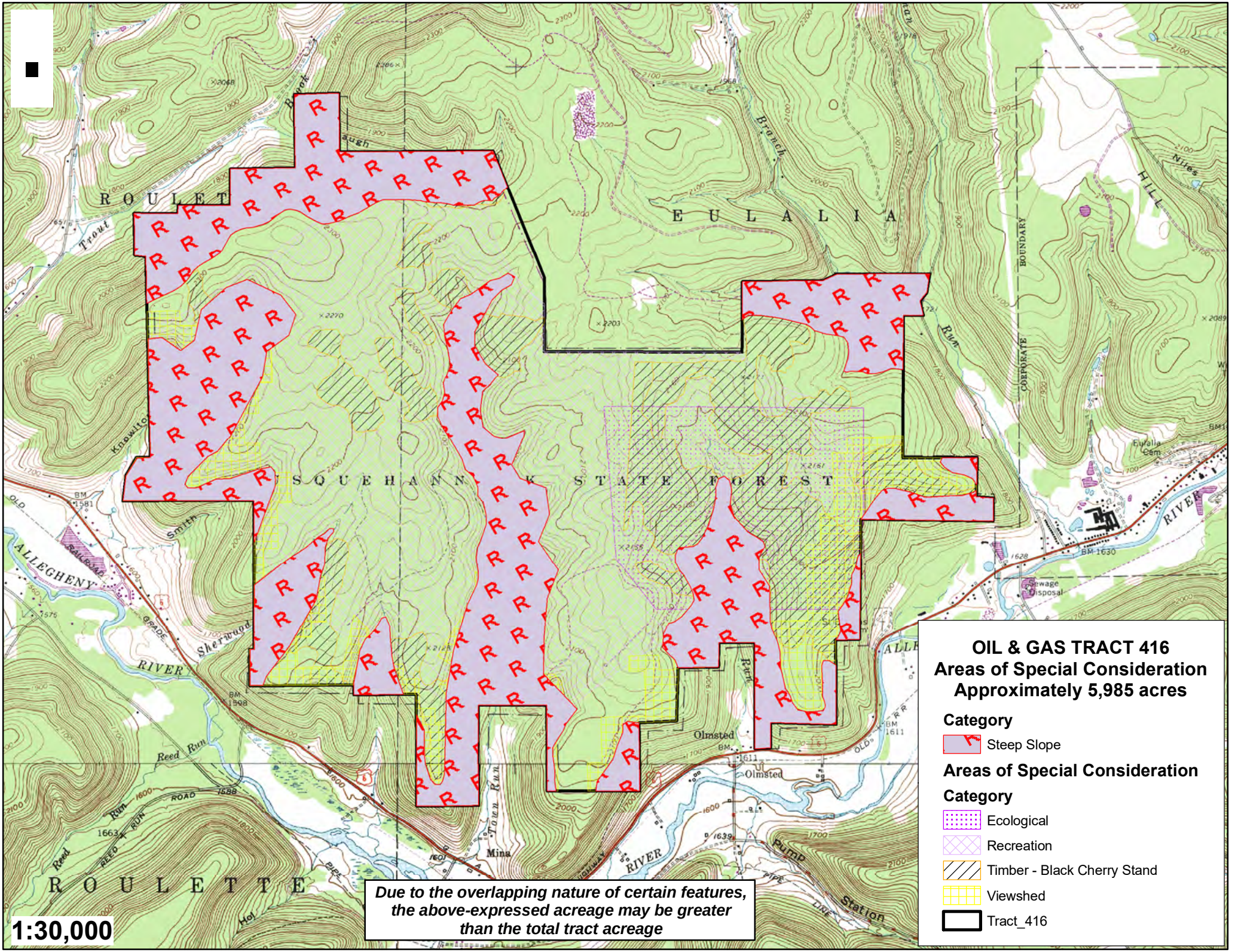

Tract 737 - 2,724 Acres Total
SPROUL STATE FOREST
COLLEBROOK STATE GAME LANDS NO 89
Cole Hill
Jerry Hollow Reservoir
Ram Hollow Reservoir
Claypits
Clayvit
COMMONWEALTH OF PENNSYLVANIA
Department of Conservation & Natural Resources
Minerals Section, Bureau of Forestry
OIL & GAS TRACT 737
Sproul State Forest
Clinton County
Feet
3,000 1,500 0 3,000
1:30,000

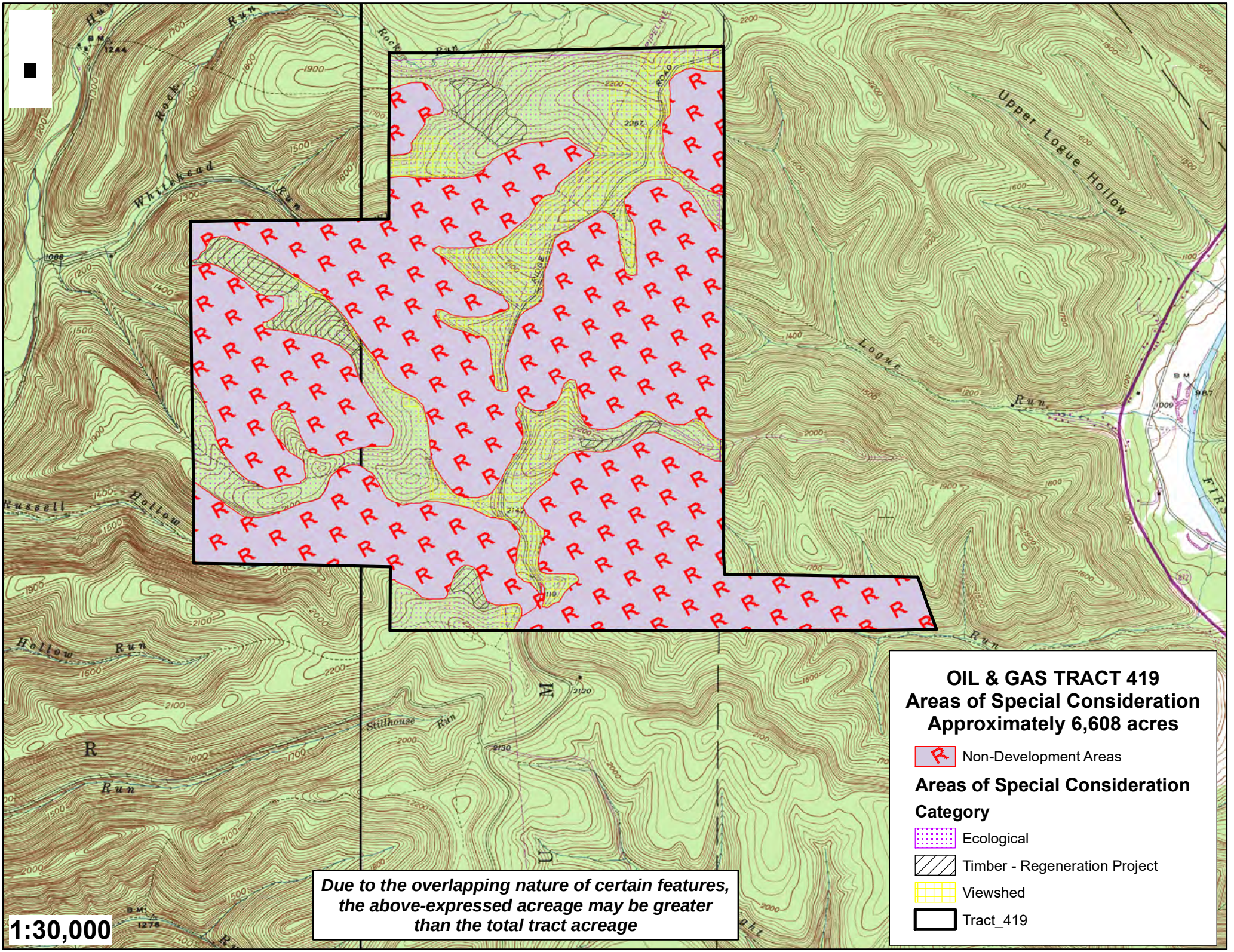
APPENDIX B - SFER MAPS

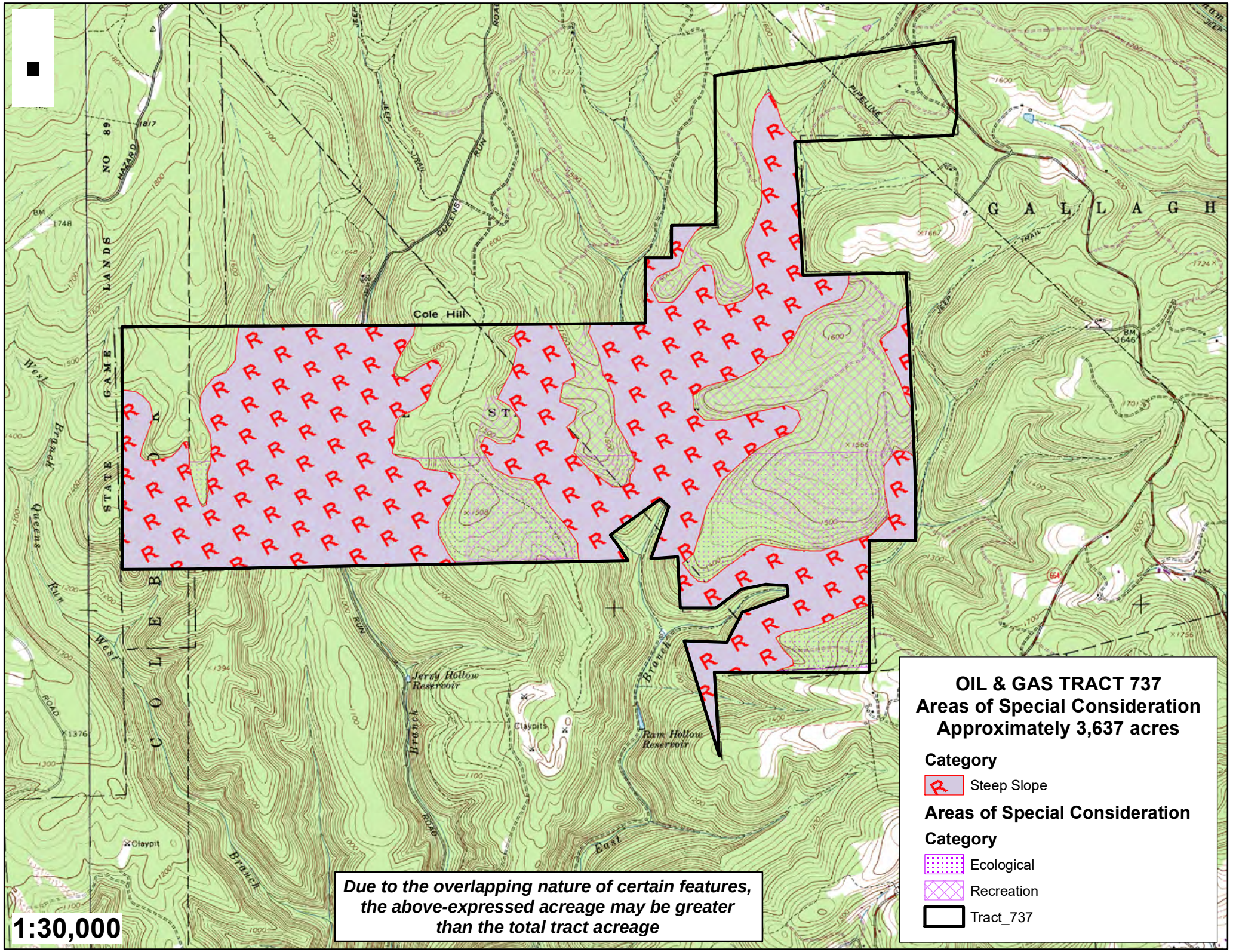

OIL & GAS TRACT 001
Areas of Special Consideration
Approximately 12,174 acres
Non-Development Areas
Category
Ecological
Steep Slope
Areas of Special Consideration
Category
Timber - Black Cherry Stand
Recreation
Viewshed
Tract_001
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:48,000
ALLEGANY
EDEN
ANNOCA
TE
Sweden Hill
Brooklard
DENTON HILL STATE PARK
Deaton Hill
Woodcock Creek
Grass Hollow
Lyon Hill
Vinemile
SUSQUEHANNOCK STATE


OIL & GAS TRACT 007
Areas of Special Consideration
Approximately 20,051 acres
Non-Development Areas
Category
Ecological
Recreation
Steep Slope
Areas of Special Consideration
Category
Ecological
Timber
Viewshed
Tract_007
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:48,000


S B ELLIOTT
STATE PARK
INTERCHANGE 16
Reservoir
Lookout Tower
BM 2238
Elliott
SMITH ROAD
WELDER ROAD
KENNEDY ROAD
P I N E
Hobo Hill
Antenna
STATE
N O R T H
F O R E S T
SCHOFIELD ROAD
DUBEC
GELLAR
Pike
BM 2282
Woods Run
Horn Shanty Hollow
BM 1807
Fork
1:30,000
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
OIL & GAS TRACT 323
Areas of Special Consideration
Approximately 5,503 acres
Non-Development Areas
Category
Municipal Watershed
Steep Slope
Areas of Special Consideration
Category
Ecological
Timber - Regeneration Project
Viewshed
Tract_323


ROULETTE
EULALIA
SUSQUEHANNOCK STATE FOREST
Trout Run
Knowlton Branch
Smith
Sherwood
Reed Run
Town Run
Mina
Olmsted
Pump Station
Nites Hill
CORPORATE BOUNDARY
ALLEGHENY RIVER
OIL & GAS TRACT 416
Areas of Special Consideration
Approximately 5,985 acres
Category
Steep Slope
Areas of Special Consideration
Category
Ecological
Recreation
Timber - Black Cherry Stand
Viewshed
Tract_416
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:30,000


OIL & GAS TRACT 419
Areas of Special Consideration
Approximately 6,608 acres
Non-Development Areas
Areas of Special Consideration
Category
Ecological
Timber - Regeneration Project
Viewshed
Tract_419
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:30,000
Upper Logue Hollow
Logue Run
Rock Run
Whitehead Run
Russell Hollow
Hollow Run
Stillhouse Run
PIPELINE
ROAD
RIDGE


OIL & GAS TRACT 737
Areas of Special Consideration
Approximately 3,637 acres
Category
Steep Slope
Areas of Special Consideration
Category
Ecological
Recreation
Tract_737
Due to the overlapping nature of certain features, the above-expressed acreage may be greater than the total tract acreage
1:30,000
Cole Hill
Jerry Hollow Reservoir
Ram Hollow Reservoir
Claypits
Claypit
STATE GAME LANDS NO 89
COLLEGE
GALLAGH
PIPELINE
JEEP TRAIL
QUEENS RUN ROAD
HAZARD
West Branch Queens Run
Branch
East Branch

COMMONWEALTH OF PENNSYLVANIA
Department of Conservation and Natural Resources
November 6, 2009
717-783-0387

SUBJECT: Environmental Review **SFER – 000902** CAC
FY 2009-2010 Oil and Gas Lease Sale

TO: Daniel A. Devlin
State Forester

FROM: Craig A. Chapman CAC
Forest Resource Planner

This review was placed in circulation for critical analysis on October 23, 2009. No negative comments were received.

Please approve or disapprove this project based on the information in the attached packet. Any amendments to the packet will require another critical analysis and resubmission of this form for your review and signature.

If you decide to disapprove this project please list the conditions that need to be met for the project to meet your approval, or why the project cannot be approved at this time.

Daniel A Devlin 11/6/09
APPROVED **DATE**

_____
DISAPPROVED **DATE**

Comments on Disapproval:

☐ The project will be reconsidered after the following items are addressed:
☐ The project cannot be approved at this time because:

_____
_____
_____
_____

DCNR
Bureau of Forestry
Environmental Review Policy

Environmental Reviews

On initiation of any project on state forest lands that may or will disrupt, alter, or otherwise change the environment, review and consider the environmental review items. Some projects, such as timber sales, have developed checklists to facilitate environmental reviews.

On initiation of any project in the following categories, a formal written project review, addressing the environmental review items, must be completed by the district forester (or designee) and approved by the state forester:

- Any wetlands encroachment
- In-stream alterations
- Disturbance activities in a natural area including insect and disease control
- Timber management in a wild area
- Right-of-way expansions or new construction (pipelines or major powerlines)
- Surface mining, oil and gas leases (excluding gas storage)
- Large-scale stone removals
- Subsurface disturbance to caves
- Addition of public-use roads to the state forest road system
- Land acquisitions/exchanges
- New trail construction
- Large blocks of artificial regeneration, i.e. monocultures (>10 acres)
- ***Wind power development (proposed)***
- Other projects as determined by the state forester

The district forester will submit the original copy of the written environmental review to the Division of Resource Planning and Information for dissemination and review. The state forester will make final project approval/disapproval. The written environmental review will be made a permanent part of the project file.

Project Review Items:

Written environmental reviews will include a description of the project, justification for the project's need, a description of the project site, and a narrative consideration of each of the environmental review items. The narrative consideration must include an assessment of the project's probable impact on each factor and whether it is beneficial or adverse. Factors where an adverse impact is predicted require an explanation of the corrective measures that will be taken, or justification why none are planned.

1. **Promotion of Goals:** Every acre of state forest lands is included in an array of goals including ecoregional goals, landscape goals, and plan component goals (State Forest Resource Management Plan - Overview).

2. **Erosion and Sedimentation:** Soil losses and resultant water degradation can be greatly reduced or prevented for most activities (BMP Manuals, Timber Sale Manual, SFRMP Water, Soil, and Fauna Sections, or County Conservation District).

3. **Water Quality:** Potential sedimentary, thermal, and chemical pollution can be avoided for most activities. Existing pollution can be reduced or eliminated by certain practices or procedures (BMP Manuals, SFRMP Water, Soil, and Fauna Sections, the DEP Bureau of Water Quality Management or PA Fish & Boat Commission).

4. **Air Quality:** Potential dust, smoke, chemical, and other pollution can be avoided for most activities. Certain practices, like timing of the activity, can alleviate potential problems when the pollutant cannot be reduced or prevented (DEP Bureau of Air Quality).

5. **Water Quantity:** Certain practices in or adjacent to wetlands can affect the water level. Streams and bodies of water are also subject to manipulation of water levels. Practices should have an overall beneficial effect and not adversely affect water levels (State Forest Resource Management Plan - Water, DEP Bureau of Water Supply Management or PA Fish & Boat Commission).

6. **Groundwater:** Potential pollution of groundwater can be avoided for most activities (State Forest Resource Management Plan - Water, DCNR Bureau of Topographic & Geologic Survey, DEP Bureau of Water Quality Protection).

7. **Soils:** Potential problems such as erosion, stability, over-compaction and saturation should be anticipated and avoided (State Forest Resource Management Plan - Soils, SCS County Soil Survey, County Conservation District, or DEP Bureau of Water Quality Protection).

8. **Unique and Unusual Geologic Features:** Potential damage to or destruction of these features should be anticipated and avoided (State Forest Resource Management Plan and Pennsylvania Natural Diversity Inventory for details of locations. Minerals Section, Bureau of Forestry or DCNR Bureau of Topographic and Geologic Survey for details of possible project effect on feature and preventive measures).

9. **Aesthetic Values:** Often projects can be blended into their surroundings, or the adverse impact of their appearance can be lessened by certain practices or procedures (Operating Management Manuals).

10. **Noise Levels:** Potential problems for the public, contractors, and employees should be anticipated and avoided. Certain practices or procedures such as timing of the activity and the use of buffer zones can alleviate potential problems.

11. **Archeological Sites and Historic Sites:** Potential damage to or destruction of these features should be anticipated and avoided. Discovery of new sites should be reported to

the Division of Planning & Information (State Forest Resource Management Plan - Infrastructure, Historical and Museum Commission).

12. **Recreation Sites and Opportunities:** Potential damage to or degradation of existing or potential recreational sites should be anticipated and avoided. Certain practices such as timing of the activity and use of buffer zones can alleviate potential problems (Bureau of Forestry - Division of Operations & Recreation).

13. **Public Health and Safety:** Project design and administration must ensure that the public is protected at the project site from all potential hazards that could be associated with the project activities or result from the completed project (Bureau of Forestry - Division of Operations & Recreation, Bureau of Facility Design and Construction).

14. **Transportation:** Project design must ensure adequate ingress to and egress from the site and minimize disruption of public rights-of-way (Bureau of Forestry -Division of Operations & Recreation).

15. **Energy Needs/Use:** Energy resources fill domestic and commercial needs. Projects should also be designed to use energy wisely and ensure conservation (Minerals Section).

16. **Existing/Potential Land Use:** Project design should be compatible with current zoning for the site and planned future uses, if any. The project should conform to landscape goals and be consistent with adjoining lands strategy (State Forest Resource Management Plan - Overview).

17. **Protected Animals and Plants:** Certain animal and plant species have been listed and given protected status by the U.S. Fish and Wildlife Service, the Pennsylvania Game Commission, the Pennsylvania Fish and Boat Commission and the Pennsylvania Department of Conservation & Natural Resources. Projects that will have a potentially adverse effect on any of these species, or the habitats critical to their survival should be avoided. (For a listing of these species and guidelines for their protection, refer to the State Forest Resource Management Plan - Fauna, Flora and Ecological Considerations, Bureau of Forestry - Ecological Services Section and Pennsylvania Natural Diversity Inventory).

18. **Habitat Diversity and Interspersion:** Habitats are classified as either terrestrial, wetland, aquatic, riparian or cave. Management strategies, in most cases, should be designed to optimize diversity within and between these habitats, primarily by promoting various habitat components. When protecting, creating or developing habitat components, consideration should be given to the arrangement or interspersion of these components within a landscape. (State Forest Resource Management Plan - Fauna and Flora).

19. **Biological Productivity:** While it is the goal of the bureau to provide for and maintain a diversity of species, it is also striving to promote conditions favorable for maintaining viable populations of certain species, while still maintaining diversity. Management for productivity may be directed toward a particular species or group of species while not jeopardizing the overall species diversity of a particular landscape or ecological region (Bureau of Forestry - Ecological Services Section).

20. **Vegetation:** Many projects require the manipulation or disturbance of forest vegetation. Effects on the project on forest communities should be considered.

21. **Non-Native Invasive Species:** Some projects have the potential to either directly introduce non-native invasive species or create conditions favorable for the potential introduction of these species (Bureau of Forestry - Ecological Services Section).

22. **Other:** Consider other unique features that may be affected by the proposed project (e.g., scenic rivers, National Natural Landmarks).

23. **Permits:** Projects affecting or encroaching on wetlands require encroachment permits. New entrances to public roads, other than state forest roads, require occupancy permits. Certain other activities also require permits.

COORDINATION AGREEMENT

THIS COORDINATION AGREEMENT (this "Agreement") is entered into as of August 31, 2006 by and between the Commonwealth of Pennsylvania (the "Commonwealth"), acting by and through the Department of Conservation and Natural Resources ("DCNR"), and Pennsylvania General Energy Company, L.L.C., a Pennsylvania limited liability company, with its principal place of business at 208 Liberty Street, Warren, Pennsylvania 16365 ("PRODUCER").

W I T N E S S E T H :

WHEREAS, DCNR has the authority to acquire and hold land as State forests (the "State Forest"), in the name of the Commonwealth, including land subject to reservations of oil, gas and other mineral rights, pursuant to Section 302(a) of the Conservation and Natural Resources Act, Act 18 of 1995:

WHEREAS, PRODUCER has acquired and may acquire additional oil, gas and other mineral rights by deed, lease or other agreements or instruments, copies of which will be provided to DCNR pursuant to this Agreement, (the "Oil & Gas Rights") on certain land owned by the Commonwealth and managed by DCNR as state forest land;

WHEREAS, PRODUCER has, to the extent provided in its Oil & Gas Rights, (i) the legal right to engage in the activities necessary for oil and gas exploration, development, and production ("Oil & Gas Production") on the State Forest in accordance with its Oil & Gas Rights; and (ii) the legal right to enter upon the surface of the State Forest in accordance with its Oil & Gas Rights in order to engage in Oil & Gas Production;

WHEREAS, as part of Oil & Gas Production, PRODUCER will need to develop access to proposed drill sites in the State Forest (the "Drill Sites"), develop and maintain the Drill Sites, and install and maintain required ancillary support services and equipment (collectively, the "Site Preparation");

WHEREAS, DCNR and PRODUCER acknowledge the interest of the public in the surface of the State Forest and the rights of PRODUCER to use so much of the surface as is necessary for Oil & Gas Production and further desire to memorialize their understanding as to how their respective rights will be exercised; and

WHEREAS, in view of the foregoing premises, the parties to this Agreement wish to set forth their mutual understandings and agreements concerning PRODUCER's development of its Oil & Gas Rights and the related coordination of activities between DCNR and PRODUCER.

NOW, THEREFORE, in consideration of the premises, and intending to be legally bound hereby, DCNR and PRODUCER agree as follows:

1. Operating Plan Notice. Prior to commencing its operations in the State Forest, PRODUCER must provide the DCNR District Forester with at least sixty (60) days advance

DCNR OCC
LOG #: 06-1325

written notice of surface occupancy (the "Notice") by submitting a proposed operating plan in a form which shall include, to the extent relevant in light of the circumstances, the following information (collectively, the "Operating Plan"):

(a) detailed maps (as referenced in Section 7.02 of Exhibit A, attached hereto) showing the location of roads, wells, pipelines and other facilities associated with Oil & Gas Production, including Site Preparation;

(b) areas to be disturbed by Oil & Gas Production, including Site Preparation;

(c) methods of oil & gas extraction;

(d) methods of disposal or treatment of wastes;

(e) reclamation plans;

(f) methods for control of erosion and prevention of water pollution;

(g) proposed schedule for construction activities described in the erosion and sedimentation control plan;

(h) identification of PRODUCER's agent; and

(i) documentation of Oil & Gas Rights.

2. Review of Operating Plan. Upon receipt, DCNR will expeditiously review the proposed Operating Plan, engage in cooperative planning with PRODUCER as needed, and provide a timely response to PRODUCER in the form of a notification to proceed with development or an objection to some or all of the proposed development. If no response is received within 60 days the PRODUCER may treat and consider the proposed plan as approved by DCNR and may proceed with the planned development. If DCNR objects to a planned surface use by the PRODUCER, DCNR shall identify in writing the elements of the plan that are objectionable, along with the basis for its objections and suggested changes. DCNR shall not object to any Operating Plan component that is consistent with the guidelines included in Exhibit A. If PRODUCER has concerns with any of DCNR's objections, PRODUCER and DCNR shall attempt to resolve the concern using the dispute resolution process set forth in paragraph 18 of this Agreement. Without limiting the parties' responsibilities to coordinate their respective activities, if a significant new project or plan modification that is not otherwise included in a prior Operating Plan is proposed, the PRODUCER will provide notifications and documentation (as applicable) consistent with that included in an original Operating Plan.

3. Cutting and Marketing Timber. PRODUCER acknowledges that there is forest growth on the State Forest that PRODUCER will need to cut for wells, roads, pipelines, or surface facilities pertaining to its Oil and Gas Production. DCNR shall mark and assess the value of the trees that must be removed in cooperation with PRODUCER. For purposes of this Agreement, the assessed value shall be the fair market value of the marked trees. PRODUCER shall pay 1.25 times the assessed value and remove the trees. If the PRODUCER believes that the assessed value does not fairly represent the fair market value the PRODUCER may obtain at its

expense an independent third-party timber appraisal by a reputable and qualified forester who will be selected by agreement of the PRODUCER and DCNR within 5 business days of PRODUCER's request. If the DCNR does not select an appraiser within five (5) business days or if DCNR's assessed value exceeds the third-party appraisal by 10% or more then the PRODUCER shall pay the assessed value based on the third-party appraisal. In cutting marked timber, the height of the stumps above the surface of the ground will not exceed the diameter of the trees cut at the cutting point and in no case will exceed the height of 12 inches above the surface of the ground.

4. Oil & Gas Production. PRODUCER shall engage in those activities reasonably necessary for Oil & Gas Production on State Forest subject to its Oil & Gas Rights including, without limiting the generality of the foregoing, the following activities: (i) the Site Preparation; (ii) the drilling of wells and the related installations, maintenance and replacements of pipe, machinery and equipment; and (iii) the laying of pipeline and the related installation, maintenance and replacement of compressor stations and processing facilities.

5. Placement of Facilities. PRODUCER agrees that in connection with its wells, pipelines and surface facilities, it will provide DCNR with detailed maps (as specified in Section 1) and will consult with DCNR regarding the best placement of wells, pipelines and facilities prior to constructing these facilities.

6. Signs. Markers and Fences. PRODUCER shall replace or repair, as DCNR shall direct, all signs, property markers, fences and other structures and service utility lines destroyed or damaged in any work incident to the construction, operation, maintenance or removal of facilities built or installed in connection with Oil & Gas Production or in any cutting or removal of forest growth.

7. Controlled Burning. No fire shall be set on or adjacent to any surface area used pursuant to this Agreement by PRODUCER or any of its officers, agents, employees, contractors or subcontractors except in pursuance of and in accordance with conditions prescribed in the permission first obtained from DCNR in writing, fixing the time, place and manner of burning. Should any fire set by PRODUCER, or by any of the persons mentioned in this paragraph, escape in any manner and damage any state forest land or other property, PRODUCER shall be liable for all such damages resulting from such escape, and for all costs incurred in controlling such fire. PRODUCER, its officers, agents and employees in the vicinity, as well as its contractors, subcontractors, and agents and employees of contractors and subcontractors, shall, with such means as they may have at hand or be able to summon, render aid in fighting said fire without cost or liability to the Commonwealth.

8. Erosion and Sedimentation Control/Site Restoration. Upon termination of Oil & Gas Production, PRODUCER shall refill to contour all ditches or other excavations caused by Oil & Gas Production, including Site Preparation; construct cross ditches; seed or replant the disturbed surface areas; keep its facilities in good repair and appearance, and take such other measures as may be reasonable and deemed necessary by DCNR to control erosion and sedimentation and to maintain or restore the natural and aesthetic values as directed by DCNR, including the planting of trees and shrubs and/or seedlings, at the option of DCNR. PRODUCER will implement the

erosion and sedimentation plan as prepared for the Pennsylvania Department of Environmental Protection or the appropriate County Conservation District.

9. Ingress and Egress. PRODUCER shall not share its rights of ingress and egress or use of the State Forest pursuant to its Oil & Gas Rights with other parties unless said use is for the benefit of PRODUCER and is related to Oil & Gas Production.

10. Pollution. PRODUCER shall at all times perform under this Agreement in such a manner as to minimize the possibility of polluting the environment. PRODUCER shall be liable and responsible for any pollution or other damage which occurs on the State Forest as a result or consequence of PRODUCER's occupation and use thereof, if such pollution or damage is due to PRODUCER's operations. Any action for civil damages brought by DCNR against PRODUCER on account of such pollution pursuant to this Agreement shall not bar DCNR from bringing other actions under the Clean Streams Law or other applicable law, rule, or regulation of the Commonwealth.

11. Gates or Barricades. If requested by DCNR, PRODUCER shall install gates or barricades on the State Forest at PRODUCER's expense to prevent unauthorized vehicular travel on the State Forest. If requested by DCNR, PRODUCER shall place warning signs at said gates or barricades, the wording of which shall be subject to the mutual agreement of DCNR and PRODUCER. PRODUCER shall maintain any gate or barricade installed in proper condition.

12. Limits of Use. PRODUCER shall not use, or grant others permission to use, the State Forest or facilities and installations placed on or beneath the State Forest for any purpose other than Oil & Gas Production.

13. Well Plugging. PRODUCER shall properly and effectively plug all of its wells on the State Forest before abandoning the well in accordance with the regulations of the Department of Environmental Protection's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth. If a gas well does not produce more than an average of one (1) Mcf/day of natural gas in a calendar year for two consecutive years (calculated by dividing its annual production in Mcf by 365 days), or in the case of an oil well more than $1/10^{th}$ of a barrel of oil per day in a calendar year for two consecutive years (calculated by dividing its annual production in barrels by 365 days), PRODUCER shall plug and abandon the well no later than six (6) months after the end of the second year, unless DCNR in its sole discretion agrees otherwise. For wells that produce both oil and gas, regardless of how classified by permit, minimum production would have to be below both production levels. This provision does not apply if PRODUCER chooses to shut-in production due to market conditions at any time during the two-year period or production is disrupted, in whole or in part, at any time during the relevant two-year period by an act of Force Majeure as defined in Section 26 of this Agreement. PRODUCER hereby waives any objection to DCNR obtaining annual well production data from the Department of Environmental Protection (DEP) for each of its wells on the State Forest that are subject to this Agreement and further authorizes DCNR to use this clause as proof of said waiver without further action by PRODUCER. DCNR agrees to maintain the confidentiality of any production data obtained unless released from such obligation by the express written consent of PRODUCER or by operation of law.

14. Financial Security. Prior to drilling any well pursuant to this Agreement, PRODUCER shall provide DCNR with security in a form reasonably acceptable to DCNR (or alternatively, in the form provided in Exhibit B) regarding the costs associated with the plugging and abandonment of each well. The selection of the form of security, i.e., surety bond, irrevocable letter of credit, or other type of credit security, shall be in the sole discretion of PRODUCER. The security shall remain in effect with respect to the well until (i) the plugging and abandonment of the well and associated site restoration has been certified to the Pennsylvania Department of Environmental Protection by PRODUCER, and (ii) either one year has passed subsequent to said certification or the plugging and abandonment and associated site restoration has been approved by the District Forester, whichever shall first occur. In the event of the sale or assignment by PRODUCER of its Oil & Gas Rights or any portion thereof, PRODUCER shall maintain or shall cause the security to remain effective with respect to the well until the completion of plugging and abandonment and associated site restoration has been certified in accordance with the foregoing provision. The aforementioned security per well shall be in accordance with the following:

Well Depth	Amount of Security
Less than 2,500 feet	$ 2,500
2,500 feet to 8,500 feet	$ 7,500
8,501 feet to 10,000 feet	$ 25,000
10,001 feet and deeper	$75,000

In addition to the above financial security for plugging and abandonment of wells drilled subsequent to execution of this Agreement, PRODUCER shall provide financial security for existing wells of PRODUCER in the State Forest in accordance with the foregoing schedule within ninety (90) days of the effective date of this Agreement. The amount of financial security required pursuant to this paragraph shall be adjusted every five (5) years in accordance with the procedure attached hereto as Exhibit C.

15. Indemnification. PRODUCER and DCNR agree that liability regarding claims for injury or damages will be determined in accordance with Pennsylvania law. This provision shall not be construed to limit either party's rights, claims or defenses that arise as a matter of law. This provision shall not be construed to limit the sovereign immunity of the Commonwealth.

16. Sale of Oil & Gas Rights. To the extent PRODUCER desires to sell any of its Oil & Gas Rights on the State Forest, PRODUCER shall provide DCNR with an opportunity to propose to purchase such rights.

17. Assignment. This Agreement may be assigned by PRODUCER in connection with any disposition or dispositions, in whole or in part, of the Oil & Gas Rights, whether such disposition results from one or more sales, leases, or transfers of the Oil & Gas Rights resulting from one or more sales, assignments or corporate transactions, without approval of DCNR. PRODUCER agrees to continue performance under this Agreement, including maintenance of the financial security required pursuant to Section 14 above, until such time as the assignee (i) assumes responsibility for and provides financial security in accordance with the provisions of said

Section 14; and (ii) assumes full responsibility for the PRODUCER's obligations under this Agreement generally. The provisions of this Agreement shall be binding upon the respective successors and assigns of the parties hereto; provided, however, that this Agreement shall not be applicable if PRODUCER has not engaged in Oil & Gas Production on land subject to its Oil & Gas Rights and such lands are subject to a lease or an assignment providing for an automatic reversion to a lessor or assignor of such lands unless such property interests have vested in PRODUCER.

18. Dispute Resolution. In the event that a dispute arises with respect to the administration of the Operating Plan, the complaining party(ies), i.e., PRODUCER or DCNR or both, shall provide a written summary of the dispute to the District Forester. PRODUCER and DCNR agree to meet and negotiate in good faith in a first attempt to resolve the dispute informally within ten (10) days of the District Forester's receipt of such written summary(ies) or within a timeframe that is mutually agreeable to the parties. If the parties are unable to resolve the dispute informally, PRODUCER or DCNR or both shall forward a written summary summarizing the dispute to the State Forester. A meeting or conference call between PRODUCER and the State Forester (and their respective representatives) shall be scheduled within ten (10) days, or within a timeframe that is mutually agreeable to the parties, to permit the parties to negotiate in good faith and attempt to resolve the dispute. If the dispute remains unresolved, each party may avail itself of available legal remedies without limitation.

19. Commonwealth Law. Nothing in this Agreement shall in any way be so construed as to impair (i) the powers, privileges, rights, duties or obligations of the Commonwealth or its representatives in the execution of the statutory law, case law, or other law of or applicable to the Commonwealth, or the applicable rules and regulations promulgated thereunder, now in force or hereafter enacted or adopted (collectively "Commonwealth Law"), or (ii) the powers, privileges, rights, duties or obligations of PRODUCER under Commonwealth Law including, without limitation, that Commonwealth Law relevant to its Oil & Gas Rights. This Agreement shall be governed by the laws of the Commonwealth, without regard to its conflict of law rules.

20. Headings. The paragraph headings herein are for reference only and are intended to have no legal force or effect.

21. Conveyancing Documents. This Agreement is not intended to modify, amend or alter in any way the rights and obligations of the parties as set forth in the leases, deeds or other conveyancing documents related to the Oil & Gas Rights.

22. Entire Agreement. This Agreement constitutes the entire understanding between the parties hereto with respect to the subject matter of this Agreement.

23. Amendment. This Agreement may not be amended except by an instrument in writing signed by PRODUCER and DCNR.

24. Termination. This Agreement shall terminate when (i) PRODUCER and/or its successor or successors in interest or its assignees elect in its or their sole discretion to cease permanently Oil & Gas Production, (ii) all terms and conditions of this Agreement relevant to the termination of such production have been complied with, and (iii) all relevant provisions of law relative to

the activities contemplated by this Agreement have been complied with including, without limiting the generality of the foregoing, site restoration and the plugging of abandoned wells.

25. Notice. Unless otherwise provided in this Agreement or mutually agreed upon by the parties, any written communication required by this Agreement may be provided by U.S. Mail, a recognized overnight delivery service, email or facsimile and shall be provided to the following persons:

For PRODUCER:

Pennsylvania General Energy Company, L.L.C.
208 Liberty Street
Warren, PA 16365
Attention: Douglas E. Kuntz
Telephone: (814) 723-3230
Telecopier: (814) 723-4746
Email: dougkuntz@penngeneralenergy.com

with copy to:

Pennsylvania General Energy Company, L.L.C.
208 Liberty Street
Warren, PA 16365
Attention: Craig Mayer
Telephone: (814) 723-3230
Telecopier: (814) 723-4746
Email: craigmayer@penngeneralenergy.com

For DCNR:

Department of Conservation and Natural Resources
Minerals Section
6th Floor, Rachel Carson State Office Building
P.O. Box 8552
Harrisburg, PA 17105-8552
Attention: Section Chief
Telephone: (717) 787-4835
Telecopier: (717) 783-5109
Email: tborawski@state.pa.us

with a copy to the District Forester(s) in the State Forest District(s) in which the relevant oil and gas activity is located.

Any party may designate in a writing to any other party any other address, email address or telecopier number to which, and any other person to whom or which, a copy of any such notice, request, instruction or other communication should be sent.

26. Force Majeure. An act of Force Majeure, for purposes of this Agreement, shall be an act resulting from an act of God, strike, lockout, or other industrial disturbance, act of the public enemy, war, blockade, public riot, lightning, fire, storm, flood, explosion, governmental action, governmental delay, restraint or inaction, unavailability of equipment, and any other cause, whether of a kind specifically enumerated above or otherwise, which is not reasonably within the control of the party claiming suspension.

27. Wharton Pipeline. To the extent not otherwise provided by its Oil & Gas Rights and subject to the terms and conditions of this Agreement, DCNR grants PRODUCER a right-of-way as described in Exhibit D attached hereto, pursuant to the authority provided in Section 302(b)(3) of the Conservation and Natural Resources Act, Act 18 of 1995. DCNR acknowledges and agrees that PRODUCER has previously provided the information relevant to said installation that would otherwise be required by Section 1 of this Agreement.

28. No Recording. This Agreement may not be recorded by either party hereto.

29. Severability. In the event that any one or more of the provisions contained in this Agreement shall, for any reason, be held to be invalid, illegal or unenforceable in any respect, then to the maximum extent permitted by law, such invalidity, illegality or unenforceability will not affect any other provision of this Agreement.

30. Execution in Counterparts. This Agreement may be executed by the parties hereto in several counterparts, each of which shall be executed by PRODUCER and DCNR and deemed to be an original and all of which shall constitute together but one and the same agreement.

[The remainder of this page is

intentionally left blank.]

WITNESS the due execution hereof as of the date first written above.

PENNSYLVANIA GENERAL
ENERGY COMPANY, L.L.C.

By: _____
David A. Lind
President and CEO

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

By: _____
Michael DiBerardinis
Secretary

Form & Legality Review:

_____
DCNR Chief Counsel

_____
~~Executive~~ Deputy General Counsel
Office of General Counsel

_____
Deputy Attorney General
Office of Attorney General

EXHIBIT A

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOUCES
GUIDELINES FOR OIL AND GAS DEVELOPMENT
ON STATE FOREST LAND

1. Coordination with District Forester

1.01 Consult with District Forester regularly during the planning, development and implementation of oil and gas operations on State Forest land. Advise District Forester when operations begin and end and of any changes to previously agreed upon plans, preferably before operations begin, but at least as soon as practically possible.

2. Site Development/Erosion Control

2.01 Consult with District Forester when planning the location for drilling sites, access roads and other oil and gas facilities.

2.02 Maintain an approved site-specific Erosion and Sedimentation Control Plan on site at all times.

2.03 Restore all disturbed areas at each drilling site immediately upon completion of well installation. Consult with Department's representative to discuss grading, seeding and other planned activities prior to site restoration.

2.04 Do not construct or allow others to construct earthen dams across any stream to obtain a water supply prior to consulting with the Department.

2.05 Maintain all erosion and sedimentation control facilities and devices.

3. Water Quality

3.01 Consult with the District Forester prior to locating any bore/core hole or well site clearing within two hundred (200) feet of any stream or body of water or three hundred (300) feet of any exceptional value (EV) stream or body of water on State Forest lands. Prevent any contamination or any pollution of springs, brooks, streams, or other waters on State Forest lands.

3.02 Where construction, operation, or maintenance of any of the facilities on or connected with this Agreement causes damage to the watershed or pollution of the water resources, repair such damage and take corrective measures to prevent further pollution or damage to the watershed after consultation with an authorized representative of Department.

3.03 Consult with the Department, the Pennsylvania Game Commission, and the Pennsylvania Fish and Boat Commission, as appropriate, to determine the appropriate

procedures to use to value the loss of any property, wildlife or fish as a result of oil and gas production activities.

3.04 Pay the Commonwealth of Pennsylvania for any damage or destruction of property, fish, and wildlife resulting from oil and gas operations under this Agreement.

4. Buildings

4.01 Do not drill any bore/core hole, carry on operations, make excavations, or otherwise disturb the surface of the lands within two hundred (200) feet of any building prior to consulting with the District Forester.

4.02 Consult with the District Forester prior to the construction and erection of any storage facilities, buildings, work sheds, or any other physical structure upon State Forest lands.

5. Appearance

5.01 Maintain State Forest lands in a neat and presentable manner. Remove all rubbish and debris as it accumulates. Restore each individual area or facility to its original condition or to a condition acceptable to the District Forester within thirty (30) days of completions of any oil and gas activities that disturb the area.

6. Water Wells

6.01 To the extent a water well is necessary for oil and gas production activities, consult with the Department prior to the drilling and development of any such water well on State Forest land.

6.02 Submit a final plat within thirty (30) days after completion of a water well showing its exact location, elevation, total depth, lithology penetrated and thickness of discrete lithologic units, depth to water-bearing horizons, estimates of flow rates, results of draw down tests, and results of analytical tests conducted.

6.03 Supply the Department with any other records, driller's logs, memoranda, accounts, reports, cuttings, cores, or other information relative to the drilling, completion, or operation of water wells on State Forest land, including true copies of any electrical or radioactivity surveys made in the wells.

6.04 Comply with the Water Well Drillers License Act 6 10 of May 29, 1956 (P.L. 1840), as amended or amended in the future.

6.05 Allow the Department to use water from wells drilled for oil and gas purposes on State Forest land provided such use does not interfere with the oil and gas operations.

6.06 Contact the District Forester before plugging any water well. Upon request by the Department, transfer any water wells no longer needed for oil and gas operations to the

Department at no cost. Plug water wells not transferred to the Department from bottom to top with clay, cement, or other impervious materials acceptable to the Department.

7. Road Specifications

7.01 Consult with the District Forester to discuss plans for access roads prior to construction. Prior to the use of State Forest roads for oil and gas operations, consult with the District Forester to establish the existing conditions of such roads and an acceptable schedule of maintenance and repair to ensure the condition of the roads does not deteriorate.

7.02 Locate and designate, in consultation with the District Forester, access roads necessary for oil and gas activities on a Topographic Map, scale 1 inch = 2,000 feet, or any road construction map of larger scale. Provide a copy of the map to the District Forester prior to construction.

7.03 Where possible, locate access roads along existing roads or old abandoned roads or pipeline rights-of-way. In such instances, improved and maintained such roads to conform to the specifications for the location, construction, and maintenance of new access roads. Ensure road grades do not exceed ten percent (10%).

7.04 Conduct operations in a manner that does not prevent, hinder, or obstruct the customary use by the Department or the public of any roads and trails owned or maintained by the Department. Keep all roads and trails free from obstruction by logs, brush, or other debris resulting from oil and gas operations. Upon request by the District Forester, temporarily discontinue the use of a road when necessary to prevent serious damage.

7.05 When a road being constructed crosses a fence, construct a gate and keep the gate closed except when the passageway is in use.

7.06 When access roads must be located in an area where no road exists and access to drill site will open onto a state or township highway, obtain the necessary permits and approval from the Pennsylvania Department of Transportation or township for the opening. On all Agreement tracts where the road opens onto a paved state or township highway, prevent mud and debris from being carried onto the paved highway especially during periods of heavy road use. In areas where a mud problem may be present, stabilize the paved road junction with native stone or washed gravel.

7.07 Install gates on all access roads constructed to support oil and gas operations unless the District Forester advises that a gate is not necessary. Consult with the District Forester to determine the appropriate type of gate to be installed.

7.08 Notify the District Forester at least five (5) working days prior to start of any road construction, improvement or maintenance so that the District Forester can make arrangements to be available when actual work begins.

7.09 Clearing access road areas to allow for the construction of a road having a minimum width of 18 feet including ditches (a 16-foot running surface). Where turnouts are required, allow additional width determined in consultation with the District Forester. Allow a minimum right-of-way width of 24 feet to allow the road to dry after rain events.

7.10 Consult with the District Forester to determine the whether access road should be insloped, outsloped, or crowned. Maintain road surfaces so as to allow water to be drained from the roadway. Construct ditches along all roads except where they cross rock formations. Remove loose boulders and slide material from roadway and side ditches.

7.11 Consult with the District Forester to determine the acceptable steepness of road cuts based on soil formation or road material. Do not undercut slope. Mulch and seed all cut slopes as specified in the Erosion and Sedimentation Plan as soon as possible after disturbance.

7.12 Consult with District Forester prior to removing any road shale and/or borrow materials from State Forest land. Do not extract such material from locations unacceptable to the District Forester. Stabilize, lime, fertilize and seed all Restore all disturbed areas in accordance with the Erosion and Sedimentation Plan to the satisfaction of the District Forester.

7.13 On pipeline rights-of-way and access roads, construct water bars or similar diversion channels to carry surface runoff away from the rights-of-way and roads to prevent siltation. During construction, if excess siltation is expected, construct a settling basin at the base of the right-of-way or road to impound runoff and allow sediment to settle prior to discharge into nearby streams.

7.14 Consult with the District Forester prior to installing or constructing underground culverts (metal or plastic), intercepting dips or other drainage structures to determine the appropriate location, size and type of such structures.

7.15 When any cross drainage or intercepting dip is within 100 feet of a stream crossing on a watershed that is not used for domestic or public water supply or within 200 feet of a stream crossing on a watershed that is used for domestic or public water supply, install a sump at the discharge end to receive water before it is discharged into the forest.

7.16 Break the berm on the outside of the road at strategic locations to allow drainage of the road surface. Such breaks may be made with a bulldozer. Consult with the District Forester to determine the location of such breaks, which as a rule, are no more than 50 feet apart.

7.17 If soil erosion takes place at the discharge end of culverts, intercepting dips, water bars, or breaks in the berms, provide a floor of hand-placed rock to prevent future erosion. At discharge ends, allow tail ditches of sufficient length and depth to insure that drainage does not back up to road surface.

7.18 Build up sections of access roads located in poorly drained areas above natural grade with suitable material determined in consultation with the District Forester. Use synthetic road fabric in these situations.

7.19 Grade the surface of roads to eliminate any wheel ruts. Remove fenders and high outside shoulders.

7.20 Open and deepen all drainage ways so as to handle storm waters. Complete seeding to a grade cover for an immediate erosion control.

7.21 Consult with the District Forester to determine if additional water bars are necessary to control surface runoff and install such water bars as necessary.

7.22 Upon termination of this Agreement, restore all roads and trails owned and maintained by the Department to the condition that existed upon commencement of oil and gas operations. Ensure adequate and proper drainage, road surface conditions, horizontal alignment, and cross slope. Allow roads built as part of the development of oil and gas to remain and become a part of the road system of the State Forest lands, unless otherwise directed by District Forester.

7.23 Carry out the above guidelines as each access road or portions thereof is abandoned rather than waiting until all development operations have been completed. If a well is temporarily abandoned awaiting completion operations (i.e., fracking, acidizing, perforating, drilling deeper), the road may be retired at a later time.

8. Bridges, Culverts, and Fords

8.01 Install bridges where roads cross intermittent or permanent stream channels in accordance with permits issued by the Department of Environmental Protection's Bureau of Dams, Waterways and Wetlands. Consult with the Department prior to construction to determine an acceptable bridge location and design.

8.02 Place culverts in the bottom of stream channels and cover with appropriate fill material in accordance with permits issued by the Department of Environmental Protection's Bureau of Dams, Waterways and Wetlands. Consult with the Department prior to construction to determine an acceptable culvert location and design.

8.03 Use a ford only when installation of bridge or culvert is not feasible and the ford has been the Pennsylvania Fish and Boat Commission and the Department of Environmental Protection's Bureau of Dams, Waterways and Wetlands. Consult with the District Forester prior to the location and design of a ford. Do not use a ford on a trout stream or on a stream used for water supply purposes. Provide solid bottoms and approaches that contain rock, stone or gravel for all fords. Locate fords at right angles to the stream channel. DO NOT DRAG MATERIAL ACROSS FORDS. Stream banks must be stabilized with stone to prohibit sedimentation.

8.04 Remove all bridges, drain pipes, and culvert pipes installed to support oil and gas operations when no longer needed unless the District Forester requests in writing that such structures not be removed.

8.05 When culverts are removed, provide earth or log water bars to control drainage.

8.06 Keep drainage structures open and functioning at all times.

8.07 Spread gravel or shale on intercepting dips that become subject to erosion.

EXHIBIT B

FORM OF FINANCIAL SECURITY

LETTER OF CREDIT. A letter of credit that includes the following language shall be acceptable to DCNR:

We hereby authorize you to draw on [bank], [band address], for account of [PRODUCER] up to an aggregate amount of U.S.$[amount] available by your drafts at sight drawn on [bank].

This irrevocable letter of credit shall be automatically renewed for additional terms of one (1) year unless the bank gives at least ninety (90) days written notice to the Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, Bureau of Forestry, of its intent to terminate the credit at the end of any term. The Commonwealth (the "Commonwealth") shall have the exclusive right to draw upon this letter of credit up to the aggregate amount, less any prior drafts by the Commonwealth, and hold it as cash collateral guarantee if [PRODUCER] fails to replace this letter of credit with other acceptable collateral or surety guarantee within thirty (30) days after being informed by the Commonwealth that the bank has given its 90 days written notice to terminate the credit at the end of any term, or otherwise upon sight draft of the Commonwealth. In the event that the Commonwealth draws on this letter of credit and holds the proceeds thereof as cash collateral guarantee, [PRODUCER] shall have the right to provide the Commonwealth with a replacement letter of credit in a form reasonably acceptable to the Commonwealth in exchange for the return of the cash collateral. In the event the bank pays on a draft presented by a party other than the Commonwealth, the bank shall be responsible for the unauthorized draw and shall honor all drafts submitted by the Commonwealth pursuant to the terms of this letter of credit, notwithstanding any such unauthorized draw.

Drafts must be drawn and presented not later than [date] or annually thereafter if the credit is not terminated as provided herein. Drafts drawn on this letter of credit must contain the clause "Drawn under Irrevocable Letter of Credit No. CPCS-292643 on [bank] dated [date of letter of credit]."

We hereby agree with you that drafts drawn under and in compliance with terms of this credit will be duly honored upon presentation to the drawee.

This letter of credit is subject to the Uniform Customs and Practice for Documentary Credits (1993) Revision, International Chamber of Commerce Publication No. 500, including amendments and successor publications.

BOND. A bond that contains the following language shall be acceptable to DCNR:

The [PRODUCER], hereafter called the PRODUCER, located at [PRODUCER's address] and the [Surety company name and address], as surety, are held and firmly bound to the COMMONWEALTH OF PENNSYLVANIA, in the sum of [amount] DOLLARS ($_____), lawful money of the United States to be paid to the said COMMONWEALTH OF PENNSYLVANIA, or its assigns, for which payment, well and truly to be made, we bind ourselves and our heirs, executors, administrators or successors, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 200__.

WHEREAS, the above-bound PRODUCER has entered into a Coordination Agreement with the COMMONWEALTH OF PENNSYLVANIA, by and through the Department of Conservation and Natural Resources, dated [date] (the "Agreement"), for exploring, drilling, operating, producing and removing oil and gas, laying pipelines, etc., on certain state forest land upon certain terms and conditions set forth in the Agreement.

NOW, THEREFORE, the condition of this obligation is such that if the PRODUCER shall faithfully plug and abandon [identify specific well] located on [describe location on state forest land], and restore and revegetate the accompanying wellsite, all according to the Agreement, then this obligation shall be void and of no effect, otherwise it shall be and remain in full force and effect.

Oil and Gas Well Plugging Board BOND NO. _____

IN WITNESS WHEREOF, the parties have hereunto set their hands and seals, the day and year first above written.

[Appropriate signatures for PRODUCER, SURETY, and DCNR]

EXHIBIT C
FINANCIAL SECURITY ADJUSTMENT PROCEDURE

The adjusted financial security amount will be computed by multiplying the original bond amount by a ratio derived from the Producers Price Index for All Commodities using a base of 1982 = 100, compiled and issued monthly by the U.S. Department of Labor's Bureau of Labor Statistics, as follows:

The numerator of the ratio shall be the index number for the item "All Commodities" for the month appearing in the issue of the index most recently preceding the anniversary when the bond adjustment is made.

The denominator of the ratio shall be the index number for the item "All Commodities" for the month of March 2006. The parties agree that such index number is 162.

If the base period of such index should change to other than 1982 = 100, the aforementioned numerator shall be adjusted by the usual method of linkage of base periods to the end that the ratio shall accomplish its purpose; namely to adjust the dollar amount of the financial security for changes in the price level between the date of this agreement and the date when the adjustment is made.

In the event such monthly index should be discontinued, or a new or revised one substituted therefore by the Bureau of Labor Statistics or other agencies of the United States of America, such new or revised or other similar index shall be used for the purpose of computations as described above, using such conversion factors or other devices which may be generally recognized or adopted in connection with requirements based on this index.

The adjusted bond financial security calculated using the above ratio shall be rounded to the nearest one thousand dollars.

EXHIBIT D

DESCRIPTION OF WHARTON PIPELINE

Appended

8100-FM-FR0042 9/2004
(Formerly ER-FM-19)

THE COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
BUREAU OF FORESTRY

APPLICATION FOR RIGHT OF WAY

Federal I.D. No.: 43-2007031 Date 3/21/2006

A corporation organized under the laws of Pennsylvania

and having its principal place of business at 208 Liberty Street

Warren, PA 16365

hereby applies for a license for right of way over a portion of State Forest land in the

Susquehannock State Forest in East Fork

Township. Potter County, in order that two small compressor

site's and a natural gas gathering line and related facilities

may be erected thereon and thereover at the location shown on the drawing attached hereto. (Three copies are required. Drawings should be on legal size sheets (8 ½ x 14) at a scale of ½ inch to one mile or larger, and points of entry and exit from State Forest lands should be tied into the nearest State Forest boundary corner.)

The proposed right of way will extend for a distance of approximately 20,500 feet

across State Forest land and will have a width of 2.0 feet. Following McConnel Road and a 2,700 ft. cross country route being 25 ft. in width
(Where the proposed right of way is located in more than one township, give the length and width for the portion in each township.)

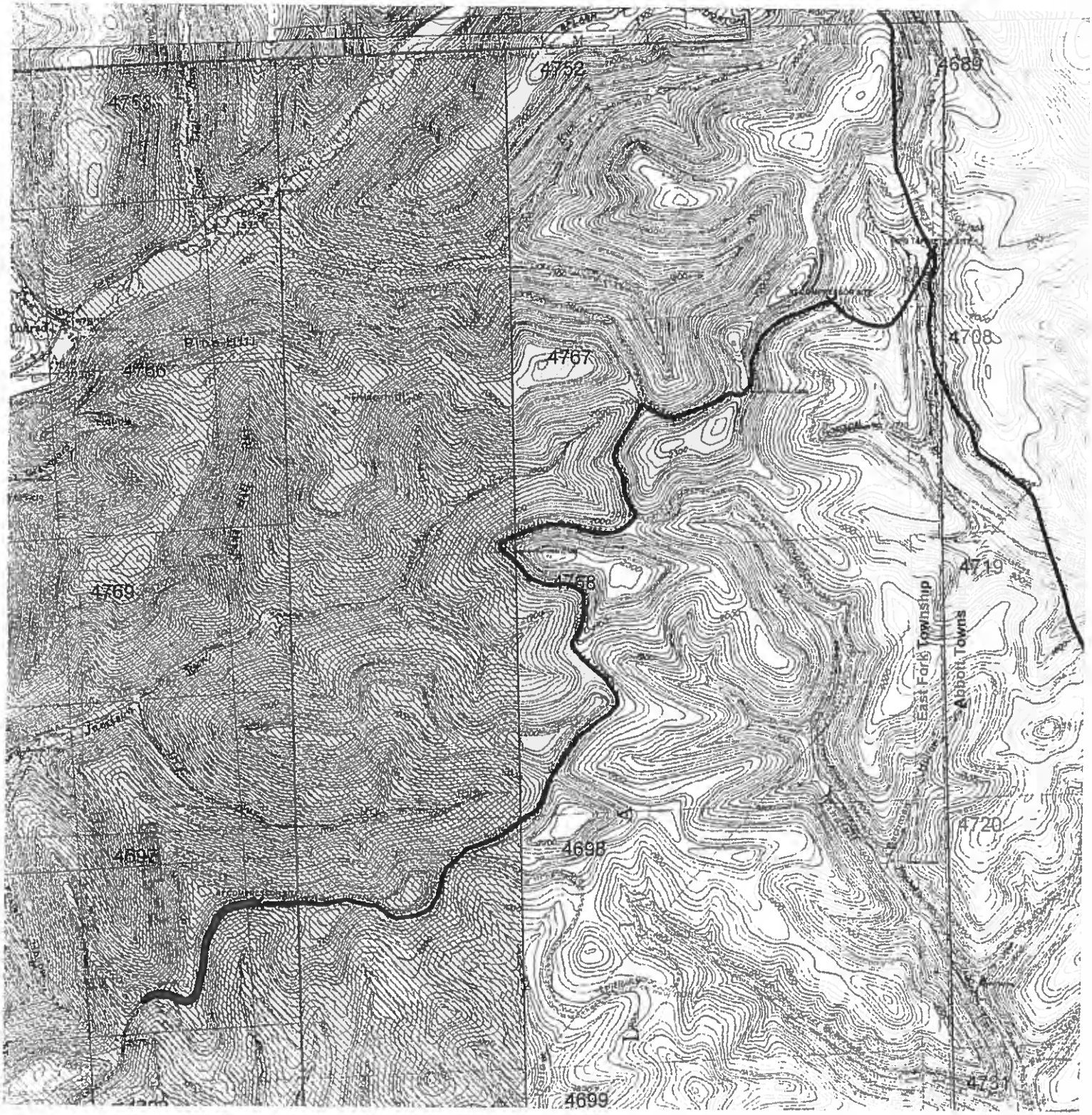
No clearing or construction may be commenced until an executed copy of the license has been received and no State Forest roads may be used for heavy hauling unless and until a Road Use Agreement has been executed.

Pennsylvania General Energy Company, L.L.C. Company

By: Ted Bailey (Name) Project Manager (Title) 814-723-3230 (Telephone Number)

208 Liberty Street, Warren Pennsylvania, 16365
Address to which license should be sent for execution.

Same as above
Address(es) to which future correspondence and/or invoices for rental should be sent.



PGE Proposed Pipelines

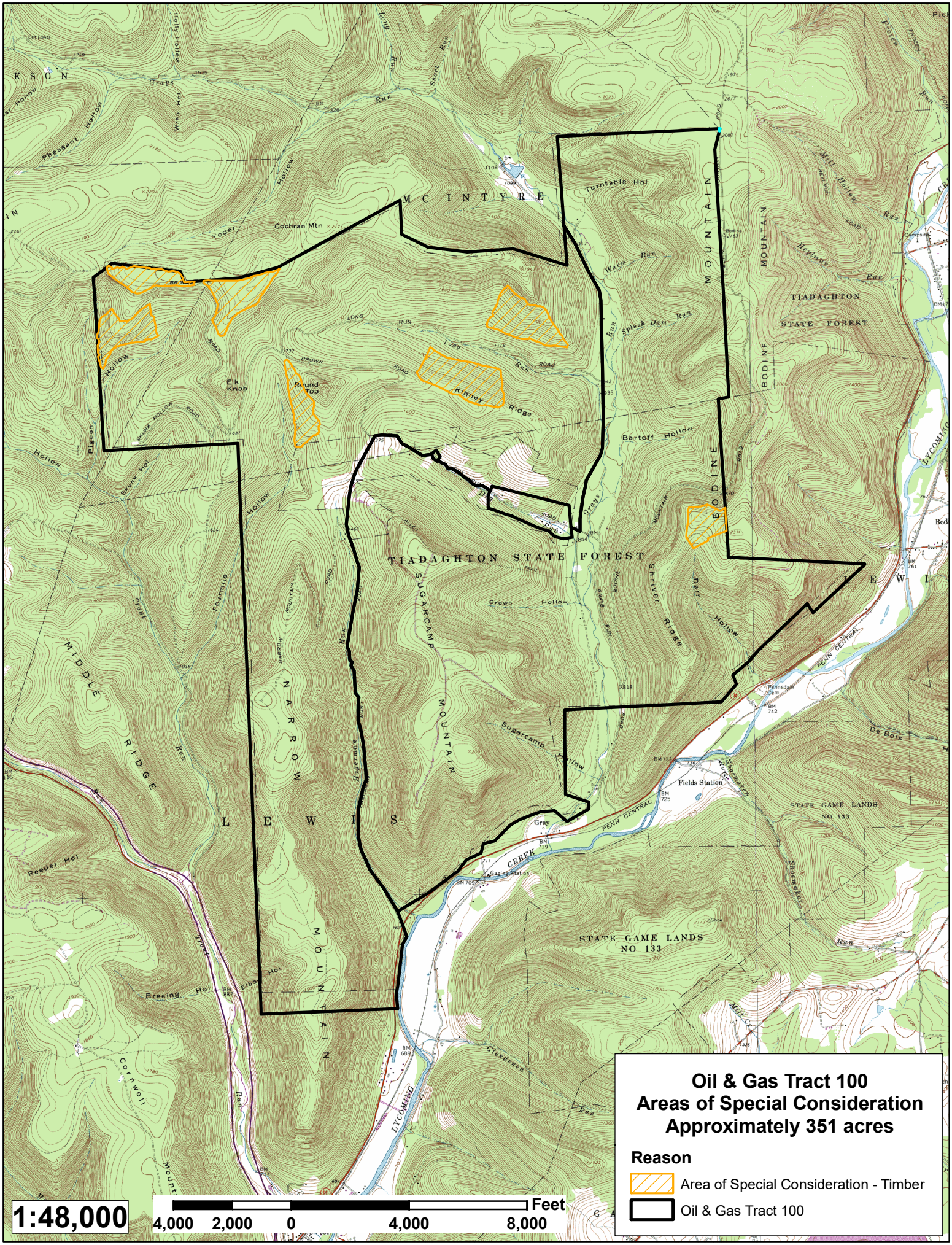
NFG Y-M53 24" Pipeline

Township Boundary

6" Pipeline

1" = 2700'

2700 0 2700 ft


Oil & Gas Tract 100
Areas of Special Consideration
Approximately 351 acres
Reason
Area of Special Consideration - Timber
Oil & Gas Tract 100
1:48,000
4,000 2,000 0 4,000 8,000
Feet
TIADAGHTON STATE FOREST
STATE GAME LANDS NO 133
McINTYRE
LEWIS
MIDDLE RIDGE
NARROW MOUNTAIN
SUGARCAMP MOUNTAIN
Shriver Ridge
Kinney Ridge
Elk Knob
Round Top
Cochran Mtn
Fields Station
Gray
Bartoff Hollow
Brown Hollow
Sugarcamp Hollow
Splash Dam Run
Warm Run
Long Run
Fourmile Run
Pigeon Hollow
Yoder Hollow
Pheasant Hollow
Holly Hollow
Wren Hollow
Grays Run
Short Run
Mill Hollow Run
Hemlock Run
Turnkable Hol
Reeder Hol
Breeing Hol
Elbow Hol
Cornwall Run
Mountain Run
Glendenen Run
Lycoming Creek
Penn Central
Bodine Mountain
Bodine Road
Mountain Road
Brown Road
Long Run Road
Skunk Hollow Road
Fourmile Mountain Road
Sugarcamp Mountain Road
Shriver Ridge Road
Bodine Ridge
Fennsdale Cem
Gaging Station
Campsite
BM 1848
BM 1326
BM 1108
BM 1093
BM 1080
BM 1017
BM 1007
BM 1000
BM 980
BM 761
BM 742
BM 733
BM 725
BM 719
BM 709
BM 689
BM 682
BM 16
Elev 1732
Elev 1119
Elev 1084
Elev 1042
Elev 1035
Elev 1000
Elev 980
Elev 818
Elev 2143
Elev 2017
Elev 1971
Elev 1414
Elev 1175
Elev 1126
Elev 1016
Elev 2093
Elev 2267
Elev 2200
Elev 2190
Elev 2180
Elev 2100
Elev 2023
Elev 1780
Elev 1700
Elev 1600
Elev 1500
Elev 1400
Elev 1300
Elev 1200
Elev 1100
Elev 1000
Elev 900
Elev 800
Elev 700
Elev 600
Elev 500
Elev 400
Elev 300
Elev 200
Elev 100

MODIFICATION OF OIL AND GAS LEASE

THIS AGREEMENT made and entered into on this 22nd day of December, 2003, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, hereinafter designated "Department" and PPL LAND HOLDINGS LLC, a Pennsylvania limited liability company, with its principal place of business at 2 North Ninth Street, Allentown, Pennsylvania 18101 ("PPL"), and Pennsylvania General Energy, Corp., a Pennsylvania corporation, with its principal place of business at 208 Liberty Street, Warren, Pennsylvania 16365, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter collectively designated "Lessee."

WITNESSETH:

WHEREAS, Department is authorized pursuant to the Conservation and Natural Resources Act 18 of 1995 ("CNRA") Act of June 28, 1995, P.L. 89, No. 18, Section 302(a)(6), 71 P.S. §§ 1349.302(a)(6), to lease in the best interest of the Commonwealth; and

WHEREAS, Emporium Lumber Company entered into an Oil and Gas Lease with East Penn Development Company dated May 25, 1931, recorded in Lease Book 10 at Page 175 in the Recorder's Office of Potter County ("The Lease"); and

WHEREAS, East Penn Development Company, through merger and acquisition, is now PPL; and

WHEREAS, Department's predecessor, the Department of Forest and Waters, and Lessee's predecessor, The Emporium Lumber Company, executed an Agreement and Quit-claim Deed on January 1, 1969, which was recorded on December 2, 1970, in Potter County, Deed Book 185 page 179 modifying The Lease; and

WHEREAS, PPL has assigned said Lease to Pennsylvania General Energy, Corp. in accordance with the terms and conditions of said Assignment dated March 5, 2002; and

WHEREAS, the parties desire to amend certain portions of said Agreement herein, with all provisions of the existing Agreement that are not amended by or otherwise inconsistent with the terms this Modification, remaining in full force and effect.

NOW THEREFORE, in consideration of the mutual covenants and agreements herein contained and for other good and lawful consideration, intending to be legally bound hereby, the parties hereto agree that The Lease shall be modified as follows:

1. **TERM OR PERIOD**

1.01 It is agreed that The Lease shall remain in force for a term of fifteen (15) years from the date first written above, and shall continue from year to year thereafter so long as oil or gas produced in paying quantities (as described in Paragraph 3.02) from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder.

2004 FEB 5 PM 4 25
RECORDER OF DEEDS

2. **REMOVAL**

2.01 Lessee shall have six (6) months after termination, abandonment, or surrender of The Lease, or any part thereof, in which to plug and abandon all wells, remove structures, and restore the site in accordance with the regulations of the Department of Environmental Protection Bureau of Oil and Gas Management and all applicable laws of the Commonwealth.

3. **PLUGGING**

3.01 Lessee shall properly and effectively plug all wells on the leased premises before abandoning, in accordance with the regulations of the Department of Environmental Protection's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth.

3.02 If a gas well does not produce more than an average of one (1) Mcf/day of natural gas in a calendar year (calculated by dividing its annual production in Mcf by 365 days), it shall be considered uneconomic (i.e., not paying quantities) to maintain and operate; and if during the following calendar year gas production from the well fails to exceed a one (1) Mcf/day average, Lessee shall plug and abandon the well in accordance with the regulations of the Department of Environmental Protection's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth, all no later than six (6) months after the end of said following calendar year.

Department may at its sole option waive all or part of the requirements of this provision by letter to Lessee, if in Department's judgment such a waiver is warranted by economic conditions or other circumstances.

4. **ORIGINAL AGREEMENT**

4.01 In all other respects, the terms and conditions of The Lease as modified are ratified and confirmed.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be dully executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

Michael DiBerardinis
Secretary

WITNESS:

PPL LAND HOLDINGS LLC
By _____
John F. Sipics

_____
President

PENNSYLVANIA GENERAL ENERGY, CORP.
By _____
Douglas E. Kuntz

ATTEST:

_____
Secretary/~~Treasurer~~ (Seal)

_____
~~President~~/Vice President

APPROVED AS TO LEGALITY AND FORM:

_____
OFFICE OF ATTORNEY GENERAL

_____
CHIEF/~~ASSISTANT~~ COUNSEL
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

APPROVED:

_____
Governor

COMMONWEALTH OF PENNSYLVANIA :
: SS:
COUNTY OF DAUPHIN :

On this, the 5th day of December, 2003, before me, a Notary Public, the undersigned officer, personally appeared Michael DiBerardinis, who acknowledged himself to be the Secretary, Department of Conservation and Natural Resources, and that he as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the Pennsylvania Department of Conservation and Natural Resources by himself as Secretary.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Dennis A. Kelly
Notary Public

COMMONWEALTH OF PENNSYLVANIA:

: SS:

COUNTY OF LEHIGH :

On this, the 22nd day of DECEMBER, 2003, before me, a Notary Public, the undersigned officer, personally appeared JOHN C SIPICS, who acknowledged himself to be the PRESIDENT of PPL Land Holdings LLC, a Pennsylvania limited liability company, and that he as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the company by himself as PRESIDENT.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Bruce A Sampson
Notary Public

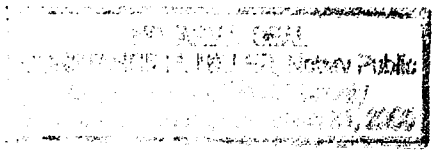
NOTARIAL SEAL
BRUCE A. SAMPSON, NOTARY PUBLIC
FAIRFIELD TWP., LYCOMING COUNTY
MY COMMISSION EXPIRES FEB. 4, 2006

BK0017PG0761

COMMONWEALTH OF PENNSYLVANIA:
: SS:
COUNTY OF WARREN :

On this, the 23rd day of December, 2003, before me, a Notary Public, the undersigned officer, personally appeared Douglas E. Kuntz, who acknowledged himself to be the Vice-Pres. of Pennsylvania General Energy, Corp., a Pennsylvania corporation, and that he as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the corporation by himself as Vice Pres.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.



Constance M. Miller
Notary Public

BK0017PG0762

RECEIPT FOR PAYMENT

Potter County - Recorder of Deeds
Courthouse: One East 2nd St.
Coudersport, Pa 16915

Receipt Date: 2/05/2004
Receipt Time: 10:46:33
Receipt No.: 139308

Instrument Number: 2004-000386

Paid By Remarks: CHESTER SMITH

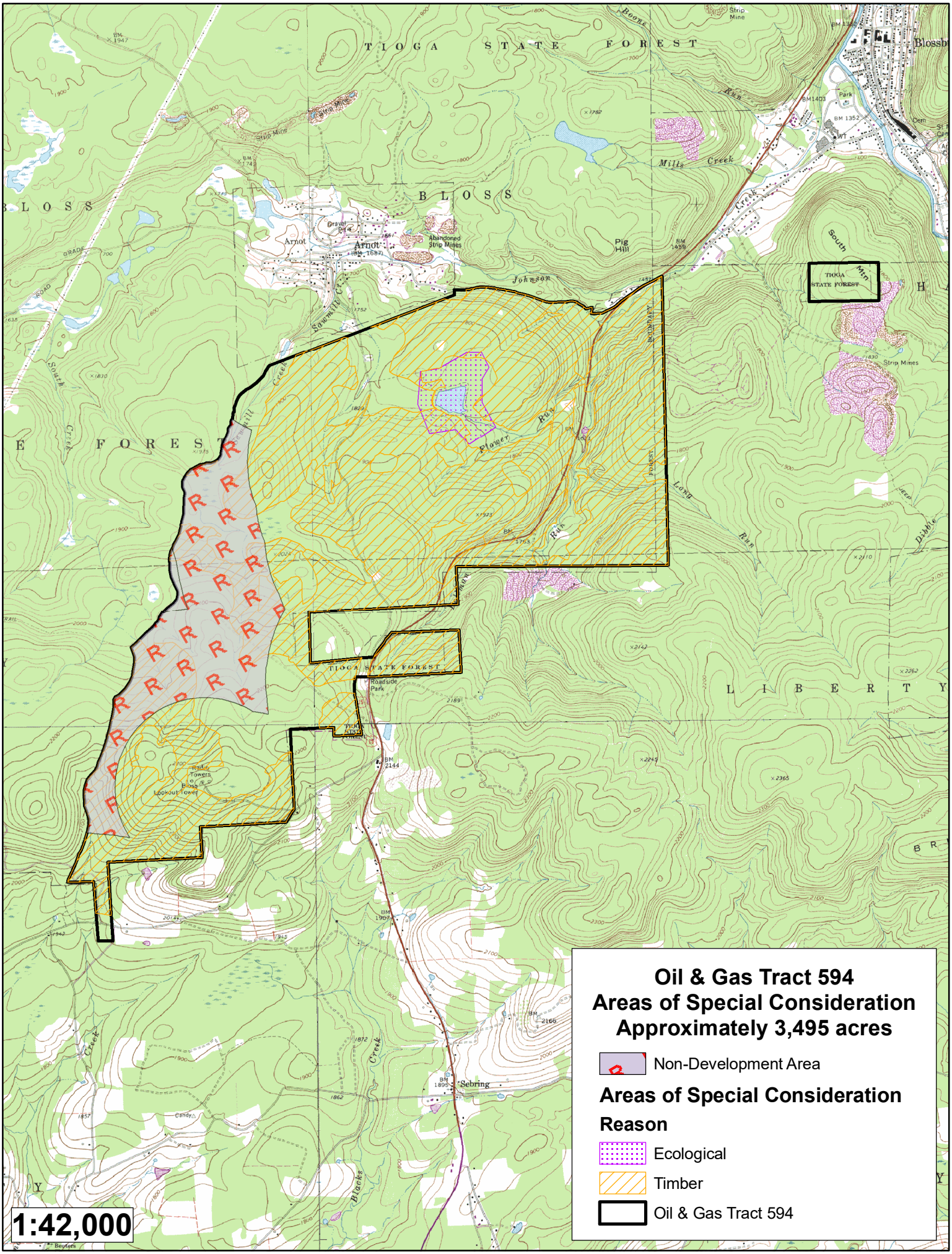
Receipt Distribution

Fee/Tax Description	Payment Amount	Payee Name
LEASE	13.00	POTTER COUNTY GENERAL FUND
LEASE - WRIT	.50	BUREAU OF RECEIPTS & CNTR MD
CO IMPROVEMENT FND	2.00	POTTER CO IMPROVEMENT FUND
REC IMPRVMT FUND	3.00	RECORDERS IMPROVEMENT FUND
EXTRA PAGES	4.00	POTTER COUNTY GENERAL FUND
Cash	$22.50	
Total Received.....	$22.50	

State of Pennsylvania
County of Potter

Recorded in the Office for Recording of Deeds, in and for the County of Potter at Record Book 17 Page 756

Witness my hand and Seal of Office
This day of February 5, 2004
Priscilla Lexton Deputy
Recorder of Deeds


Oil & Gas Tract 594
Areas of Special Consideration
Approximately 3,495 acres
Non-Development Area
Areas of Special Consideration
Reason
Ecological
Timber
Oil & Gas Tract 594
1:42,000

Commonwealth of Pennsylvania
Department of Conservation and Natural Resources
Bureau of Forestry, Minerals Section
P.O. Box 8552
Harrisburg, PA 17105-8552

STATE FOREST TRACT NO. 100

CONTRACT NO.
M-110100-20

OIL AND GAS LEASE FOR STATE FOREST LANDS

THIS AGREEMENT made and entered into on this 30th day of January 2009, by and between the **COMMONWEALTH OF PENNSYLVANIA**, acting through the **DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES**, hereinafter designated "Department" or "Lessor" and **SENECA RESOURCES CORPORATION**, with its principal place of business at 6363 Main Street, Williamsville, NY 14221, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH:

WHEREAS, Lessor is authorized pursuant to the Conservation and Natural Resources Act 18 of 1995 ("CNRA") Act of June 28, 1995, P.L. 89, No. 18, Section 302(a)(6), 71 P.S. §§1349.302(a)(6), to lease State Forest lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the completion of a competitive, sealed bid submission received by Department on or before September 3, 2008, and with bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

WHEREAS, State Forest Tract 100 is comprised of two parcels totaling 8,891 acres of State Forest lands in Lewis, McIntyre, and Cogan House townships, Lycoming County. Parcel A is comprised of 4,404 acres containing parts of warrants 5659, 5662, 5663, 5664, 5669, 5752, and 5785. Parcel B is comprised of 4,487 acres containing parts of warrants 5656, 5657, 5658, 5659, 5662, 5663, 5664, 5669, and 5785.

NOW THEREFORE, in consideration of the sum of **TWENTY EIGHT MILLION FOUR HUNDRED FIFTY ONE THOUSAND TWO HUNDRED DOLLARS AND NO CENTS ($28,451,200.00)** paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas and liquid hydrocarbons; and at locations subject to the approval of District

DCNR-OCC
LOG # 08-2341

Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, **TRACT NO. 100** containing **8,891 acres**, more or less, shown on the Map identified as **Exhibit "A,"** and more particularly described on the Oil and Gas Lease Attachment identified as **Exhibit "B"** and as which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as **Exhibit "A"** are approximate.

1. TERM OR PERIOD

1.01 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth, particularly Section 20 (First Well) providing for the drilling of the first well within the first five (5) years of the lease, and shall continue from year-to-year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as long as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder.

2. LEASE RECORDING AND PUBLIC NOTICE

2.01 Within ninety (90) days following the receipt by Lessee of a fully executed copy of this lease, Lessee shall both record the lease in the county or counties in which the leased premises lie, and also provide a copy of the recorded lease to the Department which clearly shows the recorded reference data. Thereafter, Department shall publish at least the following information in the Pennsylvania Bulletin:

(a) The subject of this lease;
(b) the general location of the leased premises;
(c) the names of Department and Lessee; and
(d) the recording reference data for this lease.

3. RENTAL

3.01 Lessee shall pay to Department a rental for the leased premises at the following rate: the first year's rental shall consist of the bonus payment which was made by Lessee and shall be payable upon delivery of this lease to Lessee. The second, third and fourth year's rentals shall be TWENTY DOLLARS ($20.00) per acre each year, payable upon the anniversary date of this lease. For the fifth and all subsequent years thereafter, the rental shall be THIRTY-FIVE DOLLARS ($35.00) per acre each year, payable on the anniversary date of this lease.

3.02 The drilling of each well in the leased premises shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 21 (Subsequent Wells), which reduction shall become effective on the next rental date, provided the well is producing in paying quantities. If such wells are drilled on a unit created by a spacing order issued by the Department of Environmental Protection's Bureau of Oil and Gas

Management, or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3.03 If at any time there is on the leased premises a well capable of producing natural gas and the well is shut-in, suspended, or otherwise not produced and the natural gas is not used or marketed therefrom during any year ending on an anniversary date of this lease, Lessee shall pay Department at the expiration of each said year for that year a rental payment for each such well at the full rental rate per acre for the "acreage attributable to the well", as referred to in Section 21 (Subsequent Wells) of the lease.

4. GAS ROYALTY

4.01 Lessee must operate each well with a discrete well meter at the well site, which will measure all the gas produced from that well. Lessee will ensure that all meters are maintained according to industry standards.

4.02 Lessee shall pay to Department, as royalty, THIRTY-FIVE CENTS ($0.35) per thousand cubic feet (Mcf) or SIXTEEN PERCENT (16%) of the market value, whichever is higher, for all marketable natural gas, marketable casinghead gas, or other marketable gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; the amount to be paid to Department will be the royalty rate (either $0.35/Mcf or 16% of the market value; whichever is higher) multiplied by the fractional interest held by Department and shall be payable monthly at the market price received for natural gas at the sales meter at the time of delivery.

4.03 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal 16% part of all marketable gas and other marketable gaseous substances produced and saved from the leased premises; the amount to be delivered to Department will be the SIXTEEN PERCENT (16%) part of the gas produced multiplied by the fractional interest held by Department in the oil and gas rights. Lessee shall act to calculate and deliver a gas balancing statement on a quarterly basis to the Department in order to ensure that the Department does not exceed its SIXTEEN PERCENT (16%) share of the marketable gas production. Adjustments for overage or underage delivery of the Department's SIXTEEN PERCENT (16%) royalty share shall be made by reducing or increasing future delivery gas volumes to the Department's account.

5. OIL ROYALTY

5.01 Lessee shall pay to Department, as royalty, SIXTEEN PERCENT (16%) of the field price per barrel (42 U.S. Gallons) at 60° F, produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks; the amount to be paid to Department will be the SIXTEEN PERCENT (16%) royalty multiplied by the fractional interest held by Department.

5.02 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal SIXTEEN PERCENT (16%) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises; the amount to be delivered to Department will be the SIXTEEN PERCENT (16%) part of the oil produced multiplied by the fractional interest held by Department.

5.03 If oil, condensate, and other liquid hydrocarbons, each in paying quantities, should be developed from the same well, then the oil and the condensate, and other liquid hydrocarbons shall be saved.

5.04 Lessee shall provide tanks or other appropriate storage for accurately measuring any crude oil produced from the lease. Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with API Standard 2500, "Measuring, sampling, and testing crude oil," Second Edition, March 1961, or as subsequently amended by the same authority. Observed gravity at the observed temperature shall be corrected to (API) gravity and volume at sixty degrees Fahrenheit (60° F) as per the American Society for Testing Materials and the Institute of Petroleum, "ASTM-IP petroleum measurement tables" (ASTM designation No. 1250; IP designation 200).

6. PAYMENTS

6.01 Lessee shall be held responsible for the payment of all rentals and royalties. **Payments shall be mailed to:**

Commonwealth of Pennsylvania
Department of Conservation and Natural Resources
Bureau of Forestry - Minerals Section
P.O. Box 8552
Harrisburg, PA 17105-8552

All checks shall be made payable to the Commonwealth of Pennsylvania. Payments of royalties shall be made monthly within 90 days after each monthly sales period.

6.02 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products within 90 days after each monthly sales period.

6.03 Once it has been determined by Department that Lessee is in default in the payment of any sum of money payable under the provision of this lease for 30 days, Lessee agrees to pay an additional twelve percent (12%) annual interest on the defaulted amount calculated from the time of such default. This provision is in no way a waiver of the requirement to pay on time.

7. GAS MEASUREMENT

7.01 The volume of gas produced, saved, and marketed shall be measured according to American Gas Association (AGA) standards and according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

(a) The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

(b) The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, regardless of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

(c) The temperature of the gas passing the meters shall be determined by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes. If a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of sixty degrees Fahrenheit (60° F) shall be used in computing gas volume.

(d) The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, annually, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

(e) The deviation of the natural gas from Boyle's Law shall be determined by tests annually or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with recommendations of the Natural Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

(f) Gas compositional analyses by chromatograph or other approved methods shall be completed as necessary or upon written request and within a timeframe specified by the Department, for the determination of gas composition, specific gravity and BTU content. A copy of the results of all such analyses, whether completed at the specific request of the Department or not, shall be provided by the Lessee to the Department for its records within ninety (90) days of the date of the test.

(g) The following factors used in the calculation of produced gas volumes shall be clearly specified on the meter statements:

Basic orifice factor (F_b)
Reynolds number factor (F_r)
Expansion factor (Y)
Pressure base factor (F_{pb})
Temperature base factor (F_{tb})
Flowing Temperature factor (F_{tf})
Specific gravity factor (F_g)
Supercompressibility factor (F_{pv})

8. AUDITS

8.01 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the leased premises. Department may keep such charts for examination for a period not to exceed one-hundred and twenty (120) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, or other products produced from the leased premises.

8.02 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, or liquid hydrocarbons, produced from any well covered by this lease to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payment to Lessee, its heirs, administrators, executors, successors, and assigns for oil, gas, or liquid hydrocarbons from wells covered by this lease.

8.03 Lessee further grants to Department or Department's designated representative the right, at any time, to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from canceling this lease upon delivery to Lessee of written notice of Department's intention.

9. INTERPRETATION

9.01 In case of ambiguity, the lease shall always be construed in favor of Lessor and against Lessee.

10. LIMITATION ON WARRANTY

10.01 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the portion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may, with the approval of the Attorney General, enter into an escrow arrangement for future royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit

against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The royalties placed in escrow shall be refunded at the direction of the court in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

10.02 This proportionate reduction clause shall not apply to and shall not reduce the bonus payments or rents payable under this lease.

11. LAWS, RULES AND REGULATIONS

11.01 Nothing in this Lease shall in any way be so construed as to impair the powers, privileges or duties of the Commonwealth, or its representatives, in the execution of the laws of the Commonwealth or the applicable rules and regulations promulgated thereunder, now in force or hereafter enacted or adopted.

11.02 The Lessee is solely responsible for obtaining any and all local, State or Federal permits or other approvals necessary for and associated with any of the operations related to this lease, and shall be held liable by the Commonwealth of Pennsylvania, any agency of the Commonwealth, or any other local or Federal authority for the violation or non-compliance of any relevant laws, rules, and regulations, including, but not limited to the following: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119,35 P.S. 4001, *et seq.*); the Clean Streams Law, as amended (Act of June 22, 1937, P.L. 1987, 35 P .S. 691.1, *et seq.*); the Solid Waste Management Act, as amended (Act of July 7,1980, P.L. 380, No.97, 35 P.S. 6018.101, *et seq.);* the Oil and Gas Act, as amended (Act of December 19, 1984, P.L. 1140, No. 223, 58 P.S. 601.101 *et seq.);* and the Surface Mining Conservation and Reclamation Act, as amended (Act of May 31, 1945, P.L. 1198, 52 P.S. 1396.1 *et seq.).*

11.03 Lessee shall strictly adhere to all rules, regulations and requirements governing the withdrawl and use of surface and ground waters as administered by the Department of Environmental Protection, the Susquehanna River Basin Commission, the Delaware River Basin Commission, or any other river basin commission having designated jurisdiction of the waters of the Commonwealth [including, but not limited to the Water Resources Planning Act of 2002 (Act 220), 25 Pa Code Chapter 110; SRBC, 18 CFR Ch. VIII § 806.20 - § 806.25]

In addition, Lessee shall obtain written authorization from District Forester prior to using surface waters located on State Forest lands as a take point for fracing or any other well drilling or well development operations. Department reserves the right to deny any such request(s) without cause.

12. INDEMNITY

12.01 Lessee shall, at all times hereinafter, indemnify and save harmless Department from and against all detriment, damage, loss claims, demands, suits, and expenses, or other claims of any kind

whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

13. LIABILITY

13.01 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, regardless of whether or not such pollution or damage is due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause is found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises, the pollution or other damage would not have occurred; it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

13.02 Department shall not be liable to Lessee for any time during which the leased premises cannot be used.

14. ASSIGNMENTS

14.01 Lessee shall not use, or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned; and assignee thereof shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

14.02 In the event that the Lessee enters into a "Farmout Agreement" with a third party for the purpose of allowing a "Farmee" to explore, develop, or produce oil and/or gas from the leased premises, or any portion thereof, Lessee shall be liable for enforcing all the provisions of this lease, including the posting of the required plugging sureties for each and every well drilled and operated by the Farmee. Although the Department recognizes a right of the Lessee to farmout its leased premises or portions thereof from time-to-time, Department will hold the Lessee solely responsible for the enforcement of all the provisions of this lease.

15. RELATED AGREEMENTS

15.01 Upon request by the Department for its own records and to protect its own interests, Lessee shall furnish a copy of all agreements made, contracts entered into, and all letters or other memoranda made by or to the Lessee which in any way concern the development, operation, or sale of products related to this lease.

16. SURETY

16.01 PERFORMANCE SURETY - Lessee agrees to give Department a surety or collateral performance bond with evergreen provisions in a form acceptable to Department (i.e., surety bond, irrevocable letter of credit, bank certificate of deposit, etc.), in the principal sum of **TWENTY-FIVE THOUSAND DOLLARS ($25,000.00)** conditioned on the faithful performance by Lessee of the covenants of this lease. The surety shall be further conditioned that, in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells within one (1) year from the termination of this lease, Commonwealth can execute upon the surety to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the surety shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, pollution, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises and in the use of all State Forest roads off the leased premises.

16.02 PLUGGING SURETY - Additionally, prior to acquiring any existing well on the leased premises, or upon the Lessee's decision to keep a newly drilled well, Lessee shall provide Department with a surety or collateral well plugging bond with evergreen provisions in a form acceptable to Department (i.e., surety bond, irrevocable letter of credit, bank certificate of deposit, etc.), in an amount equal to or exceeding the reasonably expected estimated total cost of plugging the well one (1) year after its completion as a producer or shut-in well, said surety to remain in effect until the plugging and abandonment of the well has been completed in compliance with applicable state law, and the well site has been restored and re-vegetated to the satisfaction of District Forester. The minimum well plugging surety coverage per well acceptable to Department as of the date of this agreement is as follows and shall be based on the well's measured depth (MD), regardless of its true vertical depth (TVD):

Measured Depth (MD)	Minimum Surety Amount
Less than 5000'	$ 10,000
5000' to 8500'	$ 30,000
8500' to 10,000'	$ 50,000
10,000' and Deeper	$100,000

16.03 Every five (5) years during the term of this agreement, and effective on the anniversary date of this agreement, new surety amounts may be instituted at the option of Department by notice in writing from Department to Lessee at least six (6) months prior to the anniversary date. Such new surety amounts shall equal the original surety amounts set forth in paragraphs 16.01 and 16.02 herein adjusted for inflation so that the surety amounts will adequately cover the expected lease obligation costs prevailing at the time of adjustment. The new adjusted surety amounts will be rounded off to the nearest

ONE THOUSAND DOLLARS ($1,000.00) and will be computed by multiplying the original surety amounts set forth herein by a ratio derived from the Producers Price Index for All Commodities using a base of 1982 = 100, compiled and issued monthly by the U.S. Department of Labor's Bureau of Labor Statistics, as follows:

The numerator of the ratio shall be the index number for the item "All Commodities" for the month appearing in the issue of the index most recently preceding the anniversary when the surety adjustment is made.

The denominator of the ratio shall be the index number for the item "All Commodities" for the month of **August 2008**. The parties agree that such index number is **199.9**.

If the base period of such index should change to other than 1982 = 100, the aforementioned numerator shall be adjusted by the usual method of linkage of base periods to the end that the ratio shall accomplish its purpose; namely, to adjust the dollar amount of the surety or sureties for changes in the price level between the date of this agreement and the date when the adjustment is made.

In the event such monthly index should be discontinued, or a new or revised one substituted therefore by the Bureau of Labor Statistics or other agencies of the United States of America, such new or revised or other similar index shall be used for the purpose of computations as described in this paragraph, using such conversion factors or other devices which may be generally recognized or adopted in connection with requirements based on this index.

17. COMPREHENSIVE LIABILITY INSURANCE

17.01 Lessee shall, at its sole expense, provide and maintain in full force and effect during the term of this lease such comprehensive liability insurance in an amount not less than: Combined Bodily Injury and Property Damage Liability, TWO HUNDRED FIFTY THOUSAND DOLLARS ($250,000) each occurrence and ONE MILLION DOLLARS ($1,000,000) aggregate which shall protect Lessee and Department from claims for damages from personal injury, including accidental death, as well as claims for property damages, which may arise from operations conducted under this lease or any occurrence on or about the leased premises whether such operations are by Lessee or anyone directly, or indirectly, employed by it. The operation of automobiles or motor vehicles operated in the business of Lessee shall be included or covered by like insurance. In addition, Department shall be immediately advised should Lessee or the insurance company prior to the expiration date indicated on said policy cancel any policy. Department shall be named as additional insured on said liability insurance.

17.02 Lessee or its insurer shall be liable to Department for any damage done to Commonwealth property as the result of Lessee's operations.

17.03 Lessee shall provide Department with certificates of insurance for property damage and liability attesting to the above coverages prior to beginning its operations on the leased premises.

17.04 Department shall be immediately advised should any insurance policy or surety bond be cancelled by Lessee, the insurance company, or bonding company, prior to the expiration date on said document.

17.05 Lessee shall provide Department, upon Department's request, proof of current insurance policy in full force and effect as described in Section 17.01.

18. DEEP WELL CONTROL INSURANCE AND SAFETY – 10,000'+ TVD WELLS ONLY

18.01 Prior to the beginning of well-drilling operations on a true vertical depth (TVD) well of 10,000 feet or deeper, Lessee shall acquire well-drilling insurance coverage in an amount estimated to be sufficient to cover control of well, seepage and leakage, pollution, cleanup and contamination, unlimited redrilling and/or reworking expenses, and equipment in Lessee's care, custody and/or control. Said insurance coverage shall be continuously maintained until the cessation of any well-drilling operations, well-reworking operations, well-completion operations and well-to-pipeline-hookup operations.

18.02 Insurance in the amount of at least TWENTY MILLION DOLLARS ($20,000,000.00) will be required for drilling into the Trenton-Black River Formation unless Department waives or modifies this amount in writing upon Lessee's request.

18.03 Lessee shall provide a complete copy of the Well Control Insurance Policy to Department and shall not commence well drilling operations until Department has given its written acceptance of the Well Control Insurance Policy. Termination of the well-drilling insurance coverage must be pre-approved in writing by Department prior to its termination.

18.04 At a minimum, the Lessee-Assured shall ensure that the Well Control Insurance Policy complies with and includes the following provisions, or provide alternate provisions which are acceptable to the Department:

(1) A minimum of a 10,000 psi double ram and a 5,000 psi annular blowout preventer and a fully operational remote closing device should be used for the well operation and tested successfully at least every thirty (30) days.

(2) No well should be drilled ahead unless the "leak off" pressure determined by the most recent casing shoe test or formation integrity test (as measured by mud weight equivalent in pounds per gallon) exceeds the hydrostatic pressure extended by the actual mud weight in use by at least 0.5 pounds per gallon.

(3) No wells should be drilled with an open hole section of length greater than 8,000 feet.

(4) When the Assured is the Operator of a producing or shut-in well insured hereunder, the Assured should not allow casing pressure which exceeds seventy-five percent (75%) of the rated burst pressure for a continuous period of greater than three (3) months.

(5) When the Assured is the Operator of the well insured hereunder, the Assured should conduct a reasonable review of the drilling and/or workover contractor's personnel and equipment, to ensure that:

(a) The contractor's equipment is of adequate size capacity and pressure rating to perform all anticipated operations;

(b) The contractor has crews with a reasonable level of experience and maintains at least one employee with well-control certification on location at all times; and

(c) The contractor's tubulars, choke manifold and other pressure-rated equipment are tested satisfactorily prior to commencement of operations.

19. OPERATIONS, PROTECTION AND CONSERVATION

19.01 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up-to-date oil and gas field practices.

19.02 Lessee is responsible for conducting its operations in such a manner so as not to interfere with the rights of other Grantees, Licensees, and Lessees of the Commonwealth, or any other third parties who may have an interest in the State Forest lands located in the vicinity of the area covered by this Lease, including areas of ingress and egress.

19.03 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department of Environmental Protection or applicable County Conservation District office. A copy of the plan shall be forwarded to the District Forester upon request.

19.04 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

19.05 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as **Exhibit "C"**, attached hereto and made a part hereof.

19.06 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the INVASIVE PLANTS AND REVEGETATION GUIDELINES FOR STATE FOREST LANDS, identified as **Exhibit "D"**, attached hereto and made a part hereof.

19.07 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the OIL AND GAS LEASE ACCESS ROAD SPECIFICATIONS FOR STATE FOREST LANDS, identified as **Exhibit "E"**, attached hereto and made a part hereof.

20. FIRST WELL

20.01 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well ("FIRST WELL") on the leased premises, or on unitized acreage containing a portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, this lease shall be automatically terminated in its entirety, unless the Department, at its sole discretion, grants in writing to the Lessee a continuation of the lease in effect on a year-to-year basis. Said extention shall be granted only when the Department considers it to be in the best interests of the Commonwealth. Said extension must be granted in writing by the Department to the Lessee at least thirty (30) days prior to the fifth anniversary date of this lease.

20.02 The rental rate provision of the lease shall not be affected by such extension of the 5-year first-well deadline. Additionally, the granting of such extension period shall in no way affect the anniversary dates of this lease, or the rights and responsibilities of Department and Lessee associated therewith.

21. SUBSEQUENT WELLS

21.01 If the "FIRST WELL" drilled by Lessee, or any subsequent well, is productive of oil and/or gas, and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises but not necessarily on the portion of the leased premises contained within the unit, if such a well would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If Lessee concludes an additional well is not justified, then Lessee shall submit to Department the information upon which its conclusion is based. Upon review of such information, if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within two (2) years from Department's determination or releasing all of the acreage covered by the lease except for the following:

(a) forty (40) acres around each well from which oil is produced as the principal product;

(b) three-hundred twenty (320) acres around each well completed above the top of the Onondaga Formation from which gas is being produced as the principal product;

(c) six-hundred forty (640) acres around each well completed below the top of the Onondaga Formation from which gas is being produced as the principal product; or

(d) that amount of leased acreage actually contained within an established unit, whichever is less.

21.02 Lessee shall not be required under this provision, to drill more wells than required or allowed under any spacing order, rule, or regulation of the Department of Environmental Protection's

Bureau of Oil and Gas Management, or in the absence of any such order, more than one well for each well completion depth horizon described in Section 21.01 above.

21.03. The amount of acreage around the subsurface location where oil and gas enters the well bore, commonly referred to as the "take point", included in a spacing unit ordered by the Department of Environmental Protection's Bureau of Oil and Gas Management, or in the absence of any such order, the well completion depth horizons described in Section 21.01 above, shall be referred to elsewhere in the lease as "acreage attributable to a well," which comprises acreage directly above the subsurface "take point."

22. DEVELOPMENT AND WELL SPACING

22.01 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

22.02 Lessee is limited to THIRTY FIVE (35) well pad locations of reasonable dimensions on the leased premises. Lessee shall have the option to drill vertical or horizontal well(s), or a combination thereof, from a single well pad location. Multiple wells drilled on the same well pad location may target different depths and horizons.

22.03 Upon written request by Lessee, Department may waive, in writing, the number of well pad locations specified in Section 22.02 above if, in Department's judgment, such a waiver is justified and in its best interests.

23. DRILLING RESTRICTIONS

23.01 Under Department's multiple use policy, the leased premises is continuously used for recreation, conservation and other purposes, and many other Department-authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions.

(a) No drilling or well site clearing is permitted within 200 feet of any building.

(b) No drilling or well site clearing is permitted within 200 feet of any stream or body of water.

(c) No drilling or well site clearing is permitted within 300 feet of any stream or other body of water designated by the Department of Environmental Protection's Environmental Quality Board as being Exceptional Value Waters.

(d) No drilling or well site clearing is permitted within 300 feet of any picnic area or sheltered area which has been so designated by Department.

(e) No drilling or well site clearing is permitted within 300 feet of any trail, road or existing right-of-way.

(f) No drilling or well site clearing is permitted within 300 feet of any area of historic value, tree plantation, designated overlook, designated vista or fire tower site.

(g) No drilling or well site clearing is permitted within 300 feet of the boundary line of the leased premises.

(h) No drilling or well site clearing is permitted within 600 feet of the boundary line of State Park lands or of designated Wild and Natural Areas on State Forest lands.

(i) In addition the following specific restrictions for this lease shall also apply:

At the time of issuance of this lease agreement, the Department has identified certain Areas of Special Consideration on the leased premises as described in **Exhibit "I".** Additionally, due to the changing nature of the Department's databases, such as the Pennsylvania Natural Heritage Program (PNHP), the Lessee should check with the District Forester before any construction project is initiated to avoid potential conflicts.

23.02 Upon written request by Lessee, Department may waive in writing, any portion of the above restrictions if, in Department's judgment, such a waiver is justified and in its best interests.

23.03 No drilling or production activity, including but not limited to well drilling and construction, pipeline construction, compressor station placement and construction, or road construction shall be permitted, nor shall they be subject to waivers, on the surface of State Parks, State Forest Wild Areas, and State Forest Natural Areas.

24. DRILLING OPERATIONS

24.01 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before drilling thereof is commenced, and no well shall be commenced until a permit has been issued by Department of Environmental Protection's Bureau of Oil and Gas Management.

24.02 A legible sign listing the name and address of the well operator, the permit number, the farm name, and well number shall be placed in a conspicuous place near where the access road enters the well location. In addition, a legible sign listing the name of the operator and well number shall be attached or painted on the pumping unit, wellhead or meter box of each well.

24.03 Except where Lessee intentionally drills a deviated well to a bottomhole location not vertically beneath the well site, Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical

drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

24.04 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth, if requested by Department.

24.05 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

24.06 Lessee shall maintain, at all times, the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells which are shallower than ten-thousand (10,000) feet shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled, and tested to at least ten-thousand (10,000) psia for wells deeper than ten-thousand (10,000) feet that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall, at all times, be available for efficient operations. Blowout control equipment must be capable, in case of an emergency, to shut in the well at a point at least fifty (50) feet from the wellhead. For wells being serviced, blowout protection equipment shall be of sufficient capacity to control pressures and flow rates measured in the wells being serviced.

24.07 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head, or leaking oil or gas between the producing string or next larger size casing string when such pressure or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

24.08 Lessee shall test control equipment daily, to the extent possible, without causing premature removal of drill pipe from the hole while drilling, and record the results of such tests daily.

24.09 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

24.10 Drilling mud or salt water of sufficient weight to prevent oil, gas, or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

24.11 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

24.12 Lessee shall use a casing program which complies with oil and gas statutes, and rules and regulations of the Commonwealth, and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies, and blowouts.

24.13 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

24.14 The production casing shall be of new or reconditioned pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(a) The maximum anticipated rock pressure, at any point in the casing string, shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield, as shown in A.P.I. Bulletin 5-C-2, dated April, 1972, or later amendments.

(b) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated, at any point in the casing, does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield, as shown in A.P.I. Bulletin 5-C-2, or later amendments.

24.15 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If, at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After corrective operation, the casing shall again be tested in the same manner.

24.16 All surface casing and production casing shall be cemented in the ground with good quality cement equaling or exceeding A.P.I. specification in the manner hereinafter described.

24.17 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department. Sufficient centralizers shall be attached to the casing to keep it centered in the hole during cementing.

24.18 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In cementing the surface casing, cement of sufficient quantity shall be used to fill the calculated annular space plus twenty percent (20%) back of the casing shoe to the surface. In the event that the cement cannot be circulated to the surface, due to the presence of fractures or other lost circulation zones, Lessee shall determine, as accurately as possible, the depth of the top of the cement in the annular space behind the surface casing and record it on the well record.

24.19 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another, or to the surface, does not occur behind the casing.

24.20 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval by the Department.

24.21 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors, shall not allow the well to blow open, except in case of an emergency, over twenty-four (24) hours after drilling-in. Lessee will pay Department, at the regular royalty rate, for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations, after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

24.22 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Method (USBM Monograph 7) or by other methods standard to the industry and approved by Department.

24.23 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

24.24 Annually or when requested in writing by Department, Lessee will determine the open flow potential of each producing well as required in Section 24.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive, in writing, all or parts of this requirement if, during any calendar year, production averages less than sixty (60) Mcf per day and/or the pressure tests show reservoir pressures to be less than one hundred (100) psi.

24.25 Lessee shall, at all times, conduct prudent drilling operations including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

24.26 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

24.27 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

24.28 In areas where H_2S is known to be present in the formations that are to be drilled, Lessee shall:

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety

equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) Make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) After H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) Use special steel pipe and casing which is resistant to H_2S gas stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) Quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) Post warning signs around all well sites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to, and at a safe distance from, all facilities handing the H_2S gas, including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) Install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

24.29 During well drilling and production operations, in order to reduce night lighting pollution in designated dark sky areas, Lessee is required to utilize drilling rigs equipped with fully shielded lighting consistent with Occupational Safety & Health Administration (OSHA) regulations.

24.30 Upon written request by Lessee, Department may waive, in writing, any portion of the above drilling requirements if, in the Department's judgment, such a waiver is justified by new technology or knowledge and/or will be in the best interest of the Commonwealth.

25. WELL RECORDS, LOGS AND REPORTS

25.01 Lessee shall keep a daily drilling record which describes the formations penetrated, and the depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. An accurate well location plat and any other data that are acquired during the drilling and completion operations for each well, including but not limited to those items listed in Section 26.01 (Confidentiality), shall be provided to the Department within ninety (90) days of the data's collection, or upon oral or written request by the Department and within a timeframe specified by the Department. All above-described data shall be submitted in both hard-copy and digital forms. Digital well logs shall be submitted in .LAS format.

25.02 Upon Department's request, samples of all formations penetrated and parts of cores taken, accurately labeled with the API number of the well and depth interval of collection, shall be furnished to Department at Lessee's expense within one (1) year after completion of each well.

25.03 If the Lessee collects rock samples including but not limited to whole rock core, parts of core, and cuttings from any well borehole(s) on the leased premises and no longer plans to retain said samples at its own or contracted storage facility, Lessee must first offer said rock samples to the Department before their disposal or sale. The rock samples shall be accurately labeled with the API number of the well and depth interval of collection. The Department shall make arrangements for the collection and transport of the rock samples at its own expense.

25.04 Upon written request and within a timeframe specified by the Department, Lessee shall provide Department with production and pressure test data, production and pressure decline curves, gas analysis data including BTU value determinations, water and waste disposal records, well stimulation and treatment records, maintenance records and reports, and/or any other data or records for any well(s) which the Department deems necessary to protect its interests.

26. CONFIDENTIALITY

26.01 To the extent of applicable law, Department intends to keep the following well related documents confidential for a period of three years from the date the well is spud:

(a) all drill time logs
(b) all electric well logs
(c) all nuclear well logs
(d) all acoustic or sonic well logs
(e) all caliper or hole diameter measurement logs
(f) all cement bond or integrity logs
(g) all mud or geologic well logs
(h) all dip measurement well logs
(i) all well flow or production test data
(j) all well completion data
(k) all well fracturing and stimulation data
(l) all well pressure tests or pressure data
(m)all record of lost circulation zones and caving strata
(n) all well casing records
(o) all core analysis, mud log analysis
(p) all well perforation records
(q) all lithologic well logs
(r) all written well history
(s) all well cutting samples requested by Department
(t) drill stem tests and charts
(u) formation water analysis
(v) and any other geophysical well data not specifically named

26.02 To the extent of applicable law, Department intends to keep the following seismic related documents confidential in perpetuity from the date of acquisition, and further acknowledges that the seismic data submitted to the Department are the sole property of the Lessee and considered to be business or trade secrets:

(a) all raw preprocessed data on tapes, discs, or other storage devices
(b) all processed data on tapes, discs, or other storage devices
(c) all paper or reproducible copies of stacked seismic data presentations
(d) all paper or reproducible copies of migrated seismic data presentations
(e) all paper or reproducible copies of relative amplitude seismic data presentations
(f) all paper or reproducible copies of premigrated stacked seismic data presentations
(g) all paper or reproducible copies of depth conversion seismic data presentations
(h) all paper or reproducible copies of amplitude versus offset seismic data presentations
(i) all paper or reproducible copies of any attribute seismic data presentations
(j) all post plot sh ot point and receiver location maps
(k) all time-depth conversion charts or calculations
(l) all velocity charts and calculations
(m)all sonic/acoustic well charts and data calculated from well logs
(n) all synthetic seismograms
(o) all seismic models for tuning and velocity variation
(p) and all other incidental or miscellaneous seismic related data or presentations.

26.03 To the extent of applicable law, Department intends to keep the following business documents confidential for the life of the lease agreement from the date of acquisition, and further acknowledges that the business documents submitted to the Department are the sole property of the Lessee and considered to be business or trade secrets:

(a) meter charts
(b) all third party statements related to Commonwealth's royalty volumes and payments
(c) all internal account statements of Lessee or third party related to Commonwealth's royalty volumes and payments
(d) all business books of the Lessee or third parties provided to the Commonwealth to substantiate Commonwealth's royalty volumes and payments
(e) all Lessee and third party contracts related to the Commonwealth's royalty volumes and payments
(f) all production agreements between Lessee and third parties related to Commonwealth's royalty volumes and payments
(g) all farmout agreements between Lessee and third parties related to Commonwealth's royalty volumes and payments
(h) all purchase and sale agreements between Lessee and potential purchaser of the leased premises
(i) all agreements providing for areas of mutual interest between Lessee and third pa rties
(j) and all other business documents and agreements provided to the Commonwealth that Lessee or a third party consider confidential trade secrets.

27. UNITIZATION

27.01 Lessee shall have the right, at any time or times, to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering with the owners and/or

lessees, into joint operating agreements providing for the joint operation and development of the leased premises, or portions thereof, with adjoining lands to prevent the drilling of an excessive number of wells, or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

27.02 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises, provided that the Lessee is the owner of the off-lease property.

27.03 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area, and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

28. OFFSETS

28.01 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth which is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, any well drilled on lands not owned by the Commonwealth which is completed within one-thousand six-hundred and seventeen (1617') feet (i.e., 60 acres) of the boundary line of the lease premises and from which gas is being produced as the principal product, or any well drilled on lands not owned by the Commonwealth which is completed within the radius of the drainage areas set by an order of the Department of Environmental Protection's Bureau of Oil and Gas Management; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may, at its discretion, relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except:

(a) forty (40) acres around each well from which oil is being produced as the principal product;

(b) three hundred twenty (320) acres around each well from which gas is being produced as the principal product; or

(c) that acreage attributable to a well by an order of the Department of Environmental Protection's Bureau of Oil and Gas Management if the affected acreage falls within an area subject to such a spacing order.

28.02 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on lands not owned by the Commonwealth and, if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression, as long as safety and environmental integrity are maintained.

28.03 In cases where the offset drilling obligations of this section conflict with the drilling restriction provisions of Section 23, then the drilling restriction provisions of Section 23 shall take precedence and prevail unless waived in writing by Department.

29. OIL AND GAS PIPELINES

29.01 No large diameter, high-capacity natural gas transmission pipelines shall be constructed on the leased premises. Any pipeline that exceeds twelve inches (12") in diameter shall be considered a main transmission line for the purpose of this lease, regardless of its intended use.

29.02 Lessee is herewith granted the right to lay any necessary oil or gas gathering pipelines on or under the leased premises; however, a route map for each line shall be submitted, upon request and for approval, to the District Forester as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, Lessee must enter into the customary pipeline right-of-way agreement with Department.

29.03 Lessee does hereby agree that it will, at all times during the continuance and delivery of oil, gas, and liquid hydrocarbons to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

30. GAS STORAGE RIGHTS

30.01 No gas storage rights are demised to the Lessee by this lease.

30.02 If the Lessee wishes to develop the leased premises for gas storage, Lessee must first obtain a Gas Storage Lease from the Department.

30.03 If the Lessee does not wish to develop the leased premises for gas storage, but in the Department's opinion the leased premises exhibit characteristics which indicates its potential for a gas storage reservoir, Department will so inform the Lessee in writing prior to the final plugging and abandonment of the wells and removal of the surface support equipment.

30.04 Any well and equipment identified by Department as necessary for the development of a gas storage facility on the leased premises and which is not planned for development by the Lessee shall first be offered to Department or its nominee or assignee in writing, at the then fair market value of the

well and attendant equipment, at least one hundred twenty (120) days before Lessee begins abandonment procedures.

31. SEISMIC SURVEYS

31.01 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit for approval to the District Forester, a map showing the proposed location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to Lessee, Lessee must obtain the customary Seismic Survey Agreement from Department. The performance bond required in Section 16 (Bonding) of this lease shall, hereafter, be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

31.02 A final plat will be submitted to Department within ninety (90) days after completion of any seismic survey showing the location, elevation, and depth of shot holes drilled; and indicating which holes contained ground water, at what depth it occurred, and an estimate of the amount of flow.

31.03 During the term of this lease, a copy of all seismic data gathered or obtained from any seismic survey conducted on the leased premises will be made available to Department for review at any time after a period of one (1) year of the date of completion of each individual seismic survey. The Department may examine the information gathered in the seismic survey at the location where such information is normally maintained and worked by the Lessee during regular business hours. The Department hereby agrees that none of the seismic information examined by the Department's staff will be copied or taken from the Lessee's premises without the express written permission of the Lessee.

31.04 Upon termination of this lease, or earlier with approval of the Lessee, the Lessee shall submit to the Department a copy of all seismic data collected by the Lessee or the Lessee's agent which represents the leased premises, including but not limited to those items specified in Section 26.02 above. The submitted data may be in digital form, hard copy form (paper), or in a reproducible form (film or Mylar), and said data will be the "processed" version of the data. The presentation will include the stacked, migrated, and relative amplitude presentations in time as well as depth, if any or all of these presentations are generated from the processing procedures. Special processing, such as amplitude versus offset or any attribute processing, will be supplied in hard copy form only. All hard copies will be in industry standard format, and the digital copy will be presented in the format available or in a format Department requests, as long as it is an industry standard format. The Lessee will not be required to submit interpreted versions of the seismic data.

31.05 If a seismic survey is begun but not completed, any data collected even though incomplete shall be submitted to the Department within 30 days after the seismic effort has been terminated. If the seismic effort is suspended for more than 90 days, all data collected to the date the effort was suspended shall be submitted to the Department.

31.06 A "post plot" map will accompany both the hard copy and digital versions of the data identified in Sections 31.04 and 31.05 above, wherein the shot points are clearly marked on the map in reference to known landmarks or other reference points so that the location of all shot points can be

clearly located. If multiple survey lines are completed during one survey, all lines will be shown on the post plot map in their correct relationship to one another with tie points clearly marked on the map as well as the seismic lines. All post plot maps will be provided at no cost to Department.

31.07 A Data Transmittal Listing is required by Department, to accompany the seismic information identified in Sections 31.04 and 31.05 above which shall be transmitted to Department. Department will acknowledge in writing its receipt of the transmitted information.

32. TEST OF WELL ECONOMY

32.01 For purposes of this lease, if a gas well does not produce more than an average of one (1) Mcf/day of natural gas in a calendar year (calculated by dividing its annual production in Mcf by 365 days), it shall be considered uneconomic (i.e., not in paying quantities) to maintain and operate; and if during the following calendar year gas production from the well also fails to exceed a one (1) Mcf/day average, Lessee shall plug and abandon the well as per Section 33 (Plugging), and restore the wellsite and access road to the satisfaction of District Forester, all no later than six (6) months after the end of said following calendar year.

This provision shall apply to all wells drilled or operated by Lessee on the leased premises, whether the wells are shut-in or producing, unless the Department has informed the Lessee that a well or wells falls under the provisions of Section 30 (Gas Storage Rights).

Department may, at its sole option and in writing, waive all or part of the requirements of this provision to Lessee, if in Department's judgment such a waiver is warranted by economic conditions or other circumstances, and is deemed to be in the best interest of the Commonwealth.

33. PLUGGING

33.01 Lessee shall properly and effectively plug all wells on the leased premises before abandoning, in accordance with the regulations of the Department of Environmental Protection's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth, and in accordance with the DCNR's Standard Well Plugging Procedures as described in **Exhibit "F,"** attached hereto and made a part hereof, or provide an alternative plugging method acceptable to the Department before plugging operations commence, to be approved by the Department in writing beforehand. A copy of the Certificate of Well Plugging showing the plugging procedure used and submitted to the Bureau of Oil and Gas Management shall be supplied to the Minerals Section, Bureau of Forestry for each well plugged and abandoned. In addition to the above-mentioned requirement, upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements may be reason for cancellation of this lease, in which case the posted surety would be forfeited to fund the proper plugging of the well or wells by Department.

34. DEPARTMENT'S TERMINATION

34.01 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) calendar days after Lessee's receipt of demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

34.02 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) calendar days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant, and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a Writ of Possession waiving all stay and exemption laws and release of errors.

35. LESSEE'S TERMINATION

35.01 Lessee may, at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

35.02 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 21 (Subsequent Wells). Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation, including but not limited to the plugging and abandonment of wells, which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

36. FORCE MAJEURE

36.01 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance therewith is prevented by, or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If, at the end of the primary term hereof, such term has not been extended by production or drilling, as in this lease provided; and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the

rental provision hereof shall be extended automatically from year to year for a period not to exceed ten (10) additional years, unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises, by reason of any of the above recited causes, this lease shall remain in full force and effect.

37. REMOVAL

37.01 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to plug and abandon all wells; remove all buildings, machinery, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations; to fill and level all pits; and to the extent practicable, to restore the property to the same condition as when received.

38. RIGHTS RESERVED BY DEPARTMENT

38.01 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

38.02 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

38.03 Department reserves the right to approve, in writing, all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises unless, upon due cause shown, Department waives the thirty (30) day requirement and allows a shorter, but reasonable, time for review.

38.04 The surface rights of Department shall be considered dominant and the oil and gas leasehold rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

39. THIRD PARTIES' RIGHTS

39.01 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) has hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature as defined within the lease agreement, Section 26 (Confidentiality).

40. DISPUTE RESOLUTION

40.01 In the event that Lessee wishes to dispute a decision made by Department, the following procedure shall be used to dispute Department's decision:

(a) Department shall fix a time and place for a conference within ten (10) business days from the date of the Department's receipt of the Lessee's written request for a conference.

(b) The conference shall be held within thirty (30) days of the Department's receipt of the Lessee's written request for a conference, unless Department and Lessee agree to an extension of time for the conference.

(c) At such conference, the Director of the Bureau of Forestry or his/her representative shall represent Department.

(d) Department may continue the conference if supplemental data, maps or other information are required to evaluate the basis for Lessee's objections, if further review is needed to ascertain whether a mutually agreed upon settlement is consistent with the terms of the lease agreement, or if all parties to the conference agree that a continuance is beneficial to the resolution of the objection.

(e) Any agreement(s) reached at the conclusion of said conference or follow-up discussions shall be consistent with the provisions of the lease agreement. A record of such agreement(s) shall be documented in writing by the Department, copies of which shall be provided to the Lessee, the appropriate District Forester, and all other parties involved.

41. INTEGRITY PROVISIONS

41.01 Lessee agrees to comply with the CONTRACTOR INTEGRITY PROVISIONS FOR COMMONWEALTH CONTRACTS, attached hereto as **Exhibit "G"**, and made a part hereof.

42. NONDISCRIMINATION CLAUSE

42.01 Lessee agrees to comply with the NONDISCRIMINATION CLAUSE, attached hereto as **Exhibit "H"**, and made a part hereof.

43. RELEASE

43.01 Lessee shall not be granted a final release from the terms of this lease until all records and reports and other data described above have been provided to the Department, all wells required by the Department to be plugged have been plugged and plugging certificates provided, all other terms of this lease have been met, and the District Forester has met with Lessee's field engineer or other authorized representative on the ground, inspected the premises, and both parties have signed a Statement of Release indicating that any necessary site restoration has been completed. Said release shall not be unreasonably withheld by the Department. In the absence of a two-party signed Statement of Release,

the Department shall accept the District Forester's findings based on his/her independent inspection of the leased premises. A copy of the release statement will be provided to the Minerals Section, Bureau of Forestry.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be dully executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

James R. Grace, PhD
Deputy Secretary for Parks & Forestry

ATTEST:

SENECA RESOURCES CORPORATION

Secretary/~~Treasurer~~ (signature) (Seal)

President/Vice President (signature)

Typed Name: Barry L. McMahan

(Typed Name) John P. McGinnis

Federal Identification No.:

APPROVED AS TO LEGALITY AND FORM:

OFFICE OF ATTORNEY GENERAL

OFFICE OF GENERAL COUNSEL

Kimberly A. Hummel

CHIEF/ASSISTANT COUNSEL
DEPARTMENT OF CONSERVATION AND
NATURAL RESOURCES

COMMONWEALTH OF PENNSYLVANIA, :

: ss.

COUNTY OF DAUPHIN :

On this the 30 day of January, 2008 before me, the undersigned officer, personally appeared James R. Grace, Deputy Secretary for Parks and Forestry, Commonwealth of Pennsylvania, Department of Conservation and Natural Resources, known to me to be the person described in the foregoing instrument, and acknowledged that he executed the same in the capacity therein stated and for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Gene F. Odato

Notary Public

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
GENE F. ODATO, Notary Public
City of Harrisburg, Dauphin County
My Commission Expires March 29, 2012

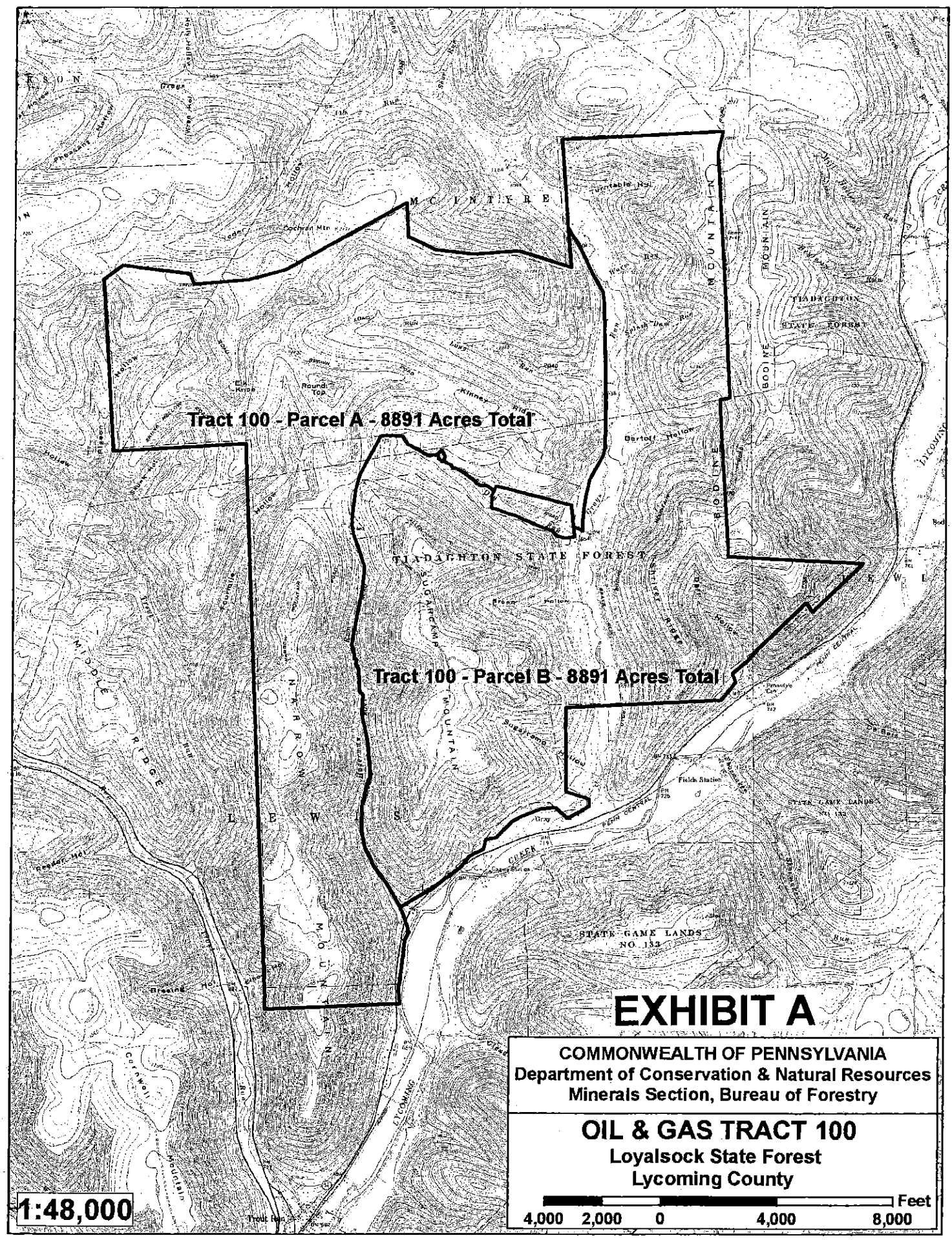


EXHIBIT A

COMMONWEALTH OF PENNSYLVANIA
Department of Conservation & Natural Resources
Minerals Section, Bureau of Forestry

OIL & GAS TRACT 100

Loyalsock State Forest
Lycoming County

Feet
4,000 2,000 0 4,000 8,000

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "B"

Attached to and made a part of Oil and Gas Lease For State Forest Lands, No. M-10100-20, by and between: COMMONWEALTH OF PENNSYLVANIA and SENECA RESOURCES CORPORATION.

Tract 100

State Tract 100 containing 8,891 acres of Loyalsock State Forest land consisting of 2 parcels: Parcel "A" (4,404 acres) comprising parts of Warrants 5659. 5662, 5663, 5664, 5669, 5752 and 5785 in Lewis and McIntyre Townships; and Parcel "B" (4,487 acres) comprising parts of Warrants 5656, 5657, 5658, 5659, 5662, 5663, 5664, 5669 and 5785 in Lewis, McIntyre and Cogan House Townships; all in Lycoming County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania, Parcel "A" from Thomas B. Albert: by deed dated September 24, 1924; from Charles Bartles and George Hoover by deed dated November 6, 1908; from John Hall by deed dated November 6, 1908; from Fred Lehman by deed dated September 21, 1948; from Mary Mahaffey by deed dated November 6, 1908; from John G. Newman by deed recorded April 17, 1970; and from Asher D. Updegraff by deed dated November 21, 1916; and Parcel "B" from Josephine Allen by deed dated May 6, 1914; from Charles Bartles and George Hoover by deed dated November 6, 1908; from J. Henry Cochran, et al, by deed dated November 6, 1908; from Grays Run Club and Pennsylvania Game Commission by deed dated November 21, 1936; from John L. Hall by deed dated November 6, 1908; from Mary Mahaffey by deed dated November 6, 1908; from John G. Newman by deed recorded April 17, 1970; and from Asher D. Updegraff by deed dated November 21, 1916; and described as follows:

Parcel A

Beginning at a point formed by the, Loyalsock State Forest boundary and the centerline of Hagerman Run Road within Warrant 5785; also being a point approximately 11,900' north 18° east of the junction of US Route 15 and State Route 14 at Trout Run, Pennsylvania; also being a point approximately 700' west-northwest of the junction of Hagerman Run and Lycoming Creek west of State Route I4; thence in a general northerly direction approximately 17,000' along the centerline of Hagerman Run Road through Warrants 5785, 5669 and 5664 to a point formed by the junction of the centerlines of Hagerman Run Road , and Dry Run Road; thence in a general southeasterly direction approximately 4700' along the centerline of Dry Run Road through Warrants 5664 and 5663 to a point on the Loyalsock State forest boundary with an "interior holding" of privately owned land; thence southward approximately 600' along the Loyalsock State Forest boundary within Warrant 5663 to a corner point on the Loyalsock State Forest boundary; also being the southwest corner of the privately owned "interior

holding" parcel of land; thence in a general southeasterly direction approximately 3200' along the Loyalsock State Forest within warrants 5663 and 5662 (?) to a corner point on the Loyalsock State Forest boundary; also being the southeast corner of the privately owned "interior holding" parcel of land; thence northward approximately 300' along the Loyalsock State Forest boundary within Warrant 5662 (?) to a point on the centerline of the Dry Run Road; thence southeastward approximately 200' along the centerline of Dry Run Road within Warrant 5662 to a point formed by the intersection of the centerlines of Dry Run Road and Grays Run Road; thence in a general northerly direction approximately 10,700' along the centerline of Grays Run Road within Warrants 5662 and 5659 to a point on the Loyalsock State Forest boundary; also being a point on the west line of Warrant 5659; thence northward approximately 3000' along the Loyalsock State Forest boundary which follows the west line of Warrant 5659 to a corner point on the Loyalsock State Forest boundary; also being the northwest corner of Warrant 5659; thence eastward approximately 5400' along the Loyalsock State Forest boundary which follows the north line of Warrant 5659 to a corner point on the Loyalsock State Forest boundary; also being the northeast corner of Warrant 5659; thence southward approximately 9502' along the east line of Warrant 5659 (which follows in part the west side of the Bodine Mountain Road) to the southeast corner of Warrant 5659; also being a point on the Lewis-McIntyre Township line; thence westward approximately 300' along the south line of Warrant 5659 which coincides with the Lewis-McIntyre Township line to a point on the south line of Warrant 5659; also being the northeast corner of Warrant 5662; thence southward approximately 5313' along the east line of Warrant 5662 to a point on the east line of Warrant 5662; also being the northwest corner of Warrant 5752; thence eastward approximately 4455' along the north line of Warrant 5752 to a point on the Loyalsock State Forest boundary; thence in a general southwesterly direction approximately 2294' southwest, 347' northwest, 3531' southwest, 282' south-southeast, 780' southwest, 5300' west (along the south line of Warrant 5662), 2850' south, 800' east-southeast, 250' south, 800' southwest (along Grays Run Road); 600' northwest, and 6600' generally southwest along the Loyalsock State Forest boundary through Warrants 5752, 5662 and 5785 to a corner point on the Loyalsock State Forest boundary; also being a point formed by the junction of the Loyalsock State Forest boundary and the centerline of Hagerman Run Road within Warrant 5785; the place of the beginning.

Parcel B

Beginning at a point formed by the Loyalsock State Forest boundary and the centerline of Hagerman Run Road within Warrant 5785; also being a point approximately 11,900' north 18° east of the junction of US Route 15 and State Route 14 at Trout Run, Pennsylvania; also being a point approximately 700' west-northwest of the junction of Hagerman Run and Lycoming Creek west of State Route 14; thence in a general northerly direction approximately 17,000' along the centerline of Hagerman Run Road through Warrants 5785, 5669 and 5664 to a point formed by the junction of the centerlines of Hagerman Run Road and Dry Run Road; thence in a general southeasterly direction approximately 2300' along the centerline of Dry Run Road through Warrants 5664 and 5663 to a point on the Loyalsock State Forest boundary with a small 1.5 acre "interior holding" of privately owned land; thence northeastward approximately 178'

along the Loyalsock State Forest boundary to a corner point on the Loyalsock State Forest boundary; also being the north corner of the 1.5 acre "interior holding" parcel of privately owned land; thence southeastward approximately 276' along the Loyalsock State Forest boundary to a corner point on the Loyalsock State Forest boundary; thence southwestward approximately 150' along the Loyalsock State Forest boundary to a point on the centerline of Dry Run Road; thence southeastward approximately 2100' along the centerline of Dry Run Road within Warrant 5663 to a point on the Loyalsock State Forest boundary with an "interior holding" of privately owned land; thence north-northeastward approximately 150' along the Loyalsock State Forest boundary to a corner point on the Loyalsock State Forest boundary; also being the northwest corner of the "interior holding" parcel of privately owned land; thence east-southeastward approximately 2800' along the Loyalsock State Forest boundary within Warrant 5663 and 5662 (?) to a corner point on the Loyalsock State Forest boundary; also being the northeast corner of the "interior holding" parcel of privately owned land; thence southward approximately 1300' along the Loyalsock State Forest boundary within Warrant 5662 (?) to a point on the centerline of Dry Run Road; thence southeastward approximately 200' along the centerline of Dry Run Road within Warrant 5662 to a point formed by the intersection of the center lines of Dry Run Road and Grays Run Road; thence in a general northerly direction approximately 10,700' along the centerline of Grays Run Road within Warrants 5662 and 5659 to a point on the Loyalsock State Forest boundary; also being a point on the west line of Warrant 5659; thence southward approximately 1350' along the Loyalsock State Forest boundary which follows the west line of Warrant 5659 to a corner point on the Loyalsock State Forest boundary also being a point on the east line of Warrant 5658; thence in a general westerly direction approximately 6000' west-northwest along the Loyalsock State Forest boundary across Warrant 5658 to a corner point on the Loyalsock State Forest boundary; also being a point on the west line of Warrant 5658; also being a point on the east line of Warrant 5657; thence northward approximately 1200' along the Loyalsock State Forest boundary which follows the east line of Warrant 5657 to a corner point on the Loyalsock State Forest boundary; thence in a general west-southwesterly direct ion approximately 8000' along the Loyalsock State Forest boundary within Warrants 5657 and 5656 to a corner point on the Loyalsock State Forest boundary; also being a point within Warrant 5656; thence in a general westerly direction approximately 350' north-northwest, 2400' west-northwest and 800' southwest along the Loyalsock State Forest boundary within Warrant 5656 to a corner point on the Loyalsock State Forest boundary; also being a point on the west line of Warrant 5656; thence southward approximately 5900' along the Loyalsock State Forest boundary which follows the west line of Warrant 5656 to a corner point on the Loyalsock State Forest boundary; also being the southwest corner of Warrant 5656; thence eastward approximately 4500' along the Loyalsock State Forest boundary which follows the south line of Warrant 5656 to a corner point on the Loyalsock State Forest boundary, also being the southeast corner of Warrant 5656; also being the northwest corner of Warrant 5664; thence southward approximately 19,400' along the Loyalsock State Forest boundary which follows the west lines of Warrants 5664 and 5669 to a corner point on the Loyalsock State Forest boundary; also being the southeast corner of Warrant 5669; thence eastward approximately 4600' along the Loyalsock State Forest boundary which follows the south line of Warrant 5669 to a corner point on the Loyalsock State Forest boundary on the

west bank of Lycoming Creek; also being at or near the southeast corner of Warrant 5669; also being at or near the south corner of Warrant 5785; thence in a general north-northeasterly direction approximately 2500' along the Loyalsock State Forest boundary which follows the west bank of Lycoming Creek within Warrant 5785 to a corner point on the Loyalsock State Forest boundary; thence north-northwestward approximately 900' along the Loyalsock State Forest boundary within Warrant 5785 to a corner point on the Loyalsock State Forest boundary; 'also being a point formed by the Loyalsock State Forest boundary and the centerline of Hagerman Run Road within Warrant 5785; the place of the beginning.

AREAS OF SPECIAL CONSIDERATION

Tract 100 contains approximately 351 acres more or less of high value standing timber as shown on Exhibit "I". Lessee is required to carefully coordinate and pre-plan all exploration and development activities within these areas with District Forester to prevent unnecessary harvesting of high value timber wherever possible.

WELL SITES

Thirty-five (35) well pad sites will be permitted on Tract 100. Well pad site size and location are subject to the terms of the lease agreement and the approval of the District Forester.

COPY

THIS LEASE AGREEMENT, made this 24 day of Dec., A., 1931, between the EMPORIUM LUMBER COMPANY, a Pennsylvania Corporation, with its principal office in Galeton, Pennsylvania, as Lessor, and the EAST PENN DEVELOPMENT COMPANY, a Delaware Corporation, with an office in Port Allegany, Pennsylvania, as Lessee,

WITNESSETH: That for and in consideration of the sum of One Dollar, to it in hand paid by the Lessee (the receipt of which is hereby acknowledged) as well as for and in consideration of the rentals and other payments, covenants and conditions herein agreed to be paid, kept and performed by the Lessee, the Lessor does hereby grant, demise and let unto the Lessee all those certain tracts or parcels of land situate in the East Fork District and Wharton Township, Potter County, Pennsylvania, (listed immediately hereafter), for the sole and exclusive right to drill and operate thereon for oil and/or gas, and the right to use sufficient water and gas from the premises to drill and operate thereon and such other rights and privileges as are reasonably necessary for conducting said operations and the right to remove at any time all of the property placed thereon by the Lessee.

Being the following Warrants, to-wit:- 4766, 4769, 4770, 4754, 4701, 4703, 4704, 4715, 4765, 4696, 4697, North ½ of 5154, 5920, Ives 4, Ives 5, Ives 6, 5917, 5148, 5912, 4753, 4714, Ives 2 and Ives 3. As the same are described in a Deed dated the first day of January, 1929, wherein the Lessor herein was Grantor and the Commonwealth of Pennsylvania, Grantee, recorded in Potter County in Deed Book 108, page 186, (The Lessor herein reserving the oil and gas), and to which reference may be had for a full and complete description of each of said warrants enumerated herein.

EXCEPTING AND RESERVING THEREFROM, the following:-

(a) A tract of eighty-nine (89) acres ninety-six (96) perches, claimed by H.B. Walker.

COPY

(b) A tract of One hundred ninety-three (193) acres thirty-two (32) perches, claimed by Minerva McFall.

(c) A tract of one hundred fifteen (115) acres claimed by Indra Williams.

(d) A tract of thirty (30) acres, claimed by Ruben Ward.

(e) A tract of forty-seven (47) acres sixty-four (64) perches, claimed by Jane Williams.

(f) A tract of one (1) acre, claimed by Ora Nichols.

(g) A right-of-way of thirty-six (36) acres, twenty (20) perches, claimed by the B.& S. Railroad Company.

The above Warrants, after deducting the exceptions and reservations herein recited, CONTAIN approximately and for the purpose of this Lease, Twenty-three Thousand (23,000) Acres.

TO HAVE AND TO HOLD, the same unto the Lessee, for the purpose herein set forth, for and during the term of Ten (10) years from the date hereof and as much longer as oil and/or gas is found in paying quantities or as operations for oil and/or gas are being conducted on the premises, but not to extend beyond the reserved right of the Lessor to drill and operate for oil and gas as set out in the Deed from the Lessor to the Commonwealth of Pennsylvania dated January 1st, 1929, and recorded in Potter County, Pennsylvania in Deed Book 108, page 186. It being the intention of this Lease to grant to the Lessee (if it so elects) the same tenure as the Lessor has in the lands described herein and with the same rights as to the development of the lands for oil and gas and no greater, and subject to the terms, covenants and conditions hereof. The reserved right in said Deed reads as follows:-

> "'H'. EXCEPTING AND RESERVING the oil and gas under all of the lands herein conveyed with the right to drill, bore and prospect for the same; and if found, to produce, store and transport the same, for and during the term of TWENTY YEARS (20), and if at the expiration of that time oil and/or gas is produced, in paying quantities, a further term of twenty (20) years is excepted herefrom, TOGETHER with the use of any part of the surface in the

operation, development, production and transportation of any oil and/or gas therein found according to such rules and regulations as may be, from time to time, adopted by the Secretary of Forest & Waters, but such rules shall at all times be reasonable rules and in harmony with the usual methods of operating and producing oil and/or gas in the Bradford Field."

"The Lessee hereby agrees to pay as rental for the first year the sum of Twenty-five Cents ($.25) per acre, and to be paid in full upon the execution and delivery of this Lease. For each subsequent year, the Lessee agrees to pay the sum of Thirty-five Cents ($.35) per acre, payable quarterly in advance, and it further agrees to pay the additional consideration of one-eighth (1/8) of all oil produced to be delivered free of expense into tanks or oil lines; and one-eighth (1/8) of the market price of each one-thousand (1,000) feet of gas produced and marketed off said premises, said market price to be the average price received by producers in the Tioga Field. The gas shall be measured by orifice meter or meters (furnished by the Lessee) and the coefficient for said meter or meters shall be based on a 10 oz. pressure, specific gravity of the gas, and a flowing temperature of 60 degrees Fahrenheit. The quantity of gas produced and marketed shall be compiled on the 10th of each month, and payment made therefor on or before the 20th of that month. The Lessor or its agents shall have the right to read and inspect the meter charts and to examine, check or test the meters at its own cost. Lessee to pay seven-eighths (7/8) of the increased Taxes.

The Lessee does hereby covenant and agreed that it will start to drill one (1) well on the premises on or before September 1st, 1931, and proceed with all due diligence into the Oriskany sand. And if gas is found therein and in paying quantities, it covenants and agrees that during the calendar year 1932, and each calendar year thereafter, to drill at least two (2) additional wells into the same sand until there

is at least one (1) well into this sand for each Five Hundred (500) acres of land leased, or undrilled land abandoned. Provided the first, or the second, or the third, and each subsequent well drilled into the Oriskany Sand shows gas in paying quantities, and provided further, that the market will absorb the gas.

IT IS FURTHER UNDERSTOOD AND AGREED that nothing herein, however, shall be construed as prohibiting the Lessee from drilling, producing and marketing oil and/or gas found in any other sand, of lesser depth, should the Oriskany sand be not found, or if found, prove unproductive in paying quantities. And it is agreed that in case the said lands are developed for the oil and/or gas in any other sand, the Lessee will, during the calendar year thereafter, drill at least four (4) additional wells into the said sand, until there is at least one (1) well for each two hundred (200) acres of land leased or undrilled land abandoned, provided that the market will absorb the gas.

Provided the Lessee is not in default in its rentals or other payments, it is hereby agreed that the Lessee shall have the right to surrender this Lease at any time and any advance rentals paid thereon shall be kept by the Lessor as stipulated damages. It is further agreed that the Lessee shall have the right to abandon all undrilled area, (being all the land leased saving and excepting only five -hundred (500) acres around each and every well drilled to a depth of twenty-five hundred (2500) feet, or more, and two-hundred (200) acres around each and every well drilled to a depth of less than twenty-five-hundred (2500) feet). Upon the surrender of this Lease, said Lessee shall be released from any subsequent accrued rentals, payments or charges to the said Lessor, and on the abandonment of the undrilled area, the Lessee shall be released from all subsequent rentals on the area abandoned. The Lessee agrees to give to the said Lessor thirty (30) days' notice in writing of its exercise of either of the said rights

to surrender or to abandon, and hereby grants to the said Lessor the right or option within the thirty-day notice period to purchase the equipment or material in any well to be abandoned and at a price to be agreed on, and if not purchased, the Lessee will comply with all requirements of the State, statutory or otherwise, in plugging or otherwise caring for the well.

THE PARTIES DO FURTHER COVENANT AND AGREE that each and every well drilled to a depth of twenty-five-hundred (2500) feet, or more, will reduce the annual rental herein agreed to be paid the sum of One Hundred Seventy-five ($175.00) Dollars, and for each and every well drilled to a depth less than twenty-five-hundred (2500) feet, the annual sum of Seventy ($70.00) Dollars. "

IT IS FURTHER AGREED that the Lessee has a right of ingress and egress on, over and across the lands of the Lessor adjacent to the lands leased for rights-of-ways as fully as the Lessor may have (under its reserved rights in the Deed to the Commonwealth of Pennsylvania), to properly develop and operate the same; and the Lessor reserves the right of ingress and egress for rights-of-way for itself and its assigns over the lands leased to develop and operate its oil, gas and mineral rights.

ALL payments of rental or royalty are to be made by check to the Lessor by mail to CONIFER, N. Y., or such other place as it may direct in writing and ten days grace shall be allowed on all payments that may become due under the provisions of this Lease.

IT IS ALSO UNDERSTOOD AND AGREED that if there is now or at any time any outstanding interest in said oil and/or gas not owned by the said Lessor, the royalty herein provided to be made to the Lessor shall be reduced accordingly.

AS A MATTER OF INFORMATION it is agreed that the Lessee

will keep an accurate log of its drilling and give to the Lessor a copy of the same as the work progresses, together with a map showing the location of wells, lines, at cetera, or other working charts, as may be used by the Lessee in the development of said land.

Failure to start the well before September 1st, 1931, shall make this lease null and void. Failure to pay any of the rentals as herein agreed to be paid shall make this Lease null and void. Failure to pay the agreed Royalty as the same becomes due and payable shall make this Lease null and void. Failure to keep and perform any of the covenants herein agreed to be done, kept and performed, by the Lessee, shall make this Lease null and void. Upon any of the said defaults said Lessor may declare this Lease forfeited with the right to re-enter and repossess itself of the same.

THIS LEASE AGREEMENT inures to the benefit of, and is binding on, the parties hereto and on their respective successors and assigns, hereby giving to the said Lessee the right to sublet the lands or any portion thereof, subject to the terms and conditions hereof.

The Emporium Lumber Company does hereby constitute and appoint E. J. JONES, to be its Attorney, for it and in its name and for its corporate act and deed to acknowledge this Lease before any person having authority by the laws of the Commonwealth of Pennsylvania to take such acknowledgement to the intent that the same may be duly recorded.

IN WITNESS WHEREOF the parties have caused the execution of this Agreement in duplicate the day and year first above written.

ATTEST:

Secretary.

EMPORIUM LUMBER COMPANY

By:

President.

ATTEST:

Asst Secretary

EAST PENN DEVELOPMENT COMPANY

By:

Vice President.

STATE OF PENNSYLVANIA)
) SS:
COUNTY OF McKEAN)

I hereby certify that on this 7th day of May, 1931, before me the subscriber, a Notary Public in and for said State and County, personally appeared E. J.JONES, the Attorney named in the foregoing Agreement, and by virtue and in pursuance of the authority therein conferred upon him, acknowledged the said deed to be the act of the said Emporium Lumber Company.

WITNESS my hand and notarial seal the day and year aforesaid.

Ada P. Duffee
Notary Public

My Comm.Exp: May 9, 1935

STATE OF PENNSYLVANIA)
) SS:
COUNTY OF McKEAN)

On the 29th day of May, 1931, before me personally came A.W. Schumacher, to me known, who, being duly sworn, did depose and say that he resides in Pittsburgh, Pa that he is Vice President of the EAST PENN DEVELOPMENT COMPANY, the company described and which executed the above instrument; that he knows the seal of said company, that the seal affixed to said instrument is such corporate seal, that it was so affixed by the order of the board of directors of said corporation, and that he signed his name thereto by like order.

IN WITNESS WHEREOF, I have hereunto set my hand and seal of office in the County and State aforesaid the day and year aforesaid.

Richard M. Edgar
Notary Public

My Comm. Exp: [illegible]

M-O&G (12-80)
Oil and Gas Lease

Commonwealth of Pennsylvania
Department of Environmental Resources
Minerals Section, Bureau of Forestry
P. O. Box 1467
Harrisburg, Pennsylvania 17120

CONTRACT NO.
M-110259-10

OIL AND GAS LEASE FOR STATE FOREST AND PARK LANDS*

THIS AGREEMENT made and entered into on this 20th day of January, 198[illegible], by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF ENVIRONMENTAL RESOURCES, hereinafter designated "Department" and BUEL H. NEECE, with his principal place of business at P. O. Box 550, Sperry, Oklahoma 74073, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH: THAT,

WHEREAS, Department is authorized by the Act 275 of December 3, 1970, P.L. 834, 71 P.S., Sections 1902A and 1906A, as amended to lease State Forest and Park lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the opening of the bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

NOW THEREFORE, in consideration of the sum of EIGHTY-FOUR THOUSAND SIX HUNDRED THIRTY-SEVEN AND 00/100 DOLLARS ($84,637.00), paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas, and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, TRACT NO. 259 containing 3,655 acres, more particularly described on the Oil and Gas Lease Attachment identified as Exhibit "A" and as shown on the Map identified as Exhibit "C" which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as Exhibit "C" are approximate.

*When this lease is granted in whole or in part on State Park land, then the words "State Forest land" shall be understood to mean State Park land in their entirety or in part whichever shall apply, wherever the words appear in the lease; and the words, "District Forester," shall be understood to mean "Park Superintendent."

Tr 259

1. TERM OR PERIOD

1.1 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth and shall continue from year to year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder, or engaged in the abandonment, or plugging of wells or removal of equipment therefrom.

2. RENTAL

2.1 Lessee shall pay to Department a rental for the above described leased premises at the following rate: the first year's rental shall consist of the bonus payment which was competitively bid by Lessee and shall be payable upon delivery of this lease to Lessee; the second and third years' rental shall be TWO DOLLARS ($2.00) per acre each year payable upon the anniversary date of this lease; for the fourth and all subsequent years thereafter, the rental shall be THREE DOLLARS ($3.00) per acre each year payable upon the anniversary date of this lease.

2.2 The drilling of each well in the leased premises as provided in Section 9 shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 10, which reduction shall become effective on the next rental date, provided the well is a producer. If such wells are drilled on a unit created by a spacing order issued by Department or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3. OIL ROYALTY

3.1 Lessee shall pay to Department, as royalty, ONE-EIGHTH (1/8th) of the field price per barrel (42 U.S. Gallons) at 60° F produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks.

3.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises.

3.3 If oil, gas, condensate, and other liquid hydrocarbons each in paying quantities should be developed from the same well, then the oil and the gas, condensate, and other hydrocarbons shall be saved.

3.4 Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with standard practices as outlined in American Petroleum Institute Standard 2500, January 1, 1955, or as subsequently amended by the same authority, and at a temperature base of 60° F. Lessee shall provide tanks for accurately measuring the crude oil produced from the lease. Positive copies of one hundred percent (100%) capacity tank tables are to be furnished to Department or other acceptable standards of measuring production.

4. GAS ROYALTY

4.1 Lessee shall pay to Department, as royalty, THIRTY CENTS ($0.30) per thousand cubic feet (Mcf) or ONE-EIGHTH (1/8th) of the market value, whichever is higher, for all natural gas, casinghead gas, or other gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; said royalties shall be payable monthly at the prevailing market value for natural gas in the area at the time of delivery.

4.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all gas and other gaseous substances produced and saved from the leased premises.

5. GAS MEASUREMENT

5.1 The volume of gas produced, saved, and marketed shall be measured according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

a. The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

b. The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, irrespective of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

c. The temperature of the gas passing the meters shall be determined: (1) by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes; (2) if a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of fifty degrees Fahrenheit (50° F) shall be used in computing gas volume.

d. The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, at intervals of three (3) months, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

e. The deviation of the natural gas from Boyle's Law shall be determined by tests at intervals of three (3) months or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with the recommendations of the National Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

6. PAYMENTS

6.1 Lessee shall be held responsible for the payment of all royalties, which shall be mailed to the office of Department at Harrisburg, Pennsylvania, and made payable to Department. Payments of royalties shall be made not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

6.2 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

7. OPERATIONS

7.1 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up to date oil and gas field practices.

7.2 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department's Bureau of Soil and Water Conservation. A copy of the plan shall be forwarded to the Minerals Section, Bureau of Forestry, P. O. Box 1467, Harrisburg, Pennsylvania 17120 and District Forester.

8. RESTRICTIONS

8.1 Under Department's multiple use policy, the leased premises are continuously used for recreation, conservation and other purposes and many Department authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions:

(a) No drilling is permitted within 200 feet of any building.

(b) No drilling is permitted within 100 feet of any stream or body of water.

(c) No drilling is permitted within 330 feet of any picnic area which has been so designated by Department.

(d) No drilling is permitted within 330 feet of any trail, road or existing right of way.

(e) No drilling is permitted within 100 feet of any area of historic value, tree plantation, overlook, vista or fire tower site.

(f) No drilling is permitted for oil within 660 feet of the boundary line of leased premises.

(g) No drilling is permitted for natural gas within 2,640 feet of the boundary line of leased premises where it is contiguous with State Park lands or other special-use State Forest lands, such as, Wild Areas and Natural Areas.

(h) In addition, the following specific restrictions for this lease shall also apply:

_____
_____
_____
_____
_____
_____

8.2 Upon written request by Lessee, Department may waive in writing any portion of the above restrictions if in Department's judgement such a waiver is justified and in its best interests.

9. FIRST WELL

9.1 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well on the leased premises or on unitized acreage containing a portion of the leased premises, but the well need not necessarily be on the portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, the lease shall be automatically terminated in its entirety, unless Department approves in writing, thirty (30) days in advance of the anniversary date of this lease, the continuation of the lease on a year to year basis.

10. SUBSEQUENT WELLS

10.1 If the "FIRST WELL" drilled by Lessee or any subsequent well is productive of oil and/or gas and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises, but not necessarily on the portion of the leased premises contained within the unit, as would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If an additional well is necessary, it must be commenced within six (6) months after the completion of the last well drilled; provided, however, that if Lessee concludes an additional well is not justified then Lessee shall submit to Department the information upon which the conclusion is based. Upon review of such information if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within six (6) months from Department's determination or releasing all of the acreage covered by the lease except forty (40) acres around each well from which oil is produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product and has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres around each shallow well from which gas is being produced as the principal product which has been completed above the Onondaga Formation, or that amount of leased acreage actually contained within an established unit, whichever is less.

10.2 Lessee shall not be required under this provision to drill more wells than required or allowed under any spacing order, rule, or regulation of Department, or in the absence of any such order, more than one well for each forty (40) acres where oil is being produced as the principal product of such well, or more than six hundred forty (640) acres where gas is being produced as the principal product of such well and has been drilled to the Onondaga Formation or deeper, or more than three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which is productive from formations above the Onondaga Formation.

10.3 The amount of acreage included in a spacing unit by Department, or in the absence of an order by Department, forty (40) acres where oil is being produced as the principal product of such well, or six hundred forty (640) acres where gas is being produced as the principal product of such deep well which has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which has been drilled to formations above the Onondaga Formation, shall be referred to elsewhere in the lease as "acreage attributable to a well."

11. DEVELOPMENT

11.1 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

11.2 Well spacing shall not be closer than one (1) well per forty (40) acres; should closer spacing be required, written approval must be obtained from Department.

12. OFFSETS

12.1 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth that is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, and any well drilled on leases not owned by the Commonwealth that is completed within two thousand six hundred and forty (2,640) feet of the boundary line of the leased premises and from which gas is being produced as the principal product; or any well drilled on leases not owned by the Commonwealth that is completed within the radius of the drainage areas set by an order of Department; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may at its discretion relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except forty (40) acres around each well from which oil is being produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product, or that acreage attributable to a well by an order of Department if the affected acreage falls within an area subject to such a spacing order.

12.2 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on leases not owned by the Commonwealth and if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression.

12.3 Lessee agrees that any well along the boundary line, contiguous to other lands where minerals, oil and/or gas are owned by the Commonwealth, shall be located at least six hundred and sixty (660) feet from such boundary if oil is the principal product anticipated from the objective formation of the well or at least two thousand six hundred and forty (2,640) feet from such boundary if gas is the principal product anticipated from the objective formation of the well, or that distance from such boundary line which will be the radius of the drainage area set forth by an order of Department, if the area is subject to such a spacing order.

12.4 Upon application by Lessee, this provision providing for the distance from such boundary line may be waived by Department when deemed in the interest of the Commonwealth and not in an area subject to a spacing order of Department.

13. UNITIZATION

13.1 Lessee shall have the right at any time or times to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering, with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises or portions thereof with adjoining lands to prevent the drilling of an excessive number of wells or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

13.2 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of any such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises.

13.3 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

14. SEISMIC SURVEYS

14.1 Lessee, its agents, contractors and subcontractors and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit to District Forester for his approval a map showing the location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to him, Lessee must obtain the customary Seismic Survey Permit from Department. The bond, hereinafter described, shall be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

15. PIPELINES

15.1 Lessee is herewith granted the right to lay any necessary pipelines on or under the leased premises; however, a route map for each line shall be submitted to District Forester for his approval as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, it must enter into the customary pipeline right of way agreement with Department.

16. DRILLING

16.1 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before the drilling thereof is commenced, and no well shall be commenced until a permit has been issued where necessary by Department's Oil and Gas Regulation Division.

16.2 Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

16.3 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth.

16.4 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

16.5 Lessee shall maintain at all times the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells or wells being serviced by a rig shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall at all times be available for efficient operations. Blowout control equipment must be capable in case of an emergency to shut in the well at a point at least fifty (50) feet from the wellhead.

16.6 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is the highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head or leaking oil or gas between the producing string and next larger size casing string when such pressures or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

16.7 While a well is being drilled with mud or water as a drilling fluid, Lessee shall test control equipment daily to the extent possible without causing premature removal of drill pipe from the hole while drilling and record the results of such tests daily. While a well is drilling with air or gas as a drilling fluid, Lessee may test control equipment only during trips for the drilling bit.

16.8 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

16.9 Drilling mud of sufficient weight to prevent oil, gas or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

16.10 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

16.11 Lessee shall use a casing program which complies with oil and gas statutes and rules and regulations of the Commonwealth and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies and blowouts.

16.12 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

16.13 The production casing shall be of new or reconditioned seamless pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(i) The maximum anticipated rock pressure at any point in the casing string shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield as shown in A.P.I. Bulletin 5-C-2 dated April, 1972 or later amendments.

(ii) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated at any point in the casing does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield as shown in A.P.I. Bulletin 5-C-2 or later amendments.

16.14 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After the corrective operation, the casing shall again be tested in the same manner.

16.15 All surface casing and production casing shall be cemented in the ground with good quality cement equalling or exceeding A.P.I. specification in the manner hereinafter described.

16.16 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department.

16.17 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In the event that the cement cannot be circulated to the surface due to the presence of fractures or other lost circulation zones, Lessee shall determine as accurately as possible the depth of the top of the cement in the annular space behind the casing and record it on the well record.

16.18 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another or to the surface does not occur behind the casing.

16.19 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval of Department.

16.20 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not allow the well to blow open, except in case of an emergency over twenty-four (24) hours after drilling-in. Lessee will pay Department at the regular royalty rate for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

16.21 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Test Method (USBM-Monograph 7) or by other methods standard to the industry and approved by Department.

16.22 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

16.23 At least once every six (6) months, Lessee will determine the open flow potential of each producing well as required in Section 16.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive in writing all or parts of this requirement if during any calendar year production averages less than sixty (60) Mcf per day and/or the semiannual twenty-four (24) hour pressure tests show reservoir pressures to be less than one hundred (100) psi.

16.24 Lessee shall at all times conduct prudent drilling operations, including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

16.25 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

16.26 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

16.27 Lessee shall

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) after H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) use special steel pipe and casing which is resistant to H_2S stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) post warning signs around all wellsites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to and at a safe distance from all facilities handling the H_2S gas including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

(h) immediately notify Department and record on appropriate well records and driller's logs any H_2S gas found in the course of drilling or producing operations.

17. REPAIR OF EQUIPMENT

17.1 Lessee does hereby agree that it will, at all times, during the continuance and delivery of oil, gas, and liquid hydrocarbons, to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

18. WELL RECORDS, LOGS AND REPORTS

18.1 Lessee shall keep a daily drilling record which will describe the formations penetrated, depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. Any other data that is usually acquired in the normal procedure of drilling shall be recorded and furnished to Department, such as drilling time, rate of fill-up, lost circulation zones, caving strata, casing records, core analyses, mud log analyses, perforation, and production test data. Within thirty (30) days after completion of each well, Lessee shall furnish Department an accurate location plat, a detailed lithologic log, a detailed history of the well and all well data including geologic, driller, electrical, and any other well surveys made to obtain subsurface information. Upon request, samples of all formations penetrated and parts of cores taken, accurately labeled with the name of the well, and interval of depth shall be furnished to Department at Lessee's expense. If requested, Lessee shall ship a complete set of samples to the Pennsylvania State Geological Survey, Room 1201, Kossman Building, 100 Forbes Avenue, Pittsburgh, Pennsylvania 15222, within thirty (30) days after completion of each well.

19. AUDITS

19.1 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the lease. Department may keep such charts for examination for a period not to exceed ninety (90) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, and other products produced from the leased premises.

19.2 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, and liquid hydrocarbons, produced from any well covered by this lease, to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payments to Lessee, his heirs, administrators, executors, successors, and assigns for oil, gas, and liquid hydrocarbons from wells covered by this lease.

19.3 Lessee further grants to Department the right at any time to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from cancelling this lease upon delivery to Lessee of written notice of Department's intention.

20. LESSEE'S TERMINATION

20.1 Lessee may at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

20.2 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 10. Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

21. REMOVAL

21.1 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to remove all buildings, machinery, wells, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations, to fill and level all pits, and to the extent practicable, to restore the property to the same condition as when received.

22. RELEASE

22.1 Lessee shall not be granted a final release from the terms of this lease until District Forester has met with Lessee's field engineer on the ground, inspected the premises, and received a signed statement of release from Department indicating the proper cleanup has been completed.

23. PLUGGING

23.1 Lessee shall properly and effectively plug all wells on the leased premises before abandoning in accordance with the regulations of the Department's Oil and Gas Regulation Division and all applicable laws of the Commonwealth. A copy of the plugging procedure approved by the Oil and Gas Regulation Division shall be supplied to the Minerals Section, Bureau of Forestry. In addition to the above mentioned requirement upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements will be reason for cancellation of this lease and the posted bond will be forfeited in order that Department may properly plug the wells.

23.2 The plugging procedures, as herein stated, shall also include all shallow wells drilled in areas which are not coal productive and are not covered by the regulations of Department (Certificate of Plugging form may be obtained from Department's Oil and Gas Regulation Division).

24. ABANDONMENT AND STORAGE RIGHTS

24.1 In the event the development of this lease demonstrates, in the opinion of Department, that this tract has potential value as a gas storage reservoir (no storage rights are demised to Lessee under the terms of this lease), the well, equipment, property, and casing involved shall first be offered to Department, its nominee or assignee, at the then fair market value of those items before any well shall be plugged. Such firm offer shall be made in writing to Department at least thirty (30) days prior to commencement of removal of the equipment from the well by Lessee.

25. DEPARTMENTAL TERMINATION

25.1 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) days after demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

25.2 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a writ of Habre Facias Possessionem (without asking leave of court) waiving all stay and exemption laws and release of errors.

26. INDEMNITY

26.1 Lessee shall at all times hereinafter indemnify and save harmless Department from and against all detriment, damage, loss, claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

27. BOND

27.1 Lessee agrees to give Department a surety or performance bond with satisfactory corporate surety in the principal sum of TWENTY-FIVE THOUSAND DOLLARS ($25,000.00) with judgment clause in a form to be approved by the Attorney General conditioned on the faithful performance of the covenants of this lease. The bond shall be further conditioned that in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells upon termination of this lease, or within six (6) months from the termination, Commonwealth can execute upon the bond to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the bond shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises.

28. RELATED AGREEMENTS

28.1 Department will be furnished for record purposes and to protect its interests a copy of all agreements, contracts, letters or memoranda entered into, made, or sent by Lessee in any way concerning the development, operation, or sale of products from this lease.

29. ASSIGNMENTS

29.1 Lessee shall not use or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned and assignee, thereof, shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

30. LIMITATION ON WARRANTY

30.1 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the rents, rentals, and royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the proportion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may with the approval of the Attorney General enter into an escrow arrangement for future rents and royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the rents and royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The rents and royalties placed in escrow shall be refunded to Lessee in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

31. FORCE MAJEURE

31.1 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance, therewith, is prevented by or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If at the end of the primary term, hereof, such term has not been extended by production or drilling as in this lease provided and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the rental provision, hereof, shall be extended automatically from year to year for a period not to exceed ten (10) additional years unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises by reason of any of the above recited causes, this lease shall remain in full force and effect.

32. THIRD PARTIES' RIGHTS

32.1 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) have hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature.

33. PUBLICATION AND NOTICE

33.1 Within thirty (30) days following the receipt by Lessee of a copy of this lease, fully executed, Lessee shall record the lease in the county or counties in which the leased premises lie. Within thirty (30) days following the recording, Lessee shall advise Department in writing of the recording reference data. Thereafter, Department shall cause to be published in the Pennsylvania Bulletin at least the following information:

(1) the subject of this lease;
(2) the general location of the leased premises;
(3) the names of Department and Lessee; and
(4) the recording reference date for this lease.

34. LIABILITY

34.1 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, irrespective of whether or not such pollution or damage be due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause be found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises the pollution or other damage would not have occurred, it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

35. RIGHTS RESERVED BY DEPARTMENT

35.1 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

35.2 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

35.3 Department reserves the right to approve in writing all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises, unless upon due cause shown, Department waives the thirty (30) day requirement and allows a lesser, but reasonable, time for review.

35.4 The surface rights of Department shall be considered dominant and the oil and gas rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

36. PROTECTION AND CONSERVATION

36.1 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as Exhibit "B" attached hereto and made a part hereof.

36.2 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

Lucy M. Cunks

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

CLIFFORD L. JONES, Secretary

ATTEST:

Mark E. Martin
(Mark E. Martin)

LESSEE
(BUEL H. NEECE)

APPROVED AS TO LEGALITY
AND FORM:

& Deputy General Counsel

~~ASSISTANT~~ ATTORNEY GENERAL
Deputy

APPROVED:

DRW GOVERNOR 3/9/81

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DAUPHIN

On this the 4th day of March, 1981, before me LUCY M. CUNKO, the undersigned officer, personally appeared CLIFFORD L. JONES, who acknowledged himself to be Secretary of Environmental Resources of the Commonwealth of Pennsylvania and that he as such Secretary of Environmental Resources being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing his name as CLIFFORD L. JONES, Secretary.

In Witness Whereof, I hereunto set my hand and official seal.

Lucy M. Cunko
Notary Public

Lucy M. Cunko, Notary Public
My Commission Expires May 2, 1983
Harrisburg, PA Dauphin County

ACKNOWLEDGMENT FOR INDIVIDUAL

STATE OF OKLAHOMA)
)ss.
COUNTY OF TULSA)

Before me, the undersigned, a Notary Public, in and for said County and State, on this 20th day of January, 1981, personally appeared BUEL H. NEECE, personally known to me to be the identical person who executed the within and foregoing instrument, and acknowledged to me that he executed the same as his free and voluntary act and deed, for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my official signature and affixed my official seal the day and year first above written.

My commission expires May 1, 1982.

Mark E. Martin
Mark E. Martin, Notary Public

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "A"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-110259-10, by and between: COMMONWEALTH OF PENNSYLVANIA and BUEL H. NEECE.

Tract 259

State Tract 259 containing 3,655 acres of Sproul State Forest land comprising all of the James Tower, John Dewart, Thomas Grant, John Kidd, John Brady and Benjamin Young Warrants and parts of the Henry Donely and John Donely Warrants in Burnside Township, Centre County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from C. M. Bower hy deed dated July 25, 1900, from S. P. Wolverton, L. H. Rohrbach and M. H. Kulp by deed dated April 10, 1900, and from William McClean and Henry Pleasants, Executors of the Last Will and Testament of Howard Spencer by deed dated August 2, 1906, and described as follows:

Beginning at the northwest corner of the John Brady Warrant, also being the northeast corner of the William Brady Warrant, also being a point on the Sproul State Forest boundary line; thence eastward approximately 9,850 feet along the north lines of the John Brady and Thomas Grant Warrants to the northeast corner of the Thomas Grant Warrant, also being a point on the west line of the James Tower Warrant; thence northward approximately 600 feet along the west line of the James Tower Warrant to the northwest corner of the James Tower Warrant; thence eastward approximately 6,700 feet along the north line of the James Tower Warrant to the northeast corner of the James Tower Warrant; thence southward approximately 8,250 feet along the James Tower and John Dewart Warrants to the southeast corner of the John Dewart Warrant; thence westward approximately 6,650 feet along the south line of the John Dewart Warrant to the southwest corner of the John Dewart Warrant, also being a point on the east line of the John Kidd Warrant; thence southward approximately 2,650 feet along the east lines of the John Kidd and John Donely Warrants to the southeast corner of the "nonoverlapping part" of the John Donely Warrant; thence westward approximately 10,050 feet along the south lines of the John Donely and Henry Donely Warrants to the southwest corner of the "nonoverlapping part" of the Henry Donely Warrant; thence northward approximately 10,500 feet along the west lines of the Henry Donely, Benjamin Young and John Brady Warrants to the northwest corner of the John Brady Warrant, the place of the beginning.

(1-77)
Revised (12-74)
Stipulation Form

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

EXHIBIT "B"

STIPULATIONS FOR PROTECTION AND CONSERVATION
OF STATE FOREST AND PARK LANDS

The lands embraced in this lease or permit[1] are leased by the Commonwealth of Pennsylvania, acting through the Department of Environmental Resources, hereinafter designated as "Lessor" or "Department." Lessee or Permittee hereby agrees to the following stipulations:

1. ENVIRONMENTAL QUALITY CONTROL

1.1 Lessee shall take all necessary precautions and measures throughout the entire course of this lease to insure strict compliance with all pertinent laws and rules and regulations promulgated thereunder, whenever enacted, including: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119, as amended through 1968, 35 P.S. 4001, et seq.); the Clean Streams Law (Act of June 22, 1937, P.L. 1987, as amended through July 31, 1970, 35 P.S. 691.1 et seq.); the Solid Waste Management Act (Act 241, July 31, 1968); the Gas Operations Well Drilling Petroleum and Coal Mining Act (Act of November 30, 1955, P.L. 756, as amended on March 3, 1970, and known as the Act of the General Assembly No. 38); the Surface Mining Conservation and Reclamation Act (Act of May 31, 1945, P.L. 1198, as amended through November 30, 1971, Act No. 147).

1.2 Notwithstanding any provision in this lease, Lessee shall be held liable by the Commonwealth of Pennsylvania, or any agency of the Commonwealth, for the violation of any relevent laws, rules and regulations.

1.3 Before any mining, drilling or quarrying, Lessee shall acquaint itself with all of the applicable rules and regulations governed by each respective Act.

1.4 Prior to undertaking actual mining, drilling or quarrying, Lessee shall confirm in writing to Lessor that he has reviewed and thoroughly understands the applicable requirements as contained in each of the aforementioned Acts.

1.5 During mining, drilling or quarrying, Lessee shall comply with all of the current applicable rules and regulations of the foregoing Acts. Where any of the rules and regulations differ concerning abatement of pollution, the more stringent rule shall apply.

1.6 Lessee shall at all times perform its work in such a manner as to substantially minimize the possibility of polluting the air, land, or bodies of water with any materials harmful to the environment.

1.7 As development of the leased premises progresses and unforeseen circumstances arise that were not evident during the design, emergency pollution control programs may be put into effect immediately. In such cases, instructions will be issued by Lessor and will be carried out by Lessee.

1.8 The Air Pollution Control Act of the Commonwealth prohibits the burning of any refuse, rubbish, brush, etc. in the designated air basins of the State, except by approval of the Department of Environmental Resources' respective Regional Air Pollution Control Engineer. Other emissions into the atmosphere are not permitted if they are injurious or hazardous to people, animals or vegetation.

[1]When a lease is granted, it shall be understood that the terms "Lease" and "Lessee" shall apply; when a permit is granted, it shall be understood that the terms "permit" and "Permittee" shall apply.

1.9 Lessee shall strictly adhere to all rules and regulations for collection, removal, transportation, and disposal of solid wastes. Littering of the leased premises will not be permitted.

1.10 The discharge of wastes to streams within the Commonwealth will not be permitted unless such discharges meet the standards of the Department of Environmental Resources.

2. PROTECTION OF PROPERTY AND OPERATIONS

2.1 Lessee shall not use or allow to be used the State Forest lands for any other purpose than that authorized by this lease. District Forester2 will be advised when operations begin and end. Any changes in the original plans, which may be necessary subsequent to the beginning of operations, must be approved by District Forester and Lessor.

2.2 Permission to remove overburden must first be obtained from District Forester who will designate the extent of such removal.

2.3 Lessee shall carry out no actual mining, quarrying, excavating, drilling, or stripping operations within sight of publicly traveled roads, as indicated by District Forester.

3. PUBLIC LAND USE

3.1 Lessee hereby recognizes and admits that the leased premises are dedicated to the purposes set forth in Environmental, Health, Park, Fish and Game Laws, and Rules and Regulations and Department's Forest Resource Plans promulgated thereunder and Lessee agrees to conduct operations with deference to such purposes.

4. HUNTING AND FISHING

4.1 Employees of Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not engage in hunting or fishing upon said land, except as permitted by law, and shall not injure or destroy wildlife and fish.

5. ANIMALS

5.1 Lessee shall prevent access of animals to pits or excavations dug for Lessee's operations by erecting, maintaining fences, or by other means approved by Department.

6. SLUSH PIT

6.1 Each slush pit will consist of two compartments; one to contain fluids from the drilling operations and the second to contain surface runoff from the drilling site. Unless authorized by Department, all slush pits will be located at approximately the same elevation as the drilling site. Depending on the topography and slope conditions, the slush pit to contain surface runoff may be located below the drilling site and at a safe and reasonable distance from the stream in which the effluent will be discharged. The slush pit used to contain drilling fluids, mud, and water, will be lined with plastic so that no escape of these fluids will occur. If said fluids contain oil or other chemical substances which are harmful to the forest environment, Lessee shall transport these fluids from State Forest lands for disposal. All trash, rubbish, or waste materials from each drilling site will be stored in one area and may be disposed of in the slush pit prior to restoration. All pits shall be filled with earth and leveled at Lessee's expense upon completion of each well. However, nothing in this paragraph shall be construed to permit a violation of any laws, rules and regulations of the Commonwealth.

[2]When this lease is granted in whole or in part on State Park land, then the words "District Forester" shall be understood to mean "Park Superintendent," whenever the words appear in the lease and State Park lands are involved.

6.2 Before any operations commence, the location, design, construction, and maintenance of any slush pit must be approved by Lessor. Pollution potential and aesthetics shall be among the factors to be considered by Lessor.

6.3 If drilling operations are conducted by air, gas, or airfoam, Lessee shall also provide sufficient means by which dust and/or foam dispersal are abated, kept to a minimum, and shall not become a nuisance.

7. SILTATION

7.1 Lessee realizes that as a result of its operation large areas of land which will be cleared to provide for compressor stations, pipeline rights of way, and drilling sites, and which will be exposed to the forces of erosion for varying periods of time, could create siltation to nearby streams. Lessee agrees, therefore, to regrade such areas immediately and reseed to either temporary or permanent grasses. Any other type of remedial work necessary to prevent erosion on such areas shall be performed by Lessee.

7.2 Lessee shall upon initial construction of all drilling sites restore all highwalls and reseed said highwalls and downslope embankment of each drilling site immediately. Department's representative shall be consulted for final design and approval of each drilling site prior to final restoration.

7.3 Lessee's contractors and subcontractors shall not construct earthen dams across any stream to obtain a water supply for its operations unless approved by Lessor.

7.4 Lessee shall on pipeline rights of way and access roads construct water bars or similar diversion channels to carry surface runoff away from the rights of way and roads to prevent siltation. During construction if excess siltation is expected, Lessee shall construct a settling basin at the base of the right of way or road to impound runoff and allow sediments to settle prior to discharge into nearby streams.

7.5 Lessee shall construct all access roads to all drilling sites along existing pipeline rights of way which are built to service the drilling site provided that a ten percent (10%) grade can be maintained. All road locations and grades must be approved by District Forester as provided hereunder. All roads will be maintained in a passable condition.

8. WATERS

8.1 Without prior approval of Department, Lessee shall not locate any bore or core hole or any part of rig or slush pit within one hundred (100) feet of any stream or body of water on State Forest lands, and hereby agrees to prevent the contamination or pollution of springs, brooks, streams, or other waters on these lands in any manner whatsoever, by such means and measures as may be lawfully required by the Environmental Quality Board of the Commonwealth of Pennsylvania or its successors in function. Lessee shall be familiar with and abide by all rules and regulations of the Environmental Quality Board and shall promptly, when ordered by the Environmental Quality Board, comply with any specific rulings concerning its operations.

8.2 Where construction, operation, or maintenance of any of the facilities on or connected with this lease causes damage to the watershed or pollution of the water resources, Lessee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by an authorized representative of Department and to pay for any and all damage or destruction of property, fish, and wildlife resulting from operations under this lease.

8.3 The cost of said property, wildlife, or fish destroyed shall be determined by Department, Pennsylvania Game Commission, or Pennsylvania Fish Commission using recognized procedures to establish the value of damage.

8.4 Upon termination of drilling or producing operations, Lessee shall obtain a certificate from Department certifying that it has complied with all requirements of law and that it has taken all necessary measures to prevent any future contamination or pollution of waters as a result of its operations. Lessee shall continue to be liable for any such damages up to one (1) year after the cessation of operations under the provisions of this lease.

9. FOREST GROWTH

9.1 Lessee shall not cut, injure, destroy, or remove any forest growth, except that which shall be absolutely unavoidable in conducting operations and shall obtain prior approval of District Forester thirty (30) days before removal is to be commenced. The full thirty (30) days prior notice may be reduced upon the discretion of District Forester.

9.2 Lessee at option of Department shall chip all tree tops, limbs, brush, slash and any timber not to be sold or utilized by Department or Lessee which have resulted from clearing operations from strp mine sites, well sites, access roads, pipeline rights of way, and other construction sites.

9.3 Lessee at the option of Department shall bury or dispose of all tree stumps and large rocks resulting from its clearing and construction operations using a plant approved by District Forester.

9.4 Lessee shall pay for all timber damages in place in accordance with the regulations of Department. Such regulations shall be obtained from District Forester and Lessee shall further be required to dispose of said timber off the area to be cleared.

9.5 Lessee shall upon completion of its operations and at its own expense secure and plant with grasses and/or trees or shrub seedlings and/or game foods all strip mine sites, well sites, access roads, pipeline rights of way and other cleared areas using a plan appproved by District Forester.

9.6 Lessee shall make full compensation to Department to be three (3) times the value of such material cut, injured, destroyed, or removed to be computed by Department should additional damage to the Commonwealth result at any time from the work incident to this lease or the construction, operation, maintenance, or removal of facilities not herein contemplated or specifically mentioned, but which may occur as a result of said work or facilities.

10. FIRE

10.1 Lessee's employees, agents, contractors, and subcontractors, and employees of contractors and subcontractors shall do everything within their power to prevent or suppress forest fires and shall not allow fires to be set on or adjacent to State Forest lands by Lessee, his agents, contractors and subcontractors, and employees of contractors and subcontractors, except in pursuance and in accordance with the conditions prescribed in the permission first obtained from District Forester fixing the time, place, and manner of burning. The burning of refuse, brush, slash, debris, or other materials, upon approval of District Forester, shall be so conducted that no living forest growth is damaged or killed.

10.2 Should any fire set by Lessee or any of the persons mentioned above escape in any manner or damage any State Forest land or other property, Lessee shall be liable for all such damages resulting from such escape and for all costs incurred by Department in fighting such fires; and Lessee's officers, agents, and employees in the vicinity, as well as contractors and subcontractors, shall with such assistance as Lessee may have at hand, or be able to summon, render aid in fighting said fire without cost to the Commonwealth.

10.3 Lessee further agrees that during periods of abnormal forest fire danger, District Forester may suspend all or part of the drilling, or other operations on all or part of the State Forest lands until the forest fire danger subsides.

10.4 Lessee, or its employees, shall report promptly all forest fires detected by them to District Forester.

11. REPLACEMENT AND REPAIR OF IMPROVEMENTS

11.1 Lessee shall replace or repair, as Department may direct, all State Forest signs, markers, corners, fences, other structures, and service utility lines, owned or used by Department which cross or otherwise lie within the State Forest lands destroyed or damaged in any work incident to this lease.

12. ROADS, QUARRY AND DRILLING SITES

12.1 Lessee shall not construct any roads, clear any quarry or drilling sites, or excavate any trenches without prior written approval from District Forester, who shall set forth the type and grade of roads, trenches, and area to be cleared. The access roads shall be held to a maximum grade of ten percent (10%). However, if steeper grades are necessary, written approval must be obtained from District Forester prior to their construction. Any roads built at the expense of Lessee in its operations shall not be removed or destroyed and shall become a part of the road system of the State Forest lands.

12.2 Lessee recognizes that all roads and trails owned or maintained by Department, which are used in the execution of this lease, were constructed and improved for the use of Department and for the general public having business in and making use of State Forest land. Lessee, therefore, agrees that its operations will never be conducted in such a manner as to prevent, hinder, or obstruct the customary use of such roads and trails by Department or by the public.

12.3 Where roads built by Lessee cross any fence, Lessee shall construct a gate and keep it closed except when the passageway is in use. Lessee shall keep all said roads and trails free at all times from obstruction by logs, brush, or debris resulting from Lessee's operation. District Forester may require Lessee to temporarily discontinue the use of said roads whenever in his opinion such action is necessary to prevent their serious damage.

12.4 Upon termination of this lease, Lessee shall repair said roads and trails and leave them in as good condition as at the beginning of this lease of which condition Department shall be the sole judge. In addition, Lessee shall make any repairs to said roads and trails deemed necessary by District Forester to insure adequate and proper drainage, road surface conditions, horizontal alinement, and cross slope.

12.5 It is understood that the bond required, under the terms of this lease, shall cover the use and repair of said roads.

12.6 Lessee also agrees to obtain prior written approval from Department for the use of all State Forest roads off the leased premises used in its operations and to repair damage to all State Forest roads within or bordering on the leased premises and when such damage is caused by Lessee's operations; provided, however, if in the opinion of District Forester in charge, the roads or portions thereof are used by others sufficiently to warrant the apportionment of the maintenance costs, then Lessee may be relieved of the burden of sole maintenance and be required to provide only Lessee's proportionate share as decided by Department through District Forester.

12.7 Lessee recognizes the rights and privileges afforded to Grantees by rights of way and other agreements executed with Department, prior to this lease, which cross or otherwise lie within the area of this lease; and therefore, agrees to relocate at Lessee's own expense all portions adversely affected by work incident to this lease in accordance with the then current rules and orders of the Public Utility Commission of the Commonwealth of Pennsylvania. In the event, the Public Utility Commission does not have any jurisdiction, any necessary relocation shall be completed subject to the approval of Grantor.

13. BUILDINGS

13.1 Lessee shall not drill any bore or core hole, carry on operations, make excavations, or otherwise disturb the surface of the lands within two hundred (200) feet of any building. However, if a lesser distance to any building is needed, written approval must be obtained from District Forester, or from the owner of the building if not the property of the Commonwealth.

13.2 Lessee shall consult with District Forester and obtain written approval prior to the construction and erection of any storage facilities, buildings, work sheds or any other physical structure upon State Forest lands outside of the leased premises.

14. APPEARANCE

14.1 In its appearances hereunder, Lessee shall at all times maintain State Forest lands in a neat and presentable manner, removing all rubbish and debris as it accumulates and restoring each individual area within thirty (30) days to as near as possible its original condition when its use is abandoned.

15. EXPLOSIVES

15.1 Lessee shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during periods of fire danger unless permission is granted by District Forester.

15.2 Explosives shall not be used in fish spawning or rearing areas, nesting areas of wildlife concentration, during periods of intense activity or at any other time or in any manner that might damage any wildlife resource.

16. RESTORATION AND REVEGETATION

16.1 Restoration and revegetation shall be accomplished in accordance with Lessee's approved reclamation plan under the Surface Mining Conservation and Reclamation Act. However, should Lessee not qualify for licensing under this Act, as amended, then Lessee shall comply with Sections 16.2, 16.3 and 16.4 of this lease which provides for restoration and revegetation of all areas disturbed by Lessee.

16.2 Upon completion of drilling, mining, quarrying, excavating, stripping, or any other operation, the surface of the site shall be backfilled to as near as possible to the original contour of the surface. Where necessary, the top of the highwall shall be graded into the drill, mine, quarry, excavation, strip, or any other site area, so that all safety hazards to both human and wildlife have been eliminated and the highwall restored to a safe and reasonable grade. Department shall be the sole judge as to what is safe and reasonable. If terraces or benches are present upon completion of operations or if restoration of the drill site, mine site, quarry site, excavation site, strip site, or any other site, is enhanced by such terraces or benches, the terraces or benches upon approval of Department may be cut into the highwall or left standing. The backfill material from the drilling, mining, quarrying, excavating, stripping, or any other operation, shall be graded to form a gradual slope away from the highwall and all peaks and ridges shall be leveled so that water shall not accumulate in pools over the restored area.

16.3 Upon completion of drilling, mining, quarrying, excavating, stripping, and backfilling of an area or any portion thereof and after backfilling has settled so as to provide an acceptable planting site, Lessee shall revegetate all disturbed or cleared areas. Such revegetation is to be done according to a planting plan prepared by Department. Lessee guarantees an establishment of not less than an average of five hundred (500) live and growing trees per acre one (1) year after date of planting. If area is planted in grasses, or shrubs, or trees and grasses, Lessee shall guarantee an establishment of sixty-five percent (65%) survival of said grasses or shrubs one (1) year after date of planting. If such growth has not resulted, Lessee shall replant such areas unless in the opinion of Department the lack of a satisfactory growth was due to soil conditions or other causes beyond the control of Lessee. Department shall be the sole judge in determining if replanting is required and shall notify Lessee in writing of areas to be revegetated. This provision may be waived by Department upon the recommendation of District Forester.

16.4 Restoration and revegetation plans of Lessee must be approved in advance of any operations by Department or its representatives. Department shall have the sole right to determine the time of backfilling and revegetation.

17. WATER WELLS

17.1 Any plan by Lessee for the drilling of water wells on State lands, and use of any water found, must be approved in writing by Department.

17.2 A final plat will be submitted within thirty (30) days after completion of each water well showing exact location, elevation, depth of well, formations penetrated and depth, type of shows, and volume of water or hydrocarbons present.

17.3 Lessee further agrees to supply Department with any other records, memoranda, accounts, reports, cuttings, cores, or other information relative to the drilling, completion, or operation of water wells on the above described premises. This will include true copies of any electrical or radioactivity surveys made in the wells.

17.4 Lessee shall be familiar with and comply in every respect with the provisions now existing or hereafter enacted of the Water Well Drillers License Act 610 of May 29, 1956 (P.L. 1840), providing for the orderly development of the ground water resources of the Commonwealth of Pennsylvania.

18. PIPELINES

18.1 Lessee shall refill to contour all ditches or other excavations caused by the construction, operation, maintenance or removal of pipelines; construct cross ditches; lime, fertilize and seed or replant the right of way; keep the pipeline and right of way in good repair and appearance, and take such other measures as may be deemed necessary by Department to control erosion and sedimentation and to maintain or restore the natural and aesthetic values as directed by Department.

19. CONTACT WITH STATE AGENCIES

19.1 Lessee shall periodically contact the following State agencies or their successors to keep informed on up-to-date information, policies, rules and regulations applicable to this lease.

Department of Environmental Resources	Brief Statement of Agency's Jurisdiction
Bureau of Forestry, Minerals Section P. O. Box 1467 Harrisburg, Pennsylvania 17120	Leasing programs, terms, policies and geophysical regulations for State owned land and waters
District Forester Forest District (where applicable) Park Superintendent State Parks (where applicable)	Restoration and replanting of leased premises, timber damages, location of well-sites, rights of way, roads, etc.
Secretary Environmental Quality Board P. O. Box 2063 Harrisburg, Pennsylvania 17120	Water encroachment regulations; disposal of water polluting materials and industrial wastes; well spacing orders and unitization
Bureau of Air Quality & Noise Control 18 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Blowing gas wells and air drilling, burning of waste materials, trash, etc.
Bureau of Soil & Water Conservation Regional Office (where applicable) or P. O. Box 1467 Harrisburg, Pennsylvania 17120	Soil Erosion & Sedimentation Control Plan
Bureau of Water Quality Management Division of Non-Point and Industrial Sources 12 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Slush pits, siltation, pollution, etc. Disposal of produced water
Bureau of Water Quality Management Water Emergency Response Team 12 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Notification of fires, breaks, leaks, spills or blowouts
Bureau of Dam Safety, Obstructions & Storm Water Management Division of Obstructions and Flood Plain Management 407 South Cameron Street Harrisburg, Pennsylvania 17120	Locating structures or pipelines in streams, rivers and lakes. Crossing streams -impoundment of stream for water supply
Bureau of Topographic & Geologic Survey Division of Oil & Gas Regulation 100 Forbes Avenue Pittsburgh, Pennsylvania 15222	Oil and gas regulations and enforcement (drilling permits, plugging, etc.)
Bureau of Surface Mine Reclamation 7 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Regulations and enforcement (when drilling in coal areas)
Bureau of Occuptional Health Division of Quarries & Explosives 6 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Blasting, seismic surveys, etc.
Pennsylvania Fish Commission	
Executive Director P. O. Box 1673 Harrisburg, Pennsylvania 17120	Regulations for the protection of fish life
Pennsylvania Game Commission	
Executive Director P. O. Box 1567 Harrisburg, Pennsylvania 17120	Regulations for the protection of wildlife

M-O&G (6-77)
Oil and Gas Lease

Commonwealth of Pennsylvania
Department of Environmental Resources
Minerals Section, Bureau of Forestry
P. O. Box 1467
Harrisburg, Pennsylvania 17120

CONTRACT NO.
M-110284-10

OIL AND GAS LEASE FOR STATE FOREST AND PARK LANDS*

THIS AGREEMENT made and entered into on this 24th day of December, 1979, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF ENVIRONMENTAL RESOURCES, hereinafter designated "Department" and TEXACO INC. with its principal place of business at P. O. Box 2420, Tulsa, Oklahoma 74102 and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH: THAT,

WHEREAS, Department is authorized by the Act 275 of December 3, 1970, P.L. 834, 71 P.S., Sections 1902A and 1906A, as amended to lease State Forest and Park lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the opening of the bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

NOW THEREFORE, in consideration of the sum of EIGHTY-TWO THOUSAND AND NINETY-TWO DOLLARS ($82,092.00), paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas, and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, TRACT NO. 284 containing 2,059 acres, more particularly described on the Oil and Gas Lease Attachment identified as Exhibit "A" and as shown on the Map identified as Exhibit "C" which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as Exhibit "C" are approximate.

*When this lease is granted in whole or in part on State Park land, then the words "State Forest land" shall be understood to mean State Park land in their encirety or in part whichever shall apply, wherever the words appear in the lease; and the words, "District Forester," shall be understood to mean "Park Superintendent."

28141-A

Tr 284

1. TERM OR PERIOD

1.1 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth and shall continue from year to year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder, or engaged in the abandonment, or plugging of wells or removal of equipment therefrom.

2. RENTAL

2.1 Lessee shall pay to Department a rental for the above described leased premises at the rate of ONE DOLLAR ($1.00) per year for each acre of this lease retained by Lessee. The first rental will be paid on or before one (1) year after the delivery of this lease to Lessee and each successive rental, thereafter, upon each successive anniversary of the date of this lease.

2.2 The drilling of each well in the leased premises as provided in Section 9 shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 10, which reduction shall become effective on the next rental date, provided the well is a producer. If such wells are drilled on a unit created by a spacing order issued by Department or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3. OIL ROYALTY

3.1 Lessee shall pay to Department, as royalty, ONE-EIGHTH (1/8th) of the field price per barrel (42 U.S. Gallons) at 60° F produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks.

3.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises.

3.3 If oil, gas, condensate, and other liquid hydrocarbons each in paying quantities should be developed from the same well, then the oil and the gas, condensate, and other hydrocarbons shall be saved.

3.4 Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with standard practices as outlined in American Petroleum Institute Standard 2500, January 1, 1955, or as subsequently amended by the same authority, and at a temperature base of 60° F. Lessee shall provide tanks for accurately measuring the crude oil produced from the lease. Positive copies of one hundred percent (100%) capacity tank tables are to be furnished to Department or other acceptable standards of measuring production.

4. GAS ROYALTY

4.1 Lessee shall pay to Department, as royalty, TWENTY-NINE CENTS ($0.29) per thousand cubic feet (Mcf) or ONE-EIGHTH (1/8th) of the market value, whichever is higher, for all natural gas, casinghead gas, or other gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; said royalties shall be payable monthly at the prevailing market value for natural gas in the area at the time of delivery.

4.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all gas and other gaseous substances produced and saved from the leased premises.

5. GAS MEASUREMENT

5.1 The volume of gas produced, saved, and marketed shall be measured according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

a. The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

b. The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, irrespective of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

c. The temperature of the gas passing the meters shall be determined: (1) by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes; (2) if a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of fifty degrees Fahrenheit (50° F) shall be used in computing gas volume.

d. The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, at intervals of three (3) months, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

e. The deviation of the natural gas from Boyle's Law shall be determined by tests at intervals of three (3) months or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with the recommendations of the National Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

6. STATEMENT

6.1 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

7. PAYMENTS

7.1 Lessee shall be held responsible for the payment of all royalties, which shall be mailed to the office of Department at Harrisburg, Pennsylvania, and made payable to Department. Payments of royalties shall be made not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

8. OPERATIONS

8.1 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up to date oil and gas field practices.

9. FIRST WELL

9.1 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well on the leased premises or on unitized acreage containing a portion of the leased premises, but the well need not necessarily be on the portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, the lease shall be automatically terminated in its entirety, unless Department approves in writing, thirty (30) days in advance of the anniversary date of this lease, the continuation of the lease on a year to year basis.

10. SUBSEQUENT WELLS

10.1 If the "FIRST WELL" drilled by Lessee or any subsequent well is productive of oil and/or gas and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises, but not necessarily on the portion contained within the unit, as would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If an additional well is necessary, it must be commenced within six (6) months after the completion of the last well drilled; provided, however, that if Lessee concludes an additional well is not justified then Lessee shall submit to Department the information upon which the conclusion is based. Upon review of such information if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within six (6) months from Department's determination or releasing all of the acreage covered by the lease except forty (40) acres around each well from which oil is produced as the principal product and six hundred (600) acres around each well from which gas is being produced as the principal product.

10.2 Lessee shall not be required under this provision to drill more wells than required or allowed under any spacing order, rule, or regulation of Department, or in the absence of any such order, more than one well for each forty (40) acres where oil is being produced as the principal product of such well, or more than six hundred (600) acres where gas is being produced as the principal product of such well.

10.3 The amount of acreage included in a spacing unit by Department, or in the absence of an order by such Board, forty (40) acres where oil is being produced as the principal product of such well, or six hundred (600) acres where gas is being produced as the principal product of such well, shall be referred to elsewhere in the lease as "acreage attributable to a well."

11. DEVELOPMENT

11.1 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

11.2 Well spacing shall not be closer than one (1) well per twenty (20) acres; should closer spacing be required, written approval must be obtained from Department.

12. OFFSETS

2640

12.1 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth that is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, and any well drilled on leases not owned by the Commonwealth that is completed within two thousand five hundred and sixty (2,560) feet of the boundary line of the leased premises and from which gas is being produced as the principal product; or any well drilled on leases not owned by the Commonwealth that is completed within the radius of the drainage areas set by an order of Department; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may at its discretion relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well based on the ratio the affected acreage bears to the total acreage drained by the well, or release all of the acreage of the leased premises except forty (40) acres around each well from which oil is being produced as the principal product and six hundred (600) acres around each well from which gas is being produced as the principal product, or that drainage attributable to a well by an order of Department if the affected acreage falls within an area subject to such a spacing order.

12.2 No well on the leased premises shall be shut in if drainage will occur through offsetting wells within the aforeprescribed distances for oil and gas wells on leases not owned by the Commonwealth and if such offsetting gas wells are on compression, the offset wells on the leased premises shall be placed on compression.

12.3 Lessee agrees that any well along the boundary line, contingent to other lands where minerals, oil and/or gas are owned by the Commonwealth, shall be located at least six hundred and sixty (660) feet from such boundary if oil is the principal product anticipated from the objective formation of the well or at least two thousand five hundred and sixty (2,560) feet from such boundary if gas is the principal product anticipated from the objective formation of the well, or that distance from such boundary line which will be the radius of the drainage area set forth by an order of Department, if the area is subject to such a spacing order.

12.4 Upon application by Lessee, this provision providing for the distance from such boundary line may be waived by Department when deemed in the interest of the Commonwealth and not in an area subject to a spacing order of Department.

13. UNITIZATION

13.1 Lessee shall have the right at any time or times to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering, with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises or portions thereof with adjoining lands to prevent the drilling of an excessive number of wells or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

13.2 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of any such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises.

13.3 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

14. LESSEE'S USE

14.1 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

14.2 Lessee, his agents, contractors and subcontractors and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit to District Forester for his approval a map showing the location of each and every line to be shot. The bond, hereinafter described, shall be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

15. PIPELINES

15.1 Lessee is herewith granted the right to lay any necessary pipelines on or under the leased premises; however, a route map for each line shall be submitted to District Forester for his approval as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to him, Lessee must enter into the customary pipeline right of way agreement with Department.

16. DRILLING

16.1 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before the drilling thereof is commenced, and no well shall be commenced until a permit has been issued where necessary by Department's Oil and Gas Division.

16.2 Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

16.3 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth.

16.4 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

16.5 Lessee shall maintain at all times the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells or wells being serviced by a rig shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall at all times be available for efficient operations. Blowout control equipment must be capable in case of an emergency to shut in the well at a point at least fifty (50) feet from the wellhead.

16.6 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is the highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head or leaking oil or gas between the producing string and next larger size casing string when such pressures or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

16.7 While a well is being drilled with mud or water as a drilling fluid, Lessee shall test control equipment daily to the extent possible without causing premature removal of drill pipe from the hole while drilling and record the results of such tests daily. While a well is drilling with air or gas as a drilling fluid, Lessee may test control equipment only during trips for the drilling bit.

16.8 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

16.9 Drilling mud of sufficient weight to prevent oil, gas or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

16.10 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

16.11 Lessee shall use a casing program which complies with oil and gas statutes and rules and regulations of the Commonwealth and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies and blowouts.

16.12 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

16.13 The production casing shall be of new or reconditioned seamless pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(i) The maximum anticipated rock pressure at any point in the casing string shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield as shown in A.P.I. Bulletin 5-C-2 dated April, 1972 or later amendments.

(ii) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated at any point in the casing does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield as shown in A.P.I. Bulletin 5-C-2 or later amendments.

16.14 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After the corrective operation, the casing shall again be tested in the same manner.

16.15 All surface casing and production casing shall be cemented in the ground with good quality cement equalling or exceeding A.P.I. specification in the manner hereinafter described.

16.16 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department.

16.17 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In the event that the cement cannot be circulated to the surface due to the presence of fractures or other lost circulation zones, Lessee shall determine as accurately as possible the depth of the top of the cement in the annular space behind the casing and record it on the well record.

16.18 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another or to the surface does not occur behind the casing.

16.19 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval of Department.

16.20 Lessee, its agent, contractors and subcontractors, and employees of contractors and subcontractors shall not allow the well to blow open, except in case of an emergency over twenty-four (24) hours after drilling-in. Lessee will pay Department at the regular royalty rate for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

16.21 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Test Method (USBM-Monograph 7) or by other methods standard to the industry and approved by Department.

16.22 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

16.23 At least once every six (6) months, Lessee will determine the open flow potential of each producing well as required in Section 16.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive in writing all or parts of this requirement if during any calendar year production averages less than sixty (60) Mcf per day and/or the semiannual twenty-four (24) hour pressure tests show reservoir pressures to be less than one hundred (100) psi.

16.24 Lessee shall at all times conduct prudent drilling operations, including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

16.25 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

16.26 Lessee shall

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) after H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) use special steel pipe and casing which is resistant to H_2S stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) post warning signs around all wellsites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to and at a safe distance from all facilities handling the H_2S gas including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

(h) immediately notify Department and record on appropriate well records and driller's logs any H_2S gas found in the course of drilling or producing operations.

17. REPAIR OF EQUIPMENT

17.1 Lessee does hereby agree that it will, at all times, during the continuance and delivery of oil, gas, and liquid hydrocarbons, to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

18. WELL RECORDS, LOGS AND REPORTS

18.1 Lessee shall keep a daily drilling record which will describe the formations penetrated, depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. Any other data that is usually acquired in the normal procedure of drilling shall be recorded and furnished to Department, such as drilling time, rate of fill-up, lost circulation zones, caving strata, casing records, core analyses, mud log analyses, perforation, and production test data. Within thirty (30) days after completion of each well, Lessee shall furnish Department an accurate location plat, a detailed lithologic log, a detailed history of the well and all well data including geologic, driller, electrical, and any other well surveys made to obtain subsurface information. Upon request, samples of all formations penetrated and parts of cores taken, accurately labeled with the name of the well, and interval of depth shall be furnished to Department at Lessee's expense. If requested, Lessee shall ship a complete set of samples to the Pennsylvania State Geological Survey, Room 1201, Kossman Building, 100 Forbes Avenue, Pittsburgh, Pennsylvania 15222, within thirty (30) days after completion of each well.

19. AUDITS

19.1 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the lease. Department may keep such charts for examination for a period not to exceed ninety (90) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, and other products produced from the leased premises.

19.2 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, and liquid hydrocarbons, produced from any well covered by this lease, to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payments to Lessee, his heirs, administrators, executors, successors, and assigns for oil, gas, and liquid hydrocarbons from wells covered by this lease.

19.3 Lessee further grants to Department the right at any time to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from cancelling this lease upon delivery to Lessee of written notice of Department's intention.

20. LESSEE'S TERMINATION

20.1 Lessee may at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

20.2 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 10. Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

21. REMOVAL

21.1 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to remove all buildings, machinery, wells, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations, to fill and level all pits, and to the extent practicable, to restore the property to the same condition as when received.

22. RELEASE

22.1 Lessee shall not be granted a final release from the terms of this lease until District Forester has met with Lessee's field engineer on the ground, inspected the premises, and received a signed statement of release from Department indicating the proper policing has been completed.

23. PLUGGING

23.1 Lessee shall properly and effectively plug all wells on the leased premises before abandoning in accordance with the regulations of the Department's Oil and Gas Division and all applicable laws of the Commonwealth. A copy of the plugging procedure approved by the Oil and Gas Division shall be supplied to the Minerals Section, Bureau of Forestry. In addition to the above mentioned requirement upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements will be reason for cancellation of this lease and the posted bond will be forfeited in order that Department may properly plug the wells.

23.2 The plugging procedures, as herein stated, shall also include all shallow wells drilled in areas which are not coal productive and are not covered by the regulations of Department (Certificate of Plugging form may be obtained from Department's Oil and Gas Division).

24. ABANDONMENT AND STORAGE RIGHTS

24.1 In the event the development of this lease demonstrates, in the opinion of Department, that this tract has potential value as a gas storage reservoir (no storage rights are demised to Lessee under the terms of this lease), the well, equipment, property, and casing involved shall first be offered to Department, its nominee or assignee, at the then fair market value of those items before any well shall be plugged. Such firm offer shall be made in writing to Department at least thirty (30) days prior to commencement of removal of the equipment from the well by Lessee.

25. DEPARTMENTAL TERMINATION

25.1 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) days after demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

25.2 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a writ of Habre Facias Possessionem (without asking leave of court) waiving all stay and exemption laws and release of errors.

26. INDEMNITY

26.1 Lessee shall at all times hereinafter indemnify and save harmless Department from and against all detriment, damage, loss, claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

27. BOND

27.1 Lessee agrees to give Department a surety or performance bond with satisfactory corporate surety in the principal sum of TWENTY-FIVE THOUSAND DOLLARS ($25,000.00) with judgment clause in a form to be approved by the Attorney General conditioned on the faithful performance of the covenants of this lease. The bond shall be further conditioned that in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells upon termination of this lease, or within six (6) months from the termination, Commonwealth can execute upon the bond to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the bond shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises.

28. RELATED AGREEMENTS

28.1 Department will be furnished for record purposes and to protect its interests a copy of all agreements, contracts, letters or memoranda entered into, made, or sent by Lessee in any way concerning the development, operation, or sale of products from this lease.

29. ASSIGNMENTS

29.1 Lessee shall not use or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned and assignee, thereof, shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

30. LIMITATION ON WARRANTY

30.1 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the rents, rentals, and royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the proportion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may with the approval of the Attorney General enter into an escrow arrangement for future rents and royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the rents and royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The rents and royalties placed in escrow shall be refunded to Lessee in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

31. FORCE MAJEURE

31.1 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance, therewith, is prevented by or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If at the end of the primary term, hereof, such term has not been extended by production or drilling as in this lease provided and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the rental provision, hereof, shall be extended automatically from year to year for a period not to exceed ten (10) additional years unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises by reason of any of the above recited causes, this lease shall remain in full force and effect.

32. THIRD PARTIES' RIGHTS

32.1 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) have hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature.

33. PUBLICATION AND NOTICE

33.1 Within thirty (30) days following the receipt by Lessee of a copy of this lease, fully executed, Lessee shall record the lease in the county or counties in which the leased premises lie. Within thirty (30) days following the recording, Lessee shall advise Department in writing of the recording reference data. Thereafter, Department shall cause to be published in the Pennsylvania Bulletin at least the following information:

(1) the subject of this lease;
(2) the general location of the leased premises;
(3) the names of Department and Lessee; and
(4) the recording reference date for this lease.

34. LIABILITY

34.1 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, irrespective of whether or not such pollution or damage be due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause be found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises the pollution or other damage would not have occurred, it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

35. RIGHTS RESERVED BY DEPARTMENT

35.1 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

35.2 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

35.3 Department reserves the right to approve in writing all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises, unless upon due cause shown, Department waives the thirty (30) day requirement and allows a lesser, but reasonable, time for review.

35.4 The surface rights of Department shall be considered dominant and the mineral rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

36. PROTECTION AND CONSERVATION

36.1 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as Exhibit "B" attached hereto and made a part hereof.

36.2 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

CLIFFORD L. JONES, Secretary

ATTEST:

TEXACO INC.

APPROVED
Form
Terms

BY:

LESSEE

Attorney-in-Fact

APPROVED AS TO LEGALITY
AND FORM:

ASSISTANT ATTORNEY GENERAL

APPROVED:

GOVERNOR

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DAUPHIN

On this the 24th day of Decemba, 1979, before me LUCY M. CUNKO, the undersigned officer, personally appeared CLIFFORD L. JONES, who acknowledged himself to be Secretary of Environmental Resources of the Commonwealth of Pennsylvania and that he as such Secretary of Environmental Resources being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing his name as CLIFFORD L. JONES, Secretary.

In Witness Whereof, I hereunto set my hand and official seal.

Lucy M. Cunko, Notary Public
My Commission Expires May 2, 1983
Harrisburg, PA Dauphin County

Lucy M. Cunko
Notary Public

PENNSYLVANIA ACKNOWLEDGMENT

STATE OF OKLAHOMA

COUNTY OF TULSA

On this the 19th day of December, 1979, before me, the undersigned Notary Public, personally appeared PAUL B. HARRIS, known to me to be the person whose name is subscribed as attorney in fact for TEXACO INC., a corporation, and acknowledged that he as such attorney in fact, being authorized so to do, executed the foregoing instrument as the act of his principal for the purposes therein contained by signing the name of the corporation by himself as attorney in fact.

In witness whereof I hereunto set my hand and official seal.

M. K. Vann
Notary Public

My Commission Expires:

Nov. 17, 1983

M. K. VANN
MY COMMISSION EXPIRES
NOVEMBER 17, 1983

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That, TEXACO INC., a corporation organized and existing under the laws of the State of Delaware (formerly named The Texas Company), acting herein by and through L. W. CALAHAN, its duly authorized Vice President, has and does hereby appoint A. R. McDANIEL, PAUL B. HARRIS and J. A. SCHELL, jointly or severally, of Tulsa County, Oklahoma, its true and lawful Attorneys-in-Fact with power and authority for and on behalf and in the name of TEXACO INC., whether for TEXACO INC., acting alone or for TEXACO INC., acting jointly with other party or parties, to contract for and to purchase lands, and oil, gas, sulphur, or other mineral fees, and oil, gas, sulphur or other mineral royalty interests; to apply for, contract for, purchase and acquire directly or by assignment oil, gas, sulphur, and mineral leases, subleases, assignments, prospecting and other permits, licenses and other oil, gas, sulphur and mineral agreements upon any and all property of every nature and kind, whether privately or publicly owned and with such terms, agreements and stipulations as he may deem proper; to let or sublet any lands, leases, permits, licenses or other rights or privileges; to make, execute, acknowledge and deliver unit, pooling, cooperative, joint operating, or any other agreements with any other person or persons, whether natural or corporate, covering and binding lands, mineral fees or oil, gas, sulphur or other mineral leases belonging to TEXACO INC., and property of such other person or persons, upon such terms and conditions as said Attorneys-in-Fact shall deem proper or expedient, whether or not under any such agreement TEXACO INC. is designated as the Operator of the area subjected to any such agreement; to release and surrender, in whole or in part, any lease, assignment, sublease, prospecting or other permit or license in favor of, or any operating or other agreement with or by, TEXACO INC.; to make agreements whereby said TEXACO INC. recognizes pledges and assignments of rentals and royalties payable under leases or subleases held by it and agrees to make payment of such rentals or royalties to the pledgees or assignees in accordance with the pledges or assignments; to contract for the drilling and reworking of wells and all related activities; to contract for the hire and/or the operation of any and all vessels, boats, barges, and other floating equipment for use in the exploration for oil, gas, sulphur, or other minerals or for the production and handling thereof; to contract for the sale of oil and gas (including casinghead gas), sulphur, and other minerals, or products therefrom, owned by TEXACO INC.; to contract for the processing or treatment of natural gas from wells owned or operated by TEXACO INC., and to undertake or agree to treat or process natural gas from wells owned or operated by TEXACO INC. and to undertake or agree to treat or process natural gas from wells owned or operated by others; to agree to pay overriding or other royalties, carried interests, or other interests in production measured by the amount or value of oil, gas (including casinghead gas), sulphur or other minerals, produced by TEXACO INC. or others for its account; to sell, exchange or dispose of equipment, materials and supplies which in his opinion are no longer required for use in the business of TEXACO INC., to grant, acquire or release, in whole or in part, servitudes, easements, and rights of way; to execute any and all forms, papers, and documents, including oaths and affidavits thereon, required to document, register or list with the Bureau of Customs, Treasury Department, United States of America, and with any other Federal or State agency or subdivision any and all vessels, boats, barges and other floating equipment owned or operated by or for TEXACO INC.; to grant, bargain, sell, convey and assign any lands, property, leases, subleases, permits, licenses, mineral fees, royalty or other interest belonging to said TEXACO INC.; to receive, receipt for and collect such sums of money as may be due and payable to said TEXACO INC. by virtue of any transaction which he shall have had under and by virtue of these presents or due and

payable to said TEXACO INC. by virtue of similar transactions which other parties shall have had by virtue of other powers of attorney of said TEXACO INC.; to make, execute, acknowledge and deliver all instruments, contracts, agreements, documents, bonds, and affidavits of every nature and kind required in carrying out or incident to carrying out the purposes of this power of attorney, with such terms, covenants and stipulations as he may deed proper or expedient; hereby giving and granting to them the power and authority to do and perform any and all acts and things whatsoever necessary or proper to be done in carrying out the foregoing as fully to all intents and purposes as TEXACO INC. might or could do if acting directly through its executive officers; hereby ratifying and confirming all that they shall lawfully do by virtue hereof.

The authority herein granted to file offers to lease with respect to Public Domain and Acquired Lands under Group 3100 of Title 43, Code of Federal Regulations, is hereby specifically limited to filing such offers for the sole and exclusive benefit of TEXACO INC. and not in behalf of any other person in whole or in part (although, as aforesaid, said Attorneys-in-Fact are authorized to make such filings in the name of TEXACO INC., whether for TEXACO INC., acting alone, or for TEXACO INC., acting jointly with any other party or parties) and said Attorneys-in-Fact are hereby specifically authorized to execute all statements of interest and of holdings in behalf of TEXACO INC. and to execute all other statements required, or which may be required, by the Acts and the regulations relating to oil and gas leasing on the Public Domain and Acquired Lands, and TEXACO INC. agrees to be bound by such representations of said Attorneys-in-Fact and waives any and all defenses which may be available to TEXACO INC. to contest, negate or disaffirm the actions of said Attorneys-in-Fact under this power of attorney.

Effective as of the date below, this power of attorney supersedes all powers of attorney granted to said A. R. McDANIEL, PAUL B. HARRIS and J. A. SCHELL prior to said date and all of such prior powers of attorney are hereby revoked, annulled and set aside as of said date.

The said A. R. McDANIEL, PAUL B. HARRIS and J. A. SCHELL shall remain the true and lawful Attorneys-in-Fact of said TEXACO INC. as aforesaid from the date hereof until such time as this instrument has been revoked by proper instrument of revocation.

IN WITNESS WHEREOF, TEXACO INC., acting by L. W. CALAHAN, one of its Vice Presidents, and under its seal, has executed this instrument at Houston, Texas, on this 22nd day of August, 1978.

TEXACO INC.

ATTEST:

By L W Calahan
L. W. CALAHAN, Vice President

RUTH M. GWIN
Ruth M. Gwin
Assistant Secretary

(SEAL)

OK AS TO FORM
OK AS TO TERMS

STATE OF TEXAS :
: SS.
COUNTY OF HARRIS :

On this 22nd day of August, 1978, before me, the undersigned, a Notary Public in and for the county and state aforesaid, personally appeared L. W. CALAHAN, to me known to be the identical person who subscribed the name of the maker thereof to the foregoing instrument as its Vice President and acknowledged to me that he executed the same as his free and voluntary act and deed, and as the free and voluntary act and deed of such corporation for the uses and purposes therein set forth.

Given under my hand and seal of office the day and year last above written.

Billie Livingston
Notary Public

BILLIE LIVINGSTON

My Commission Expires:
November 30, 1978

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "A"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-110284-10, by and between: COMMONWEALTH OF PENNSYLVANIA and TEXACO, INC.

Tract 284

State Tract 284 containing 2,059 acres of Sproul State Forest land comprising all of the John Schlonecker, Solomon Bastress, and John Pfoutz Warrants and parts of the William Gallagher (#2), James Gamble, and Samuel Morrison Warrants in Grugan and Gallagher Townships, Clinton County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from J. W. Christman by deed dated June 22, 1908; from S. N. Williams Estate by deed dated October 19, 1928.

Beginning at the southeast corner of the John Pfoutz Warrant, also being the southwest corner of the John Hamilton Warrant, also being a point on the Sproul State Forest boundary; thence westward approximately 6,850 feet along the south lines of the John Pfoutz Warrant and the James Gamble Warrant to a point on the south line of the James Gamble Warrant, also being a point on the Sproul State Forest boundary; thence northward approximately 7,400 feet through the James Gamble and William Gallagher Warrants to a point within the William Gallagher Warrant, also being a point on the Sproul State Forest boundary; thence eastward approximately 7,000 feet along the State Forest boundary through the William Gallagher Warrant and along the south line of the James Wilson Warrant to the southeast corner of the James Wilson Warrant, also being the southwest corner of the Samuel Morrison Warrant; thence northward approximately 3,600 feet along the west line of the Samuel Morrison Warrant to a point on the west line of the Samuel Morrison Warrant, also being a point on the northern boundary of the Pennsylvania Electric Power line right of way; thence eastward approximately 4,000 feet along the northern boundary of the Pennsylvania Electric Power line right of way through the Samuel Morrison Warrant to a point within the Samuel Morrison Warrant; thence in a general southeasterly direction approximately 1,100 feet South, 900 feet East, 1,350 feet South and 650 feet East within the Samuel Morrison Warrant to a point on the east line of the Samuel Morrison Warrant, also being a point on the Sproul State Forest boundary; thence southward approximately 4,700 feet along the east lines of the Samuel Morrison Warrant and John Schlonecker Warrant to the southeast corner of the John Schlonecker Warrant; thence westward approximately 5,550 feet along the south line of the John Schlonecker Warrant to the southwest corner of the John Schlonecker Warrant, also being the northeast corner of the John Pfoutz Warrant, also being a point on the Sproul State Forest boundary; thence southward approximately 3,850 feet along the east boundary of the John Pfoutz Warrant to the southeast corner of the John Pfoutz Warrant, the place of the beginning.

Drilling and Development Restrictions

Lessee shall not construct any roads, clear any drilling sites, excavate any trenches, drill any wells or conduct any oil or gas field exploration activity whatsoever within 200 feet of the Hyner View Road, Richey Road or Hyner Mt. Snowmobile Trail.

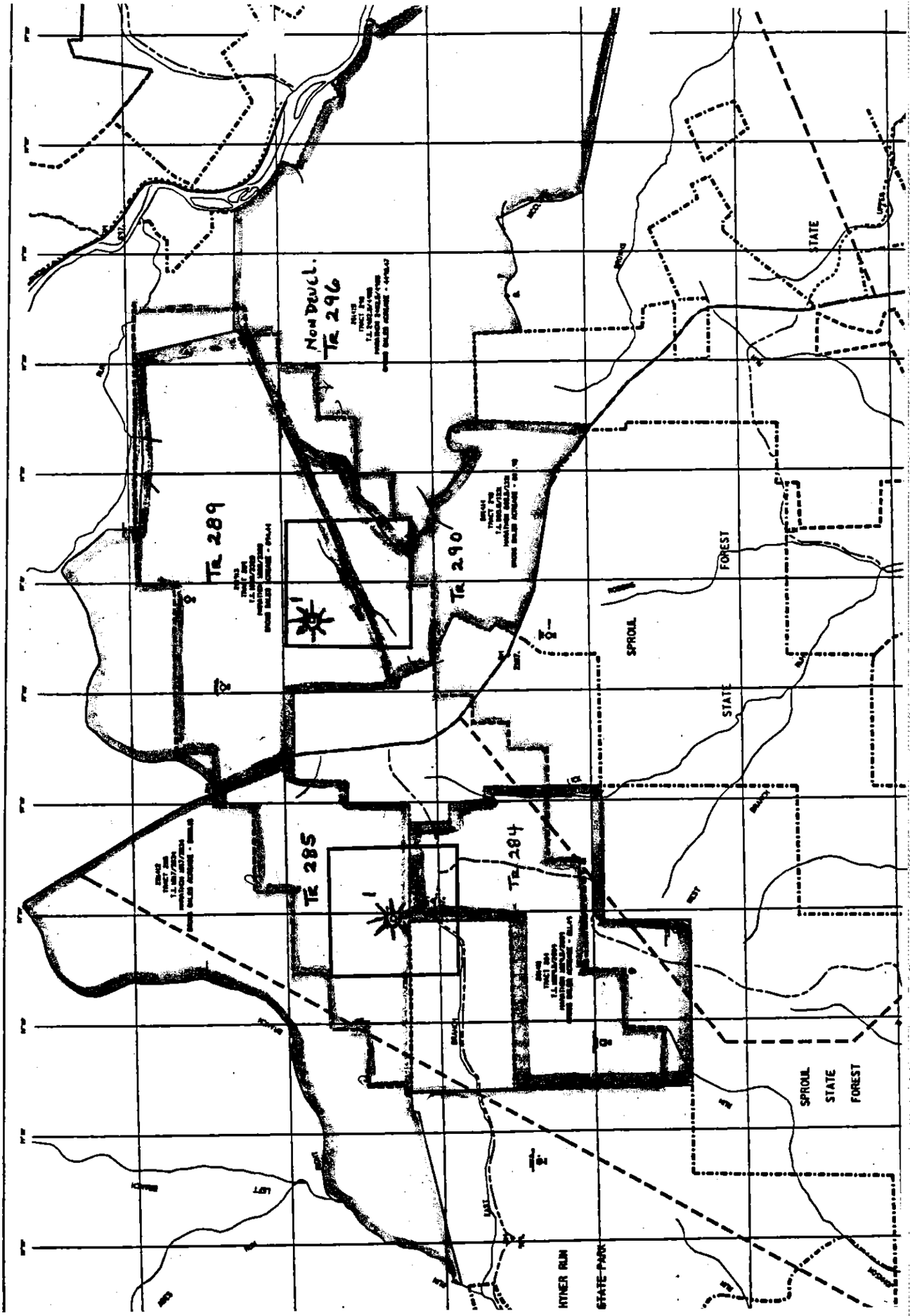


Exhibit D
Location Map

Legend

50% Leasehold Oil & Gas Assigned from TEPI To E. States 12-1-93

"In-Pool Acreage" Boundary

Lease Tract Outlines

Gas Well with Well #

Marathon Oil Co. owns all other leasehold oil and gas on these tracts

Showing Acreage Involved In Assignment of 50% Leasehold Oil and Gas From Texaco Exploration & Production Inc. To Eastern States Exploration Co.
Grugan Gas Field
Tracts 284, 285, 289, 290 & 296
Sproul & Tiadaghton State Forests
Clinton & Lycoming Counties, PA
Scale: 1" ≈ 5000' approx.

JTW July 6, 1994

M-O&G (10-7-80)
Oil and Gas Lease

Commonwealth of Pennsylvania
Department of Environmental Resources
Minerals Section, Bureau of Forestry
P. O. Box 1467
Harrisburg, Pennsylvania 17120

CONTRACT NO.
M-110324-9

OIL AND GAS LEASE FOR STATE FOREST AND PARK LANDS*

THIS AGREEMENT made and entered into on this 7th day of November, 1980, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF ENVIRONMENTAL RESOURCES, hereinafter designated "Department" and ADOBE OIL AND GAS Corporation, with it principal place of business at 1100 Western United Life Building, Midland, Texas 79701, and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee."

WITNESSETH: THAT,

WHEREAS, Department is authorized by the Act 275 of December 3, 1970, P.L. 834, 71 P.S., Sections 1902A and 1906A, as amended to lease State Forest and Park lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the opening of the bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

NOW THEREFORE, in consideration of the sum of TWO HUNDRED FIFTY-TWO THOUSAND, THREE HUNDRED SEVEN AND 55/100 DOLLARS ($252,307.55), paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas, and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, TRACT NO. 324 containing 4,565 acres, more particularly described on the Oil and Gas Lease Attachment identified as Exhibit "A" and as shown on the Map identified as Exhibit "C" which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as Exhibit "C" are approximate.

*When this lease is granted in whole or in part on State Park land, then the words "State Forest land" shall be understood to mean State Park land in their entirety or in part whichever shall apply, wherever the words appear in the lease; and the words, "District Forester," shall be understood to mean "Park Superintendent."

1. TERM OR PERIOD

1.1 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth and shall continue from year to year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder, or engaged in the abandonment, or plugging of wells or removal of equipment therefrom.

2. RENTAL

2.1 Lessee shall pay to Department a rental for the above described leased premises at the following rate: the first year's rental shall consist of the bonus payment which was competitively bid by Lessee and shall be payable upon delivery of this lease to Lessee; the second and third years' rental shall be TWO DOLLARS ($2.00) per acre each year payable upon the anniversary date of this lease; for the fourth and all subsequent years thereafter, the rental shall be THREE DOLLARS ($3.00) per acre each year payable upon the anniversary date of this lease.

2.2 The drilling of each well in the leased premises as provided in Section 9 shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 10, which reduction shall become effective on the next rental date, provided the well is a producer. If such wells are drilled on a unit created by a spacing order issued by Department or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

3. OIL ROYALTY

3.1 Lessee shall pay to Department, as royalty, ONE-EIGHTH (1/8th) of the field price per barrel (42 U.S. Gallons) at 60° F produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks.

3.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises.

3.3 If oil, gas, condensate, and other liquid hydrocarbons each in paying quantities should be developed from the same well, then the oil and the gas, condensate, and other hydrocarbons shall be saved.

3.4 Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with standard practices as outlined in American Petroleum Institute Standard 2500, January 1, 1955, or as subsequently amended by the same authority, and at a temperature base of 60° F. Lessee shall provide tanks for accurately measuring the crude oil produced from the lease. Positive copies of one hundred percent (100%) capacity tank tables are to be furnished to Department or other acceptable standards of measuring production.

4. GAS ROYALTY

4.1 Lessee shall pay to Department, as royalty, THIRTY CENTS ($0.30) per thousand cubic feet (Mcf) or ONE-EIGHTH (1/8th) of the market value, whichever is higher, for all natural gas, casinghead gas, or other gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; said royalties shall be payable monthly at the prevailing market value for natural gas in the area at the time of delivery.

4.2 Department may at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all gas and other gaseous substances produced and saved from the leased premises.

5. GAS MEASUREMENT

5.1 The volume of gas produced, saved, and marketed shall be measured according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

a. The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

b. The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, irrespective of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

c. The temperature of the gas passing the meters shall be determined: (1) by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes; (2) if a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of fifty degrees Fahrenheit (50° F) shall be used in computing gas volume.

d. The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, at intervals of three (3) months, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

e. The deviation of the natural gas from Boyle's Law shall be determined by tests at intervals of three (3) months or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with the recommendations of the National Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

6. PAYMENTS

6.1 Lessee shall be held responsible for the payment of all royalties, which shall be mailed to the office of Department at Harrisburg, Pennsylvania, and made payable to Department. Payments of royalties shall he made not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

6.2 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

7. OPERATIONS

7.1 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up to date oil and gas field practices.

7.2 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department's Bureau of Soil and Water Conservation. A copy of the plan shall be forwarded to the Minerals Section, Bureau of Forestry, P. O. Box 1467, Harrisburg, Pennsylvania 17120 and District Forester.

8. RESTRICTIONS

8.1 Under Department's multiple use policy, the leased premises are continuously used for recreation, conservation and other purposes and many Department authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions:

(a) No drilling is permitted within 200 feet of any building.

(b) No drilling is permitted within 100 feet of any stream or body of water.

(c) No drilling is permitted within 330 feet of any picnic area which has been so designated by Department.

(d) No drilling is permitted within 330 feet of any trail, road or existing right of way.

(e) No drilling is permitted within 100 feet of any area of historic value, tree plantation, overlook, vista or fire tower site.

(f) No drilling is permitted within 330 feet of any Wild Area or Natural Area as designated by Department.

(g) No drilling is permitted for oil within 660 feet of the boundary line of leased premises.

(h) No drilling is permitted for natural gas within 2,640 feet of the boundary line of leased premises.

(i) In addition, the following specific restrictions for this lease shall also apply:

_____
_____
_____
_____
_____
_____

8.2 Upon written request by Lessee, Department may waive in writing any portion of the above restrictions if in Department's judgement such a waiver is justified and in its best interests.

9. FIRST WELL

9.1 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well on the leased premises or on unitized acreage containing a portion of the leased premises, but the well need not necessarily be on the portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, the lease shall be automatically terminated in its entirety, unless Department approves in writing, thirty (30) days in advance of the anniversary date of this lease, the continuation of the lease on a year to year basis.

10. SUBSEQUENT WELLS

10.1 If the "FIRST WELL" drilled by Lessee or any subsequent well is productive of oil and/or gas and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises, but not necessarily on the portion of the leased premises contained within the unit, as would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If an additional well is necessary, it must be commenced within six (6) months after the completion of the last well drilled; provided, however, that if Lessee concludes an additional well is not justified then Lessee shall submit to Department the information upon which the conclusion is based. Upon review of such information if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within six (6) months from Department's determination or releasing all of the acreage covered by the lease except forty (40) acres around each well from which oil is produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product and has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres around each shallow well from which gas is being produced as the principal product which has been completed above the Onondaga Formation, or that amount of leased acreage actually contained within an established unit, whichever is less.

10.2 Lessee shall not be required under this provision to drill more wells than required or allowed under any spacing order, rule, or regulation of Department, or in the absence of any such order, more than one well for each forty (40) acres where oil is being produced as the principal product of such well, or more than six hundred forty (640) acres where gas is being produced as the principal product of such well and has been drilled to the Onondaga Formation or deeper, or more than three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which is productive from formations above the Onondaga Formation.

10.3 The amount of acreage included in a spacing unit by Department, or in the absence of an order by Department, forty (40) acres where oil is being produced as the principal product of such well, or six hundred forty (640) acres where gas is being produced as the principal product of such deep well which has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which has been drilled to formations above the Onondaga Formation, shall be referred to elsewhere in the lease as "acreage attributable to a well."

11. DEVELOPMENT

11.1 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

11.2 Well spacing shall not be closer than one (1) well per forty (40) acres; should closer spacing he required, written approval must be obtained from Department.

12. OFFSETS

12.1 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth that is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, and any well drilled on leases not owned by the Commonwealth that is completed within two thousand six hundred and forty (2,640) feet of the boundary line of the leased premises and from which gas is being produced as the principal product; or any well drilled on leases not owned by the Commonwealth that is completed within the radius of the drainage areas set by an order of Department; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may at its discretion relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except forty (40) acres around each well from which oil is being produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product, or that acreage attributable to a well by an order of Department if the affected acreage falls within an area subject to such a spacing order.

12.2 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on leases not owned by the Commonwealth and if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression.

12.3 Lessee agrees that any well along the boundary line, contiguous to other lands where minerals, oil and/or gas are owned by the Commonwealth, shall be located at least six hundred and sixty (660) feet from such boundary if oil is the principal product anticipated from the objective formation of the well or at least two thousand six hundred and forty (2,640) feet from such boundary if gas is the principal product anticipated from the objective formation of the well, or that distance from such boundary line which will be the radius of the drainage area set forth by an order of Department, if the area is subject to such a spacing order.

12.4 Upon application by Lessee, this provision providing for the distance from such boundary line may be waived by Department when deemed in the interest of the Commonwealth and not in an area subject to a spacing order of Department.

13. UNITIZATION

13.1 Lessee shall have the right at any time or times to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering, with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises or portions thereof with adjoining lands to prevent the drilling of an excessive number of wells or of wells located too close to the boundary of this lease; provided, however, that such agreement and termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

13.2 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of any such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises.

13.3 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

14. SEISMIC SURVEYS

14.1 Lessee, its agents, contractors and subcontractors and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit to District Forester for his approval a map showing the location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to him, Lessee must obtain the customary Seismic Survey Permit from Department. The bond, hereinafter described, shall be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

15. PIPELINES

15.1 Lessee is herewith granted the right to lay any necessary pipelines on or under the leased premises; however, a route map for each line shall be submitted to District Forester for his approval as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, it must enter into the customary pipeline right of way agreement with Department.

16. DRILLING

16.1 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before the drilling thereof is commenced, and no well shall be commenced until a permit has been issued where necessary by Department's Oil and Gas Regulation Division.

16.2 Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

16.3 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth.

16.4 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

16.5 Lessee shall maintain at all times the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells or wells being serviced by a rig shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall at all times be available for efficient operations. Blowout control equipment must be capable in case of an emergency to shut in the well at a point at least fifty (50) feet from the wellhead.

16.6 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is the highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head or leaking oil or gas between the producing string and next larger size casing string when such pressures or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

16.7 While a well is being drilled with mud or water as a drilling fluid, Lessee shall test control equipment daily to the extent possible without causing premature removal of drill pipe from the hole while drilling and record the results of such tests daily. While a well is drilling with air or gas as a drilling fluid, Lessee may test control equipment only during trips for the drilling bit.

16.8 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

16.9 Drilling mud of sufficient weight to prevent oil, gas or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

16.10 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

16.11 Lessee shall use a casing program which complies with oil and gas statutes and rules and regulations of the Commonwealth and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies and blowouts.

16.12 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

16.13 The production casing shall be of new or reconditioned seamless pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

(i) The maximum anticipated rock pressure at any point in the casing string shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield as shown in A.P.I. Bulletin 5-C-2 dated April, 1972 or later amendments.

(ii) If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated at any point in the casing does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield as shown in A.P.I. Bulletin 5-C-2 or later amendments.

16.14 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After the corrective operation, the casing shall again be tested in the same manner.

16.15 All surface casing and production casing shall be cemented in the ground with good quality cement equalling or exceeding A.P.I. specification in the manner hereinafter described.

16.16 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department.

16.17 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In the event that the cement cannot be circulated to the surface due to the presence of fractures or other lost circulation zones, Lessee shall determine as accurately as possible the depth of the top of the cement in the annular space behind the casing and record it on the well record.

16.18 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another or to the surface does not occur behind the casing.

16.19 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval of Department.

16.20 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not allow the well to blow open, except in case of an emergency over twenty-four (24) hours after drilling-in. Lessee will pay Department at the regular royalty rate for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

16.21 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Test Method (USBM-Monograph 7) or by other methods standard to the industry and approved by Department.

16.22 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

16.23 At least once every six (6) months, Lessee will determine the open flow potential of each producing well as required in Section 16.21 and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive in writing all or parts of this requirement if during any calendar year production averages less than sixty (60) Mcf per day and/or the semiannual twenty-four (24) hour pressure tests show reservoir pressures to be less than one hundred (100) psi.

16.24 Lessee shall at all times conduct prudent drilling operations, including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

16.25 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

16.26 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

16.27 Lessee shall

(a) install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas in concentrations exceeding 100 ppm is anticipated or used.

(b) make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

(c) after H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

(d) use special steel pipe and casing which is resistant to H_2S stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

(e) quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

(f) post warning signs around all wellsites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to and at a safe distance from all facilities handling the H_2S gas including warning markers on all pipelines which may be used to transmit the toxic gas.

(g) install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

(h) immediately notify Department and record on appropriate well records and driller's logs any H_2S gas found in the course of drilling or producing operations.

17. REPAIR OF EQUIPMENT

17.1 Lessee does hereby agree that it will, at all times, during the continuance and delivery of oil, gas, and liquid hydrocarbons, to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

18. WELL RECORDS, LOGS AND REPORTS

18.1 Lessee shall keep a daily drilling record which will describe the formations penetrated, depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. Any other data that is usually acquired in the normal procedure of drilling shall be recorded and furnished to Department, such as drilling time, rate of fill-up, lost circulation zones, caving strata, casing records, core analyses, mud log analyses, perforation, and production test data. Within thirty (30) days after completion of each well, Lessee shall furnish Department an accurate location plat, a detailed lithologic log, a detailed history of the well and all well data including geologic, driller, electrical, and any other well surveys made to obtain subsurface information. Upon request, samples of all formations penetrated and parts of cores taken, accurately labeled with the name of the well, and interval of depth shall be furnished to Department at Lessee's expense. If requested, Lessee shall ship a complete set of samples to the Pennsylvania State Geological Survey, Room 1201, Kossman Building, 100 Forbes Avenue, Pittsburgh, Pennsylvania 15222, within thirty (30) days after completion of each well.

19. AUDITS

19.1 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the lease. Department may keep such charts for examination for a period not to exceed ninety (90) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, and other products produced from the leased premises.

19.2 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, and liquid hydrocarbons, produced from any well covered by this lease, to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payments to Lessee, his heirs, administrators, executors, successors, and assigns for oil, gas, and liquid hydrocarbons from wells covered by this lease.

19.3 Lessee further grants to Department the right at any time to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from cancelling this lease upon delivery to Lessee of written notice of Department's intention.

20. LESSEE'S TERMINATION

20.1 Lessee may at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

20.2 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 10. Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

21. REMOVAL

21.1 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to remove all buildings, machinery, wells, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations, to fill and level all pits, and to the extent practicable, to restore the property to the same condition as when received.

22. RELEASE

22.1 Lessee shall not be granted a final release from the terms of this lease until District Forester has met with Lessee's field engineer on the ground, inspected the premises, and received a signed statement of release from Department indicating the proper cleanup has been completed.

23. PLUGGING

23.1 Lessee shall properly and effectively plug all wells on the leased premises before abandoning in accordance with the regulations of the Department's Oil and Gas Regulation Division and all applicable laws of the Commonwealth. A copy of the plugging procedure approved by the Oil and Gas Regulation Division shall be supplied to the Minerals Section, Bureau of Forestry. In addition to the above mentioned requirement upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements will be reason for cancellation of this lease and the posted bond will be forfeited in order that Department may properly plug the wells.

23.2 The plugging procedures, as herein stated, shall also include all shallow wells drilled in areas which are not coal productive and are not covered by the regulations of Department (Certificate of Plugging form may be obtained from Department's Oil and Gas Regulation Division).

24. ABANDONMENT AND STORAGE RIGHTS

24.1 In the event the development of this lease demonstrates, in the opinion of Department, that this tract has potential value as a gas storage reservoir (no storage rights are demised to Lessee under the terms of this lease), the well, equipment, property, and casing involved shall first be offered to Department, its nominee or assignee, at the then fair market value of those items before any well shall be plugged. Such firm offer shall be made in writing to Department at least thirty (30) days prior to commencement of removal of the equipment from the well by Lessee.

25. DEPARTMENTAL TERMINATION

25.1 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) days after demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

25.2 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a writ of Habre Facias Possessionem (without asking leave of court) waiving all stay and exemption laws and release of errors.

26. INDEMNITY

26.1 Lessee shall at all times hereinafter indemnify and save harmless Department from and against all detriment, damage, loss, claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

27. BOND

27.1 Lessee agrees to give Department a surety or performance bond with satisfactory corporate surety in the principal sum of TWENTY-FIVE THOUSAND DOLLARS ($25,000.00) with judgment clause in a form to be approved by the Attorney General conditioned on the faithful performance of the covenants of this lease. The bond shall be further conditioned that in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells upon termination of this lease, or within six (6) months from the termination, Commonwealth can execute upon the bond to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the bond shall be conditioned in favor of the Commonwealth for all damages that may arise as a result of fires, accidents, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises.

28. RELATED AGREEMENTS

28.1 Department will be furnished for record purposes and to protect its interests a copy of all agreements, contracts, letters or memoranda entered into, made, or sent by Lessee in any way concerning the development, operation, or sale of products from this lease.

29. ASSIGNMENTS

29.1 Lessee shall not use or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned and assignee, thereof, shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interests of a party not in default.

30. LIMITATION ON WARRANTY

30.1 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the rents, rentals, and royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the proportion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may with the approval of the Attorney General enter into an escrow arrangement for future rents and royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claiming title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the rents and royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The rents and royalties placed in escrow shall be refunded to Lessee in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

31. FORCE MAJEURE

31.1 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance, therewith, is prevented by or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If at the end of the primary term, hereof, such term has not been extended by production or drilling as in this lease provided and Lessee by reason of any of the above recited causes is unable to drill a well on the leased premises for oil or gas, the primary terms and the rental provision, hereof, shall be extended automatically from year to year for a period not to exceed ten (10) additional years unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises by reason of any of the above recited causes, this lease shall remain in full force and effect.

32. THIRD PARTIES' RIGHTS

32.1 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) have hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee, and provided further that access to records shall be limited to those records which are non-confidential in nature.

33. PUBLICATION AND NOTICE

33.1 Within thirty (30) days following the receipt by Lessee of a copy of this lease, fully executed, Lessee shall record the lease in the county or counties in which the leased premises lie. Within thirty (30) days following the recording, Lessee shall advise Department in writing of the recording reference data. Thereafter, Department shall cause to be published in the Pennsylvania Bulletin at least the following information:

(1) the subject of this lease;
(2) the general location of the leased premises;
(3) the names of Department and Lessee; and
(4) the recording reference date for this lease.

34. LIABILITY

34.1 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, irrespective of whether or not such pollution or damage be due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause be found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises the pollution or other damage would not have occurred, it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

35. RIGHTS RESERVED BY DEPARTMENT

35.1 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

35.2 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

35.3 Department reserves the right to approve in writing all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises, unless upon due cause shown, Department waives the thirty (30) day requirement and allows a lesser, but reasonable, time for review.

35.4 The surface rights of Department shall be considered dominant and the oil and gas rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

36. PROTECTION AND CONSERVATION

36.1 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as Exhibit "B" attached hereto and made a part hereof.

36.2 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

CLIFFORD L. JONES, Secretary

ATTEST:

ADOBE OIL & GAS CORPORATION

Assistant Secretary

LESSEE Vice President

APPROVED AS TO LEGALITY
AND FORM:

ASSISTANT ATTORNEY GENERAL

APPROVED:

DRW GOVERNOR 11/25/80

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DAUPHIN

On this the 21st day of November, 1980, before me LUCY M. CUNKO, the undersigned officer, personally appeared CLIFFORD L. JONES, who acknowledged himself to be Secretary of Environmental Resources of the Commonwealth of Pennsylvania and that he as such Secretary of Environmental Resources being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing his name as CLIFFORD L. JONES, Secretary.

In Witness Whereof, I hereunto set my hand and official seal.

Lucy M. Cunko

Notary Public

Lucy M. Cunko, Notary Public
My Commission Expires May 2, 1983
Harrisburg, PA Dauphin County

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "A"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-110324-9, by and between: COMMONWEALTH OF PENNSYLVANIA and ADOBE OIL AND GAS CORPORATION

Tract 324

State Tract 324 containing 4,565 acres of Moshannon State Forest land comprising all of Warrants #5361 and #5362 and parts of Warrants #5322, #5325, #5358, #1925 and #1926 in Girard and Goshen Townships, Clearfield County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from Dents Run Coal Company by deed dated January 7, 1909; from H. B. Mingle by deed dated December 17, 1908; and from Thomas Murray (Murray Estate) by deed dated March 13, 1930, and described as follows:

Beginning at the northeast corner of Warrant #5358, also being the northwest corner of Warrant #5359, also being a point on the Moshannon State Forest boundary line with Game lands #34; thence southward approximately 16,200 feet along the east lines of Warrants #5358, #5361 and #5362 to a point on the eastern boundary of Warrant #5362; thence eastward approximately 750 feet along the eastern boundary of Warrant #5362 to a point on the eastern boundary of Warrant #5362; thence southward approximately 2,700 feet along the east line of Warrant #5362 to the southeast corner of Warrant #5362; thence westward approximately 4,300 feet along the south line of Warrant #5362 to a point on the south boundary of Warrant #5362; thence in a general west-northwesterly direction approximately 5,525 feet north, 4,425 feet west, 1,200 feet south, 200 feet east, 1,800 feet south, 2,050 feet west, 1,600 feet north and 3,400 feet west to the southwest corner of Warrant #5362; thence northward approximately 14,750 feet along the west line of Warrant #5362 and through Warrants #5322 and #5325 to a point on the north line of Warrant #5325, also being a point on the Moshannon State Forest boundary; thence eastward approximately 13,400 feet along the north lines of Warrants #5325 and #5358 to the northeast corner of Warrant #5358, the place of the beginning.

Excluding from the above described lands a 294 acre parcel of privately owned land known as the Peter McGeorge Parcel located in the southwest quarter of Warrant #5358 and the southeast quarter of Warrant #5325 as shown on the Oil and Gas Tract Map, Exhibit "C," and described as follows:

Beginning at a point approximately 1,550 feet south-southeast of the junction of the Caledonia Pike Road and Knohs Road, also being a point within Warrant #5325 approximately 1,000 feet west-northwest of the southeast corner of Warrant #5325, also being the southwest corner of the privately owned parcel; thence in a clockwise direction around the parcel boundary approximately 2,600 feet north, 4,800 feet east, 2,600 feet south and 4,850 feet west to the southwest corner of the privately owned parcel, the place of the beginning.

(1-77)
Revised (12-74)
Stipulation Form

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

EXHIBIT "B"

STIPULATIONS FOR PROTECTION AND CONSERVATION
OF STATE FOREST AND PARK LANDS

The lands embraced in this lease or permit[1] are leased by the Commonwealth of Pennsylvania, acting through the Department of Environmental Resources, hereinafter designated as "Lessor" or "Department." Lessee or Permittee hereby agrees to the following stipulations:

1. ENVIRONMENTAL QUALITY CONTROL

1.1 Lessee shall take all necessary precautions and measures throughout the entire course of this lease to insure strict compliance with all pertinent laws and rules and regulations promulgated thereunder, whenever enacted, including: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119, as amended through 1968, 35 P.S. 4001, et seq.); the Clean Streams Law (Act of June 22, 1937, P.L. 1987, as amended through July 31, 1970, 35 P.S. 691.1 et seq.); the Solid Waste Management Act (Act 241, July 31, 1968); the Gas Operations Well Drilling Petroleum and Coal Mining Act (Act of November 30, 1955, P.L. 756, as amended on March 3, 1970, and known as the Act of the General Assembly No. 38); the Surface Mining Conservation and Reclamation Act (Act of May 31, 1945, P.L. 1198, as amended through November 30, 1971, Act No. 147).

1.2 Notwithstanding any provision in this lease, Lessee shall be held liable by the Commonwealth of Pennsylvania, or any agency of the Commonwealth, for the violation of any relevent laws, rules and regulations.

1.3 Before any mining, drilling or quarrying, Lessee shall acquaint itself with all of the applicable rules and regulations governed by each respective Act.

1.4 Prior to undertaking actual mining, drilling or quarrying, Lessee shall confirm in writing to Lessor that he has reviewed and thoroughly understands the applicable requirements as contained in each of the aforementioned Acts.

1.5 During mining, drilling or quarrying, Lessee shall comply with all of the current applicable rules and regulations of the foregoing Acts. Where any of the rules and regulations differ concerning abatement of pollution, the more stringent rule shall apply.

1.6 Lessee shall at all times perform its work in such a manner as to substantially minimize the possibility of polluting the air, land, or bodies of water with any materials harmful to the environment.

1.7 As development of the leased premises progresses and unforeseen circumstances arise that were not evident during the design, emergency pollution control programs may be put into effect immediately. In such cases, instructions will be issued by Lessor and will be carried out by Lessee.

1.8 The Air Pollution Control Act of the Commonwealth prohibits the burning of any refuse, rubbish, brush, etc. in the designated air basins of the State, except by approval of the Department of Environmental Resources' respective Regional Air Pollution Control Engineer. Other emissions into the atmosphere are not permitted if they are injurious or hazardous to people, animals or vegetation.

[1]When a lease is granted, it shall be understood that the terms "Lease" and "Lessee" shall apply; when a permit is granted, it shall be understood that the terms "permit" and "Permittee" shall apply.

1.9 Lessee shall strictly adhere to all rules and regulations for collection, removal, transportation, and disposal of solid wastes. Littering of the leased premises will not be permitted.

1.10 The discharge of wastes to streams within the Commonwealth will not be permitted unless such discharges meet the standards of the Department of Environmental Resources.

2. PROTECTION OF PROPERTY AND OPERATIONS

2.1 Lessee shall not use or allow to be used the State Forest lands for any other purpose than that authorized by this lease. District Forester2 will be advised when operations begin and end. Any changes in the original plans, which may be necessary subsequent to the beginning of operations, must be approved by District Forester and Lessor.

2.2 Permission to remove overburden must first be obtained from District Forester who will designate the extent of such removal.

2.3 Lessee shall carry out no actual mining, quarrying, excavating, drilling, or stripping operations within sight of publicly traveled roads, as indicated by District Forester.

3. PUBLIC LAND USE

3.1 Lessee hereby recognizes and admits that the leased premises are dedicated to the purposes set forth in Environmental, Health, Park, Fish and Game Laws, and Rules and Regulations and Department's Forest Resource Plans promulgated thereunder and Lessee agrees to conduct operations with deference to such purposes.

4. HUNTING AND FISHING

4.1 Employees of Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not engage in hunting or fishing upon said land, except as permitted by law, and shall not injure or destroy wildlife and fish.

5. ANIMALS

5.1 Lessee shall prevent access of animals to pits or excavations dug for Lessee's operations by erecting, maintaining fences, or by other means approved by Department.

6. SLUSH PIT

6.1 Each slush pit will consist of two compartments; one to contain fluids from the drilling operations and the second to contain surface runoff from the drilling site. Unless authorized by Department, all slush pits will be located at approximately the same elevation as the drilling site. Depending on the topography and slope conditions, the slush pit to contain surface runoff may be located below the drilling site and at a safe and reasonable distance from the stream in which the effluent will be discharged. The slush pit used to contain drilling fluids, mud, and water, will be lined with plastic so that no escape of these fluids will occur. If said fluids contain oil or other chemical substances which are harmful to the forest environment, Lessee shall transport these fluids from State Forest lands for disposal. All trash, rubbish, or waste materials from each drilling site will be stored in one area and may be disposed of in the slush pit prior to restoration. All pits shall be filled with earth and leveled at Lessee's expense upon completion of each well. However, nothing in this paragraph shall be construed to permit a violation of any laws, rules and regulations of the Commonwealth.

[2]When this lease is granted in whole or in part on State Park land, then the words "District Forester" shall be understood to mean "Park Superintendent," whenever the words appear in the lease and State Park lands are involved.

6.2 Before any operations commence, the location, design, construction, and maintenance of any slush pit must be approved by Lessor. Pollution potential and aesthetics shall be among the factors to be considered by Lessor.

6.3 If drilling operations are conducted by air, gas, or airfoam, Lessee shall also provide sufficient means by which dust and/or foam dispersal are abated, kept to a minimum, and shall not become a nuisance.

7. SILTATION

7.1 Lessee realizes that as a result of its operation large areas of land which will be cleared to provide for compressor stations, pipeline rights of way, and drilling sites, and which will be exposed to the forces of erosion for varying periods of time, could create siltation to nearby streams. Lessee agrees, therefore, to regrade such areas immediately and reseed to either temporary or permanent grasses. Any other type of remedial work necessary to prevent erosion on such areas shall be performed by Lessee.

7.2 Lessee shall upon initial construction of all drilling sites restore all highwalls and reseed said highwalls and downslope embankment of each drilling site immediately. Department's representative shall be consulted for final design and approval of each drilling site prior to final restoration.

7.3 Lessee's contractors and subcontractors shall not construct earthen dams across any stream to obtain a water supply for its operations unless approved by Lessor.

7.4 Lessee shall on pipeline rights of way and access roads construct water bars or similar diversion channels to carry surface runoff away from the rights of way and roads to prevent siltation. During construction if excess siltation is expected, Lessee shall construct a settling basin at the base of the right of way or road to impound runoff and allow sediments to settle prior to discharge into nearby streams.

7.5 Lessee shall construct all access roads to all drilling sites along existing pipeline rights of way which are built to service the drilling site provided that a ten percent (10%) grade can be maintained. All road locations and grades must be approved by District Forester as provided hereunder. All roads will be maintained in a passable condition.

8. WATERS

8.1 Without prior approval of Department, Lessee shall not locate any bore or core hole or any part of rig or slush pit within one hundred (100) feet of any stream or body of water on State Forest lands, and hereby agrees to prevent the contamination or pollution of springs, brooks, streams, or other waters on these lands in any manner whatsoever, by such means and measures as may be lawfully required by the Environmental Quality Board of the Commonwealth of Pennsylvania or its successors in function. Lessee shall be familiar with and abide by all rules and regulations of the Environmental Quality Board and shall promptly, when ordered by the Environmental Quality Board, comply with any specific rulings concerning its operations.

8.2 Where construction, operation, or maintenance of any of the facilities on or connected with this lease causes damage to the watershed or pollution of the water resources, Lessee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by an authorized representative of Department and to pay for any and all damage or destruction of property, fish, and wildlife resulting from operations under this lease.

8.3 The cost of said property, wildlife, or fish destroyed shall be determined by Department, Pennsylvania Game Commission, or Pennsylvania Fish Commission using recognized procedures to establish the value of damage.

8.4 Upon termination of drilling or producing operations, Lessee shall obtain a certificate from Department certifying that it has complied with all requirements of law and that it has taken all necessary measures to prevent any future contamination or pollution of waters as a result of its operations. Lessee shall continue to be liable for any such damages up to one (1) year after the cessation of operations under the provisions of this lease.

9. FOREST GROWTH

9.1 Lessee shall not cut, injure, destroy, or remove any forest growth, except that which shall be absolutely unavoidable in conducting operations and shall obtain prior approval of District Forester thirty (30) days before removal is to be commenced. The full thirty (30) days prior notice may be reduced upon the discretion of District Forester.

9.2 Lessee at option of Department shall chip all tree tops, limbs, brush, slash and any timber not to be sold or utilized by Department or Lessee which have resulted from clearing operations from strp mine sites, well sites, access roads, pipeline rights of way, and other construction sites.

9.3 Lessee at the option of Department shall bury or dispose of all tree stumps and large rocks resulting from its clearing and construction operations using a plant approved by District Forester.

9.4 Lessee shall pay for all timber damages in place in accordance with the regulations of Department. Such regulations shall be obtained from District Forester and Lessee shall further be required to dispose of said timber off the area to be cleared.

9.5 Lessee shall upon completion of its operations and at its own expense secure and plant with grasses and/or trees or shrub seedlings and/or game foods all strip mine sites, well sites, access roads, pipeline rights of way and other cleared areas using a plan appproved by District Forester.

9.6 Lessee shall make full compensation to Department to be three (3) times the value of such material cut, injured, destroyed, or removed to be computed by Department should additional damage to the Commonwealth result at any time from the work incident to this lease or the construction, operation, maintenance, or removal of facilities not herein contemplated or specifically mentioned, but which may occur as a result of said work or facilities.

10. FIRE

10.1 Lessee's employees, agents, contractors, and subcontractors, and employees of contractors and subcontractors shall do everything within their power to prevent or suppress forest fires and shall not allow fires to be set on or adjacent to State Forest lands by Lessee, his agents, contractors and subcontractors, and employees of contractors and subcontractors, except in pursuance and in accordance with the conditions prescribed in the permission first obtained from District Forester fixing the time, place, and manner of burning. The burning of refuse, brush, slash, debris, or other materials, upon approval of District Forester, shall be so conducted that no living forest growth is damaged or killed.

10.2 Should any fire set by Lessee or any of the persons mentioned above escape in any manner or damage any State Forest land or other property, Lessee shall be liable for all such damages resulting from such escape and for all costs incurred by Department in fighting such fires; and Lessee's officers, agents, and employees in the vicinity, as well as contractors and subcontractors, shall with such assistance as Lessee may have at hand, or be able to summon, render aid in fighting said fire without cost to the Commonwealth.

10.3 Lessee further agrees that during periods of abnormal forest fire danger, District Forester may suspend all or part of the drilling, or other operations on all or part of the State Forest lands until the forest fire danger subsides.

10.4 Lessee, or its employees, shall report promptly all forest fires detected by them to District Forester.

11. REPLACEMENT AND REPAIR OF IMPROVEMENTS

11.1 Lessee shall replace or repair, as Department may direct, all State Forest signs, markers, corners, fences, other structures, and service utility lines, owned or used by Department which cross or otherwise lie within the State Forest lands destroyed or damaged in any work incident to this lease.

12. ROADS, QUARRY AND DRILLING SITES

12.1 Lessee shall not construct any roads, clear any quarry or drilling sites, or excavate any trenches without prior written approval from District Forester, who shall set forth the type and grade of roads, trenches, and area to be cleared. The access roads shall be held to a maximum grade of ten percent (10%). However, if steeper grades are necessary, written approval must be obtained from District Forester prior to their construction. Any roads built at the expense of Lessee in its operations shall not be removed or destroyed and shall become a part of the road system of the State Forest lands.

12.2 Lessee recognizes that all roads and trails owned or maintained by Department, which are used in the execution of this lease, were constructed and improved for the use of Department and for the general public having business in and making use of State Forest land. Lessee, therefore, agrees that its operations will never be conducted in such a manner as to prevent, hinder, or obstruct the customary use of such roads and trails by Department or by the public.

12.3 Where roads built by Lessee cross any fence, Lessee shall construct a gate and keep it closed except when the passageway is in use. Lessee shall keep all said roads and trails free at all times from obstruction by logs, brush, or debris resulting from Lessee's operation. District Forester may require Lessee to temporarily discontinue the use of said roads whenever in his opinion such action is necessary to prevent their serious damage.

12.4 Upon termination of this lease, Lessee shall repair said roads and trails and leave them in as good condition as at the beginning of this lease of which condition Department shall be the sole judge. In addition, Lessee shall make any repairs to said roads and trails deemed necessary by District Forester to insure adequate and proper drainage, road surface conditions, horizontal alinement, and cross slope.

12.5 It is understood that the bond required, under the terms of this lease, shall cover the use and repair of said roads.

12.6 Lessee also agrees to obtain prior written approval from Department for the use of all State Forest roads off the leased premises used in its operations and to repair damage to all State Forest roads within or bordering on the leased premises and when such damage is caused by Lessee's operations; provided, however, if in the opinion of District Forester in charge, the roads or portions thereof are used by others sufficiently to warrant the apportionment of the maintenance costs, then Lessee may be relieved of the burden of sole maintenance and be required to provide only Lessee's proportionate share as decided by Department through District Forester.

12.7 Lessee recognizes the rights and privileges afforded to Grantees by rights of way and other agreements executed with Department, prior to this lease, which cross or otherwise lie within the area of this lease; and therefore, agrees to relocate at Lessee's own expense all portions adversely affected by work incident to this lease in accordance with the then current rules and orders of the Public Utility Commission of the Commonwealth of Pennsylvania. In the event, the Public Utility Commission does not have any jurisdiction, any necessary relocation shall be completed subject to the approval of Grantor.

13. BUILDINGS

13.1 Lessee shall not drill any bore or core hole, carry on operations, make excavations, or otherwise disturb the surface of the lands within two hundred (200) feet of any building. However, if a lesser distance to any building is needed, written approval must be obtained from District Forester, or from the owner of the building if not the property of the Commonwealth.

13.2 Lessee shall consult with District Forester and obtain written approval prior to the construction and erection of any storage facilities, buildings, work sheds or any other physical structure upon State Forest lands outside of the leased premises.

14. APPEARANCE

14.1 In its appearances hereunder, Lessee shall at all times maintain State Forest lands in a neat and presentable manner, removing all rubbish and debris as it accumulates and restoring each individual area within thirty (30) days to as near as possible its original condition when its use is abandoned.

15. EXPLOSIVES

15.1 Lessee shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during periods of fire danger unless permission is granted by District Forester.

15.2 Explosives shall not be used in fish spawning or rearing areas, nesting areas of wildlife concentration, during periods of intense activity or at any other time or in any manner that might damage any wildlife resource.

16. RESTORATION AND REVEGETATION

16.1 Restoration and revegetation shall be accomplished in accordance with Lessee's approved reclamation plan under the Surface Mining Conservation and Reclamation Act. However, should Lessee not qualify for licensing under this Act, as amended, then Lessee shall comply with Sections 16.2, 16.3 and 16.4 of this lease which provides for restoration and revegetation of all areas disturbed by Lessee.

16.2 Upon completion of drilling, mining, quarrying, excavating, stripping, or any other operation, the surface of the site shall be backfilled to as near as possible to the original contour of the surface. Where necessary, the top of the highwall shall be graded into the drill, mine, quarry, excavation, strip, or any other site area, so that all safety hazards to both human and wildlife have been eliminated and the highwall restored to a safe and reasonable grade. Department shall be the sole judge as to what is safe and reasonable. If terraces or benches are present upon completion of operations or if restoration of the drill site, mine site, quarry site, excavation site, strip site, or any other site, is enhanced by such terraces or benches, the terraces or benches upon approval of Department may be cut into the highwall or left standing. The backfill material from the drilling, mining, quarrying, excavating, stripping, or any other operation, shall be graded to form a gradual slope away from the highwall and all peaks and ridges shall be leveled so that water shall not accumulate in pools over the restored area.

16.3 Upon completion of drilling, mining, quarrying, excavating, stripping, and backfilling of an area or any portion thereof and after backfilling has settled so as to provide an acceptable planting site, Lessee shall revegetate all disturbed or cleared areas. Such revegetation is to be done according to a planting plan prepared by Department. Lessee guarantees an establishment of not less than an average of five hundred (500) live and growing trees per acre one (1) year after date of planting. If area is planted in grasses, or shrubs, or trees and grasses, Lessee shall guarantee an establishment of sixty-five percent (65%) survival of said grasses or shrubs one (1) year after date of planting. If such growth has not resulted, Lessee shall replant such areas unless in the opinion of Department the lack of a satisfactory growth was due to soil conditions or other causes beyond the control of Lessee. Department shall be the sole judge in determining if replanting is required and shall notify Lessee in writing of areas to be revegetated. This provision may be waived by Department upon the recommendation of District Forester.

16.4 Restoration and revegetation plans of Lessee must be approved in advance of any operations by Department or its representatives. Department shall have the sole right to determine the time of backfilling and revegetation.

17. WATER WELLS

17.1 Any plan by Lessee for the drilling of water wells on State lands, and use of any water found, must be approved in writing by Department.

17.2 A final plat will be submitted within thirty (30) days after completion of each water well showing exact location, elevation, depth of well, formations penetrated and depth, type of shows, and volume of water or hydrocarbons present.

17.3 Lessee further agrees to supply Department with any other records, memoranda, accounts, reports, cuttings, cores, or other information relative to the drilling, completion, or operation of water wells on the above described premises. This will include true copies of any electrical or radioactivity surveys made in the wells.

17.4 Lessee shall be familiar with and comply in every respect with the provisions now existing or hereafter enacted of the Water Well Drillers License Act 610 of May 29, 1956 (P.L. 1840), providing for the orderly development of the ground water resources of the Commonwealth of Pennsylvania.

18. PIPELINES

18.1 Lessee shall refill to contour all ditches or other excavations caused by the construction, operation, maintenance or removal of pipelines; construct cross ditches; lime, fertilize and seed or replant the right of way; keep the pipeline and right of way in good repair and appearance, and take such other measures as may be deemed necessary by Department to control erosion and sedimentation and to maintain or restore the natural and aesthetic values as directed by Department.

19. CONTACT WITH STATE AGENCIES

19.1 Lessee shall periodically contact the following State agencies or their successors to keep informed on up-to-date information, policies, rules and regulations applicable to this lease.

Department of Environmental Resources	Brief Statement of Agency's Jurisdiction
Bureau of Forestry, Minerals Section P. O. Box 1467 Harrisburg, Pennsylvania 17120	Leasing programs, terms, policies and geophysical regulations for State owned land and waters
District Forester Forest District (where applicable) Park Superintendent State Parks (where applicable)	Restoration and replanting of leased premises, timber damages, location of well sites, rights of way, roads, etc.
Secretary Environmental Quality Board P. O. Box 2063 Harrisburg, Pennsylvania 17120	Water encroachment regulations; disposal of water polluting materials and industrial wastes; well spacing orders and unitization
Bureau of Air Quality & Noise Control 18 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Blowing gas wells and air drilling, burning of waste materials, trash, etc.
Bureau of Soil & Water Conservation Regional Office (where applicable) or P. O. Box 1467 Harrisburg, Pennsylvania 17120	Soil Erosion & Sedimentation Control Plan
Bureau of Water Quality Management Division of Non-Point and Industrial Sources 12 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Slush pits, siltation, pollution, etc. Disposal of produced water
Bureau of Water Quality Management Water Emergency Response Team 12 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Notification of fires, breaks, leaks, spills or blowouts
Bureau of Dam Safety, Obstructions & Storm Water Management Division of Obstructions and Flood Plain Management 407 South Cameron Street Harrisburg, Pennsylvania 17120	Locating structures or pipelines in streams, rivers and lakes. Crossing streams -impoundment of stream for water supply
Bureau of Topographic & Geologic Survey Division of Oil & Gas Regulation 100 Forbes Avenue Pittsburgh, Pennsylvania 15222	Oil and gas regulations and enforcement (drilling permits, plugging, etc.)
Bureau of Surface Mine Reclamation 7 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Regulations and enforcement (when drilling in coal areas)
Bureau of Occuptional Health Division of Quarries & Explosives 6 Fulton National Bank Building Harrisburg, Pennsylvania 17120	Blasting, seismic surveys, etc.
Pennsylvania Fish Commission	
Executive Director P. O. Box 1673 Harrisburg, Pennsylvania 17120	Regulations for the protection of fish life
Pennsylvania Game Commission	
Executive Director P. O. Box 1567 Harrisburg, Pennsylvania 17120	Regulations for the protection of wildlife

M-O&G (8-86)
Oil and Gas Lease

7-K-490

Commonwealth of Pennsylvania
Department of Environmental Resources
Minerals Section, Bureau of Forestry
P.O. Box 1467
Harrisburg, Pennsylvania 17120

CONTRACT NO.
M-110706-10

OIL AND GAS LEASE FOR STATE FOREST AND PARK LANDS*

THIS AGREEMENT, made and entered into on this 17th day of September, 1986, by and between the COMMONWEALTH OF PENNSYLVANIA, acting through the DEPARTMENT OF ENVIRONMENTAL RESOURCES, hereinafter designated "Department", and TEXACO INC. with its principal place of business at P. O. Box 2100, Denver, Colorado 80201 and authorized to do business within the Commonwealth of Pennsylvania, hereinafter designated "Lessee".

W I T N E S S E T H

WHEREAS, Department is authorized by the Act 275 of December 3, 1970, P.L. 834, 71 P.S., Sections 1902A and 1906A, as amended, to lease State Forest and Park lands for oil and gas development when such disposition is deemed by Department to be in the best interest of the Commonwealth; and

WHEREAS, Department has made a determination that the leasing of oil and gas rights in the premises hereinafter described will be in the best interests of the Commonwealth and has authorized leasing of the same; and

WHEREAS, the proposed leasing of said lands was duly advertised as required by law and on the opening of the bids submitted pursuant to such advertising, Lessee herein was found to be the highest responsible bidder.

ENTERED FOR RECORD
'89 APR 17 AM 11 13
HAZEL M. PETERS
RECORDER OF DEEDS
CENTRE COUNTY

*When this lease is granted, in whole or in part, on State Park land, then the words "State Forest land" shall be understood to mean State Park land in their entirety or in part, whichever shall apply, wherever the words appear in the lease, and the words "District Forester", shall be understood to mean "Park Superintendent".

9-17-86

TR 706

DEW

NOW THEREFORE, in consideration of the sum of TWENTY SIX THOUSAND NINE HUNDRED NINETY-TWO AND 80/100 DOLLARS ($26,992.80), paid by Lessee to Department, receipt of which is hereby acknowledged, and other mutual covenants and agreements hereinafter set forth, Department does hereby grant, demise, lease, and let, exclusively unto Lessee for the purposes only of exploring, drilling, operating, producing, and removing of oil, gas, and liquid hydrocarbons; and at locations subject to the approval of District Forester, acting for Department, the laying of pipelines and the building of roads, tanks, towers, stations, and structures thereon to produce, save, take care of, and transport said products, all that certain tract of land, TRACT NO. 706 containing 2,760 acres, more particularly described on the Oil and Gas Lease Attachment identified as Exhibit "A" and as shown on the Map identified as Exhibit "C", which are attached hereto and made a part hereof, hereinafter referred to as the leased premises. It is understood that the aforesaid acreage and the location shown on the Map identified as Exhibit "C" are approximate.

1. TERM OR PERIOD

1.01 It is agreed that this lease shall remain in force for a term of ten (10) years from the date first written above, subject to the conditions hereinafter set forth, particularly Section 9 First Well, providing for the drilling of the first well within the first five (5) years of the lease; and shall continue from year to year thereafter so long as oil or gas is produced in paying quantities from the leased premises hereunder or as Lessee is engaged in bona fide attempts to secure or restore the production of oil or gas by conducting drilling, or reworking operations on the leased premises hereunder, or engaged in the abandonment, or plugging of wells or removal of equipment therefrom.

2. RENTAL

2.01 Lessee shall pay to Department a rental for the above described leased premises at the following rate: the first year's rental shall consist of the bonus payment which was competitively bid by Lessee and shall be payable upon delivery of this lease to Lessee; the second and third years' rental shall be TWO DOLLARS ($2.00) per acre each year, payable upon the anniversary date of this lease; for the fourth and all subsequent years thereafter, the rental shall be THREE DOLLARS ($3.00) per acre each year, payable upon the anniversary date of this lease.

2.02 The drilling of each well in the leased premises, as provided in Section 9, shall reduce the rental set out in the preceding paragraph by the amount of rental on the number of acres attributable to each well as provided in Section 10, which reduction shall become effective on the next rental date, provided the well is a producer. If such wells are drilled on a unit created by a spacing order issued by Department or on a unit created by a voluntary unitization agreement entered into with the approval of Department, a well drilled on such unit shall reduce the rental above set out by the amount of rental attributable to the acreage contained in the portion of the leased premises included in such unit.

2.03 If at any time there is on the leased premises a well capable of producing natural gas and the well is shut-in, suspended, or otherwise not produced and the natural gas is not used or marketed therefrom during any year

ending on an anniversary date of this lease, Lessee shall pay Department at the expiration of each said year for that year a rental payment for each such well at the full rental rate per acre for the "acreage attributable to the well", as referred to in Section 10 of the lease.

3. OIL ROYALTY

3.01 Lessee shall pay to Department, as royalty, ONE-EIGHTH (1/8th) of the field price per barrel (42 U.S. Gallons) at 60° F, produced and saved from the leased premises for all oil, condensate and other liquid hydrocarbons of like grade and gravity which prevails in that area on the day such oil and other products are run into the pipeline or into storage tanks; the amount to be paid to Department will be the one-eighth (1/8th) royalty multiplied by the fractional interest held by Department.

3.02 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, in the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all oil, condensate and liquid hydrocarbons produced and saved from the leased premises; the amount to be delivered to Department will be the one-eighth (1/8th) part of the oil produced multiplied by the fractional interest held by Department.

3.03 If oil, gas, condensate, and other liquid hydrocarbons, each in paying quantities, should be developed from the same well, then the oil and the gas, condensate, and other hydrocarbons shall be saved.

3.04 Lessee shall gauge, measure, sample, and test all petroleum and petroleum products in accordance with standard practices as outlined in American Petroleum Institute Standard 2500, January 1, 1955, or as subsequently amended by the same authority, and at a temperature base of 60° F. Lessee shall provide tanks for accurately measuring the crude oil produced from the lease. Positive copies of one hundred percent (100%) capacity tank tables or other acceptable standards of measuring production are to be furnished to Department.

4. GAS ROYALTY

4.01 Lessee shall pay to Department, as royalty, TWENTY-FIVE CENTS ($0.25) per thousand cubic feet (MCF) or ONE-EIGHTH (1/8th) of the market value, whichever is higher, for all natural gas, casinghead gas, or other gaseous substances produced and sold or utilized by Lessee at the wellhead from each gas well drilled on the leased premises; the amount to be paid to Department will be the one-eighth (1/8th) royalty multiplied by the fractional interest held by Department and shall be payable monthly at the prevailing market value for natural gas in the area at the time of delivery.

4.02 Department may, at its option, however, demand that Lessee deliver to the credit of Department, as royalty, free of cost, into the pipeline to which Lessee may connect its wells, the equal one-eighth (1/8th) part of all gas and other gaseous substances produced and saved from the leased premises; the amount to be delivered to Department will be the one-eighth (1/8th) part of the gas produced multiplied by the fractional interest held by Department.

5. GAS MEASUREMENT

5.01 The volume of gas produced, saved, and marketed shall be measured according to Boyle's Law for the measurement of gas under varying pressures with deviations therefrom as provided in Paragraph "e" below, on the measurement basis hereinafter specified and shall be determined as follows:

a. The unit of volume for the purpose of measurement shall be one (1) cubic foot of gas at a temperature of sixty degrees Fahrenheit (60° F) and an absolute pressure of 14.73 pounds per square inch.

b. The average absolute atmospheric pressure shall be assumed to be 14.4 pounds to the square inch, irrespective of actual elevation or location of Point of Delivery above sea level or variations in such atmospheric pressure from time to time.

c. The temperature of the gas passing the meters shall be determined: (1) by the continuous use of a recording thermometer so installed that it may properly record the temperature of the gas flowing through the meters. The arithmetic average of the temperature recorded each 24-hour day shall be used in computing gas volumes; (2) if a recording thermometer is not installed, or if installed and not operating properly, an average flowing temperature of fifty degrees Fahrenheit (50° F) shall be used in computing gas volume.

d. The specific gravity of the gas shall be determined by tests made by the use of an Edwards or Acme gravity balance, at intervals of three (3) months, or at such intervals as are found necessary in practice. Specific gravity so determined shall be used in computing gas volumes.

e. The deviation of the natural gas from Boyle's Law shall be determined by tests at intervals of three (3) months or at such other shorter intervals as are found necessary in practice. The apparatus and the method to be used in making said test shall be in accordance with the recommendations of the National Bureau of Standards of the Department of Commerce, or Report No. 3 of the Gas Measurement Committee of the American Gas Association, or any amendments thereof, or any other mutually agreed upon method. The results of such tests shall be used in computing the volume of gas delivered hereunder.

6. PAYMENTS

6.01 Lessee shall be held responsible for the payment of all royalties, which shall be mailed to the office of Department at Harrisburg, Pennsylvania, and made payable to Department. Payments of royalties shall be made not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

6.02 Lessee shall submit statements by individual wells of the production and sales of oil, gas, other hydrocarbon products, and other products

BOOK 481 PAGE 425

not later than the twenty-fifth (25th) day of each calendar month covering production and sales for the preceding calendar month.

6.03 Once it has been determined by Department that Lessee is in default in the payment of any sum of money payable under the provisions of this lease for 30 days, Lessee agrees to pay an additional twelve percent (12%) annual interest on the defaulted amount calculated from the time of such default. This provision is in no way a waiver of the requirement to pay on time.

7. OPERATIONS

7.01 Lessee shall carry on all operations under this lease with all due diligence and in a good and workmanlike manner, in accordance with the best and most up-to-date oil and gas field practices.

7.02 Before any earthmoving activities take place, Lessee shall prepare a Soil Erosion and Sedimentation and Control Plan as required by Department's Bureau of Soil and Water Conservation. A copy of the plan shall be forwarded to the Minerals Section, Bureau of Forestry, Post Office Box 1467, Harrisburg, Pennsylvania 17120 and District Forester.

8. RESTRICTIONS

8.01 Under Department's multiple use policy, the leased premises are continuously used for recreation, conservation and other purposes; and many Department authorized activities may be in progress on the lands. Hence, Lessee shall conduct its operations so as to minimize interference with the other Department authorized activities on these State Forest lands and shall comply with the following restrictions:

a. No drilling is permitted within 200 feet of any building.

b. No drilling is permitted within 100 feet of any stream or body of water.

c. No drilling is permitted within 330 feet of any picnic area which has been so designated by Department.

d. No drilling is permitted within 330 feet of any trail, road or existing right-of-way.

e. No drilling is permitted within 100 feet of any area of historic value, tree plantation, overlook, vista or fire tower site.

f. No drilling is permitted for oil within 660 feet of the boundary line of leased premises.

g. No drilling is permitted for natural gas within 2,640 feet of the boundary line of leased premises where it is contiguous with State Park lands or other special-use State Forest lands such as Wild Areas and Natural Areas.

h. In addition, the following specific restrictions for this lease shall also apply:

None

8.02 Upon written request by Lessee, Department may waive, in writing, any portion of the above restrictions if, in Department's judgement, such a waiver is justified and in its best interests.

9. FIRST WELL

9.01 Unless sooner terminated as otherwise herein provided, Lessee shall commence a well on the leased premises or on unitized acreage containing a portion of the leased premises, but the well need not necessarily be on the portion of the leased premises contained within the unit, within five (5) years from the date first written above and shall drill said well with due diligence. In the event the aforesaid well is not commenced within the above mentioned five (5) year period, the lease shall be automatically terminated in its entirety, unless Department approves, in writing, thirty (30) days in advance of the anniversary date of this lease, the continuation of the lease on a year-to-year basis.

9.02 Notwithstanding anything to the contrary in Section 9.01 above, if the drilling of the first well has not commenced by the beginning of the month directly preceding the 5th annual anniversary date of the lease, due to adverse weather conditions (which hinders or prevents construction of well sites and roads) or other unanticipated delays beyond Lessee's reasonable control, Department may at its sole discretion continue the lease in effect by granting a one-time written extension to the 5 year first-well-deadline of not more than 2 months. Department shall grant such an extension only when it considers it to be fair, reasonable and appropriate under the circumstances. The rental rate provision of the lease shall not be affected by such extension of the 5 year first-well-deadline.

9.03 If the aforesaid well is still not commenced by the end of the one-time extension period, the lease shall terminate unless Department approves in writing before the end of such extension period the continuation of the lease on a year-to-year basis. The granting of such extension period shall in no way affect the anniversary dates of this Agreement, or the rights and responsibilities of Department and Lessee associated therewith.

10. SUBSEQUENT WELLS

10.01 If the "FIRST WELL" drilled by Lessee, or any subsequent well, is productive of oil and/or gas, and the well is expected to return the investment and operating costs on that well during the anticipated productive life of the well to its economic limit, then Lessee shall drill an additional well on the leased premises or on a unit containing a portion of the leased premises; but not necessarily on the portion of the leased premises contained within the unit, as would be drilled by an ordinary prudent operator acting under the same or similar circumstances. If an additional well is necessary, it must be commenced within six (6) months after the completion of the last well drilled; provided, however, that if Lessee concludes an additional well is not justified, then Lessee shall submit to Department the information upon which the conclusion is based. Upon

review of such information, if Department determines that an additional well should be drilled, then Lessee shall have the option of drilling an additional well within six (6) months from Department's determination or releasing all of the acreage covered by the lease except forty (40) acres around each well from which oil is produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product and has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres around each shallow well from which gas is being produced as the principal product which has been completed above the Onondaga Formation, or that amount of leased acreage actually contained within an established unit, whichever is less.

10.02 Lessee shall not be required, under this provision, to drill more wells than required or allowed under any spacing order, rule, or regulation of Department, or in the absence of any such order, more than one well for each forty (40) acres where oil is being produced as the principal product of such well, or more than six hundred forty (640) acres where gas is being produced as a principal product for such well and has been drilled to the Onondaga Formation or deeper, or more than three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which is productive from formations above the Onondaga Formation.

10.03 The amount of acreage included in a spacing unit by Department, or in the absence of an order by Department, forty (40) acres where oil is being produced as the principal product of such well, or six hundred forty (640) acres where gas is being produced as the principal product of such deep well which has been drilled to the Onondaga Formation or deeper, or three hundred twenty (320) acres where gas is being produced as the principal product of such shallow well which has been drilled to formations above the Onondaga Formation, shall be referred to elsewhere in the lease as "acreage attributable to a well".

11. DEVELOPMENT

11.01 Lessee agrees to drill such wells as a reasonably prudent operator would drill under the same or similar circumstances and after discovery of oil or gas on the leased premises, to develop and produce from the described leased premises efficiently, economically, without waste, and to the best advantage of Department.

11.02 Well spacing shall not be closer than one (1) well per forty (40) acres; should closer spacing be required, written approval must be obtained from Department.

12. OFFSETS

12.01 Upon the failure of Lessee to enter into a unitization agreement to protect affected acreage of the leased premises from drainage through offset wells, Lessee agrees to offset within sixty (60) days any well drilled on leases not owned by the Commonwealth that is completed within six hundred and sixty (660) feet of the boundary line of the leased premises and from which oil is being produced as the principal product, and any well drilled on leases not owned by the Commonwealth that is completed within two thousand six hundred and forty (2,640) feet of the boundary line of the leased premises and from which gas

is being produced as the principal product; or any well drilled on leases not owned by the Commonwealth that is completed within the radius of the drainage areas set by an order of Department; provided, however, that Lessee may present evidence to Department to show that such offsetting well is unnecessary or economically unsound. Upon review of such evidence, Department may, at its discretion, relieve Lessee of its obligation to drill the offsetting well. However, if Department determines that an offsetting well should be drilled, Lessee will have the option of drilling the well as required, or paying to the Commonwealth compensatory royalty on production from the offset well as if it had been drilled based on the production from the completed well which is to be offset and on the ratio the affected acreage bears to the total acreage which would have been drained by the well, or release all the acreage of the leased premises except forty (40) acres around each well from which oil is being produced as the principal product and six hundred forty (640) acres around each well from which gas is being produced as the principal product, or that acreage attributable to a well by an order of Department if the affected acreage falls within an area subject to such a spacing order.

12.02 No well on the leased premises shall be shut in if drainage will occur through any well within the aforeprescribed distances for oil and gas wells on leases not owned by the Commonwealth and, if such draining gas wells are on compression, the offset wells on the leased premises shall be placed on compression.

12.03 Lessee agrees that any well along the boundary line, contiguous to State Park Lands or Special Use State Forest lands such as designated Wild Areas and Natural Areas, where minerals, oil and/or gas are owned by the Commonwealth, shall be located at least six hundred and sixty (660) feet from such boundary if oil is the principal product anticipated from the objective formation of the well or at least two thousand six hundred and forty (2,640) feet from such boundary if gas is the principal product anticipated from the objective formation of the well, or that distance from such boundary line which will be the radius of the drainage area set forth by an order of Department, if the area is subject to such a spacing order. Upon written request by Lessee, Department may waive, in writing, any portion of the above restrictions if, in Department's judgement, such a waiver is justified and in its best interests.

12.04 Upon application by Lessee, this provision providing for the distance from such boundary line may be waived by Department when deemed in the interest of the Commonwealth and not in an area subject to a spacing order of Department's Bureau of Oil and Gas Management.

13. UNITIZATION

13.01 Lessee shall have the right, at any time or times, to pool and consolidate this lease, in whole or in part, or as to any stratum or strata, with lands or leases adjacent to or in the immediate vicinity of this lease, so as to constitute a unit or units for the purpose of entering, with the owners and/or lessees, into joint operating agreements providing for the joint operation and development of the leased premises, or portions thereof, with adjoining lands to prevent the drilling of an excessive number of wells or of wells located too close to the boundary of this lease; provided, however, that such agreement and

termination thereof shall not become valid unless and until the same shall have been approved in writing by Department; provided further, however, that if such joint operating agreements or unit agreements are entered into pursuant to a valid spacing or integration order, the approval of Department shall not be required.

13.02 Drilling, mining, or reworking operations upon, or production of oil or gas from any part of any such unit shall be treated, for all purposes hereunder, as operations upon or production from the leased premises.

13.03 Upon production from any part of any such unit, Department shall be entitled to and Lessee shall pay royalties calculated as follows: there shall be allocated to the portion of this lease included in such unit a fractional part of such production on the basis the ratio of the acres from the leased premises included in such unit bears to the total number of acres included in the unitized area; and Department shall be entitled to the royalties provided for in this lease on such fractional part of such production and no more; provided, that if State or Federal authorities shall prescribe a different method of allocation, the method so prescribed shall prevail.

14. SEISMIC SURVEYS

14.01 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall have the right to conduct seismic surveys over and across the leased premises. Prior to conducting any seismic work, Lessee shall submit to District Forester, for his approval, a map showing the location of each and every seismic line. When Lessee's seismic lines cross State Forest lands not already under lease to him, Lessee must obtain the customary Seismic Survey Permit from Department. The bond, hereinafter described, shall be conditioned in favor of Department for all damages that may arise as a result of said seismic surveys.

15. PIPELINES

15.01 Lessee is herewith granted the right to lay any necessary pipelines on or under the leased premises; however, a route map for each line shall be submitted to District Forester for his approval as to location prior to the laying of that line. Where Lessee's pipelines cross State Forest land not already leased to Lessee, it must enter into the customary pipeline right-of-way agreement with Department.

16. DRILLING

16.01 Lessee shall submit to Department and to District Forester for their approval as to location, a plat showing the location of each well before the drilling thereof is commenced, and no well shall be commenced until a permit has been issued where necessary by Department's Bureau of Oil and Gas Management.

16.02 Lessee shall drill a straight hole to the best of its ability. The maximum point at which a well penetrates a producing formation shall not vary unreasonably from the vertical drawn from the center of the hole at the surface. Minor deviations will be permitted for short distances to straighten the hole, to sidetrack junk, or to correct other mechanical difficulties.

16.03 Lessee shall run a device for measuring deviation from the vertical periodically during the drilling of the well and at the total depth.

16.04 After the completion of an intentionally deviated well, a complete angular deviation and directional survey of the well obtained by an approved well surveying company and certified as to correctness shall be furnished to Department.

16.05 Lessee shall maintain, at all times, the casing control equipment in such condition that will effectively control any oil, gas, or water encountered during operations in a well being drilled, tested, completed, or reconditioned. All drilling wells or wells being serviced by a rig shall be equipped with working blowout control equipment tested to twice normal hydrostatic pressure for the depth drilled that will completely close off the open hole and that will completely close off around any equipment being employed in the well and will be equipped with a bleed-off valve of the proper size and working pressure. If the blowout preventer is hydraulically operated, adequate pressure shall, at all times, be available for efficient operations. Blowout control equipment must be capable, in case of an emergency, to shut in the well at a point at least fifty (50) feet from the wellhead.

16.06 All wells shall be equipped with casing heads of rated working pressure not less than twenty-eight percent (28%) greater than the maximum rock pressure anticipated or rated to withstand test pressure exceeding by ten percent (10%) the maximum well treatment or stimulation pressure anticipated, whichever is the highest, with adequate connections and valves available to permit pumping mud-laden fluid between any two strings of casing at the surface. Reconditioning shall be required on any well showing pressure on the casing head, or leaking oil or gas between the producing string and next larger size casing string when such pressures or leakages assume hazardous proportions or indicate the existence of underground waste. No casing shall be perforated until adequate control equipment has been installed and is in good working order. Such control equipment shall consist of a Master Valve and Lubricator, or their equivalent. The entire equipment shall be in good working order and condition at all times.

16.07 While a well is being drilled with mud or water as a drilling fluid, Lessee shall test control equipment daily, to the extent possible, without causing premature removal of drill pipe from the hole while drilling, and record the results of such tests daily. While a well is drilling with air or gas as a drilling fluid, Lessee may test control equipment only during trips for the drilling bit.

16.08 Whenever an inspection shows that the casing or control equipment at a well is not adequate, Department may prescribe remedial measures which shall be complied with before any further drilling.

16.09 Drilling mud of sufficient weight to prevent oil, gas or water blowouts, or flows to the surface, shall be mixed and ready to use in wells prior to drilling any reservoir deemed by Department to be capable of flowing liquid or gas to the surface.

16.10 All casing, tubing, and equipment used in the drilling and completion of a well should be in good condition and adequate in strength for the depths to be drilled and the pressures that may be encountered.

16.11 Lessee shall use a casing program which complies with oil and gas statutes, and rules and regulations of the Commonwealth, and which prevents the escape of oil, gas, or water out of one stratum into another, the pollution of fresh water supplies and blowouts.

16.12 The surface casing shall extend from the surface to a depth below all fresh water zones known to exist in the field and adjacent area to protect them from contamination.

16.13 The production casing shall be of new or reconditioned seamless pipe of a grade and weight designed to withstand the greater of the following pressures to which the casing is planned to be stressed:

a. The maximum anticipated rock pressure, at any point in the casing string, shall not stress the casing in yield greater than seventy-five percent (75%) of the A.P.I. specified internal yield pressure of the pipe at minimum yield, as shown in A.P.I. Bulletin 5-C-2, dated April, 1972, or later amendments.

b. If the well is to be fractured, the casing shall be designed so that the fracture pressure anticipated, at any point in the casing, does not exceed the A.P.I. specified internal yield pressure of the casing at minimum yield, as shown in A.P.I. Bulletin 5-C-2, or later amendments.

16.14 After cementing and before perforating or drilling-in, the casing shall be tested by pump pressure at the wellhead to a pressure twenty percent (20%) greater than the anticipated maximum pressure at the wellhead. If, at the end of thirty (30) minutes, pressure shows a drop of fifty (50) pounds per square inch or more, the casing shall be repaired sufficiently to withstand the pressure test described herein. After the corrective operation, the casing shall again be tested in the same manner.

16.15 All surface casing and production casing shall be cemented in the ground with good quality cement equalling or exceeding A.P.I. specification in the manner hereinafter described.

16.16 Cementing of all casing strings shall be accomplished by pump and plug or another method approved by Department. Sufficient centralizers shall be attached to the casing to keep it centered in the hole during cementing.

16.17 An attempt shall be made to circulate the cement to the surface in cementing the surface casing. In the event that the cement cannot be circulated to the surface, due to the presence of fractures or other lost circulation zones, Lessee shall determine, as accurately as possible, the depth of the top of the cement in the annular space behind the casing and record it on the well record.

16.18 In wells where cement has not been circulated to the surface, there must be sufficient good quality cement in place in the annular space behind the casing to tightly hold the casing in place so that the escape of oil, gas, or water from one stratum to another, or to the surface, does not occur behind the casing.

16.19 Cement shall be allowed to stand a minimum of twenty-four (24) hours before drilling the plug or initiating tests. The waiting period for cement to harden may be reduced from twenty-four (24) hours upon approval of Department.

16.20 Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not allow the well to blow open, except in case of an emergency, over twenty-four (24) hours after drilling-in. Lessee will pay Department, at the regular royalty rate, for any gas allowed to escape, except in case of an emergency not caused by Lessee's operations, after this initial twenty-four (24) hour period. Such gas will be estimated by a method approved by Department.

16.21 After an initial open flow test has been taken, all future determinations of open flow potential shall be made by the United States Bureau of Mines, Back-Pressure Test Method (USBM-Monograph 7) or by other methods standard to the industry and approved by Department.

16.22 The determination of the initial open flow of a well, as that phrase is used in this lease, shall be made before any attempts are undertaken to increase the flow of such well through mechanical or chemical stimulation.

16.23 At least once every six (6) months, Lessee will determine the open flow potential of each producing well, as required in Section 16.21, and will also take a twenty-four (24) hour reservoir pressure test and will furnish Department a copy of the results of all such tests. Department may, at the request of Lessee, waive, in writing, all or parts of this requirement if, during any calendar year, production averages less than sixty (60) MCF per day, and/or the semiannual twenty-four (24) hour pressure tests show reservoir pressures to be less than one hundred (100) psi.

16.24 Lessee shall, at all times, conduct prudent drilling operations, including the setting and cementing of casing in such a manner as will permit the production of oil, gas, and liquid hydrocarbons, without waste and including the taking of all reasonable precaution by the use of proper equipment and drilling practices as will protect persons and property against fires and hazards from blowouts.

16.25 It is agreed that Lessee shall have the privilege of using sufficient water and gas from the leased premises, free of royalty, to run all machinery necessary for drilling thereon only.

16.26 Lessee shall take all safety precautions necessary to prevent the uncontrolled escape of H_2S (hydrogen sulfide) gas from oil and gas wells and facilities.

16.27 In areas where H_2S is known to be present in the formations that are to be drilled, Lessee shall

a. install adequate emergency shutdown equipment, H_2S gas detection and monitoring equipment, hazardous condition alarms and personnel safety equipment, particularly protective breathing apparatus at all facilities where H_2S gas, in concentrations exceeding 100 ppm, is anticipated or used.

b. make gas masks and portable H_2S gas detectors readily available for use at all sites, particularly drill sites, where H_2S gas is anticipated or used.

c. after H_2S has been initially detected by any device, conduct frequent checks of all areas of poor ventilation with a portable H_2S detector.

d. use special steel pipe and casing which is resistant to H_2S stress cracking, in wells and facilities handling the gas in concentrations exceeding 100 ppm.

e. quickly notify and evacuate, if necessary, all persons in the vicinity if dangerous quantities of H_2S gas uncontrollably escape from oil or gas facilities.

f. post warning signs around all well sites or other facilities handling toxic H_2S gas in concentrations exceeding 100 ppm. The warning signs should be visible on all approaches to, and at a safe distance from, all facilities handling the H_2S gas, including warning markers on all pipelines which may be used to transmit the toxic gas.

g. install a fence around any fixed surface facility handling H_2S gas in concentrations exceeding 100 ppm and keep the gate locked.

h. immediately notify Department and record on appropriate well records and driller's logs any H_2S gas found in the course of drilling or producing operations.

17. REPAIR OF EQUIPMENT

17.01 Lessee does hereby agree that it will, at all times during the continuance and delivery of oil, gas, and liquid hydrocarbons to the market, keep, maintain, and repair its pipelines and equipment to the end that there shall be no leaks or waste of oil and gas and liquid hydrocarbons.

18. WELL RECORDS, LOGS AND REPORTS

18.01 Lessee shall keep a daily drilling record which will describe the formations penetrated, depth and volumes of water, oil, gas, and liquid hydrocarbons found while drilling each well on the leased premises. Any other data that is usually acquired in the normal procedure of drilling shall be recorded and furnished to Department, such as drilling time, rate of fill-up, lost circulation zones, caving strata, casing records, core analyses, mud log analyses, perforation,

and production test data. Within thirty (30) days after completion of each well, Lessee shall furnish Department an accurate location plat, a detailed lithologic log, a detailed history of the well, and all well data including geologic, driller, electrical, and any other well surveys made to obtain subsurface information. Upon request, samples of all formations penetrated and parts of cores taken, accurately labeled with the name of the well, and interval of depth shall be furnished to Department at Lessee's expense. If requested, Lessee shall ship a complete set of samples to the Pennsylvania State Geological Survey, 7th Floor, Highland Building, 121 South Highland Avenue, Pittsburgh, Pennsylvania 15206-3988, within thirty (30) days after completion of each well.

19. AUDITS

19.01 Lessee shall furnish to Department, at its request, the meter charts covering the production of each well on the lease. Department may keep such charts for examination for a period not to exceed ninety (90) days. Lessee shall furnish or secure for Department promptly any statements furnished to Lessee by any person or corporation to whom Lessee delivers for sale or transport any oil, gas, and other products produced from the leased premises.

19.02 Lessee further authorizes and directs any person, association, company, partnership, corporation, or other entity to whom it sells or furnishes oil, gas, and liquid hydrocarbons, produced from any well covered by this lease, to disclose and exhibit accounts and other instruments to representatives of Department at Department's request having to do with the transactions involving payments to Lessee, his heirs, administrators, executors, successors, and assigns for oil, gas and liquid hydrocarbons from wells covered by this lease.

19.03 Lessee further grants to Department the right, at any time, to examine, audit, or inspect books, records, and accounts of Lessee pertinent to the purpose of verifying the accuracy of the reports and statements furnished to Department, and for checking the amount of payments lawfully due under the terms of this lease. Lessee agrees to provide every aid or facility to enable such audit to be made by Department. If such audit should disclose any gross error or fraud by Lessee in payment of royalties, then Lessee shall pay the cost and expense of the audit together with the deficiency. However, in case of fraud by Lessee, such payments shall not preclude Department in its discretion from cancelling this lease upon delivery to Lessee of written notice of Department's intention.

20. LESSEE'S TERMINATION

20.01 Lessee may, at any time, or from time to time, surrender this lease or any portion thereof if Lessee is not then in default of any obligations under this lease; provided, however, that such surrender must be evidenced by written notice delivered to Department thirty (30) days prior to the effective date thereof, and that Lessee has performed all commitments with which Lessee is charged to the effective date of surrender. It is also agreed that any amount paid as an advance bonus or land rental, previous to the effective date of the surrender, shall be deemed liquidated damages due Department and shall be in no way prorated or subject to claim by Lessee for return to Lessee. The "FIRST

WELL" provision shall not be regarded or construed as a commitment or obligation under this paragraph.

20.02 In the event that producing wells are to be retained, Lessee shall be entitled to retain that drainage acreage attributable to each well as previously provided under Section 10. Lessee shall deliver to Department a release or releases in duly recordable form approved by Department. Lessee shall be relieved of all obligations thereafter accruing as to acreage surrendered and any rental thereafter coming due shall be reduced in the same proportion that the acreage covered hereby is reduced; provided, however, that Lessee shall not be relieved of any obligation which accrues prior to such surrender even if the result caused by Lessee's performance or failure of performance of an obligation or covenant does not manifest itself until after the date of surrender.

21. REMOVAL

21.01 Lessee shall have six (6) months after termination, abandonment, or surrender of the lease, or any part thereof, in which to remove all buildings, machinery, wells, equipment, structures, unused pipelines, rubbish, and debris resulting from Lessee's operations, to fill and level all pits, and to the extent practicable, to restore the property to the same condition as when received.

22. RELEASE

22.01 Lessee shall not be granted a final release from the terms of this lease until District Forester has met with Lessee's field engineer on the ground, inspected the premises, and received a signed statement of release from Department indicating the proper cleanup has been completed.

23. PLUGGING

23.01 Lessee shall properly and effectively plug all wells on the leased premises before abandoning, in accordance with the regulations of the Department's Bureau of Oil and Gas Management and all applicable laws of the Commonwealth. A copy of the plugging procedure approved by the Bureau of Oil and Gas Management shall be supplied to the Minerals Section, Bureau of Forestry. In addition to the above mentioned requirement, upon completion and plugging of a well, a permanent marker of concrete or any other marker approved by Department shall be erected over the well. The marker shall extend from ten (10) feet below the surface to at least two (2) feet above the surface. The name of the person, firm, company, or corporation by whom the well was drilled and the number of the well shall be stamped, cast, or otherwise permanently made a part of the marker. The erection of the marker shall in no way interfere with the vent pipe if one is required. Failure to comply with the above plugging requirements will be reason for cancellation of this lease and the posted bond will be forfeited in order that Department may properly plug the wells.

23.02 The plugging procedures, as herein stated, shall also include all shallow wells drilled in areas which are not coal productive and are not covered by the regulations of Department (Certificate of Plugging form may be obtained from Department's Bureau of Oil and Gas Management).

24. ABANDONMENT AND STORAGE RIGHTS

24.01 In the event the development of this lease demonstrates, in the opinion of Department, that this tract has potential value as a gas storage reservoir (no storage rights are demised to Lessee under the terms of this lease), the well, equipment, property, and casing involved shall first be offered to Department, its nominee or assignee, at the then fair market value of those items before any well shall be plugged. Such firm offer shall be made in writing to Department at least thirty (30) days prior to commencement of removal of the equipment from the well by Lessee.

25. DEPARTMENTAL TERMINATION

25.01 If Lessee shall fail or refuse to pay any rental or royalty due under the terms of this lease within thirty (30) days after demand in writing by Department, or if Lessee shall violate, or fail to perform any of the covenants or provisions of this lease, Department shall have the right to terminate the lease.

25.02 In case of default in the payment of any sum of money due under the provisions of this lease within thirty (30) days after demand in writing by Department or the breach of any other of the terms of this lease, Lessee hereby authorizes and empowers the Attorney General of the Commonwealth of Pennsylvania, or any attorney of any court of record to appear for it in an amicable action of ejectment for the leased premises above described, to be entered by the Prothonotary in which Department shall be plaintiff and Lessee defendant, and confess judgment therein in favor of the plaintiff and against the defendant for the leased premises and authorize the immediate issuing of a Writ of Possession waiving all stay and exemption laws and release of errors.

26. INDEMNITY

26.01 Lessee shall, at all times hereinafter, indemnify and save harmless Department from and against all detriment, damage, loss, claims, demands, suits, and expenses, or other claims of any kind whatsoever which Department may sustain, suffer, or be subject to directly or indirectly by reason of location, obstruction, presence, maintenance, renewal, or removal of the operations permitted by this lease or resulting therefrom.

27. BOND

27.01 Lessee agrees to give Department a surety or performance bond with satisfactory corporate surety in the principal sum of TWENTY-FIVE THOUSAND DOLLARS ($25,000.00) with judgment clause in a form to be approved by the Attorney General conditioned on the faithful performance of the covenants of this lease. The bond shall be further conditioned that, in the event Lessee shall fail to remove its equipment and machinery and properly abandon all wells upon termination of this lease, or within six (6) months from the termination, Commonwealth can execute upon the bond to pay for cost of removal of the equipment and machinery and proper abandonment of the well or wells. In addition, the bond shall be conditioned in favor of the Commonwealth for all

damages that may arise as a result of fires, accidents, or any other causes brought about by Lessee or Lessee's agents occupying the leased premises and in the use of all State Forest roads off the leased premises.

28. RELATED AGREEMENTS

28.01 Department will be furnished, for record purposes and to protect its interests, a copy of all agreements, contracts, letters or memoranda entered into, made, or sent to Lessee in any way concerning the development, operation, or sale of products from this lease.

29. ASSIGNMENTS

29.01 Lessee shall not use or allow to be used, the leased premises for any other purpose than authorized by this instrument and shall not assign or sublet the leased premises in whole or in part at any time or from time to time without the prior written consent of Department. Lessee shall make application to obtain such consent in writing accompanied by a plat to Department describing the land to be assigned and the interest therein if less than the whole, together with the interest retained by assignor. Assignee shall agree in writing to be bound by all of the terms and provisions of the lease and shall furnish a surety or performance bond satisfactory to Department. After Department has consented to the assignment, assignor shall be released from all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned; and assignee thereof shall, thereupon, be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned. In the event that a portion only of the leased premises is assigned, the default of any of the covenants, conditions, or obligations of this lease by one of the holders of a portion of the leased premises created by an assignment will not affect the interest of a party not in default.

30. LIMITATION ON WARRANTY

30.01 The Commonwealth is considered to be the owner of the oil and gas rights under the leased premises but makes no warranty as to the presence of oil and gas, nor as to its ownership thereof. In the event it is determined by compromise or by a final judgment of a court of competent jurisdiction that the Commonwealth does not have title to all or part of the oil and gas rights on the lands hereby leased, the royalties thereafter accruing from any part as to which this lease covers less than the full interest in such oil and gas rights, shall thereafter be paid only in the proportion which the interest therein, if any, covered by this lease bears to the whole and undivided fee simple estate therein; but any sums of money previously paid pursuant to the terms of the lease shall not be reimbursable to Lessee, except as hereinafter provided in this paragraph. In the event of an adverse claim to the premises affecting title to all or a portion of the oil and gas rights under the leased premises, notice of such claim will be given to Department which may, with the approval of the Attorney General, enter into an escrow arrangement for future royalties accruing to such disputed portion under terms and conditions that he feels proper to safeguard the rights and interests of the Commonwealth. In the event an adverse claimant files suit against the Commonwealth or against Lessee claimining title to all or a portion of the oil and gas rights under the leased premises, or if the Lessee, after receiving

notice of an adverse claim, institutes litigation in a court of competent jurisdiction to secure an adjudication of the validity of the claim, the royalties accruing to the litigated portion shall be placed in an escrow account until such time as the ownership of the disputed interest shall be determined by a court of competent jurisdiction. The royalties placed in escrow shall be refunded to Lessee in an amount proportionate to the outstanding title if it is finally determined by compromise or by a court of competent jurisdiction that all or part of such rights are not owned by the Commonwealth.

30.02 This proportionate reduction clause shall not apply to and shall not reduce the bonus payments or rents payable under this lease.

31. FORCE MAJEURE

31.01 This lease shall not be terminated, in whole or in part, nor shall Lessee be held liable for damages for failure to comply with express or implied covenants hereof if compliance therewith is prevented by, or if such failure is the result of any Federal or State laws, executive orders, rules, or regulations whether valid or invalid. If, at the end of the primary term hereof, such term has not been extended by production or drilling, as in this lease provided; and Lessee, by reason of any of the above recited causes, is unable to drill a well on the leased premises for oil and gas, the primary terms and the rental provision hereof shall be extended automatically from year to year for a period not to exceed ten (10) additional years, unless further extension is approved by Department so long as Lessee meets all requirements for payments of money and other obligations to Department; provided, however, upon the removal of such delaying cause, Lessee must commence operations within six (6) months after such removal. During any period that Lessee is unable to produce and/or market any products from the leased premises, by reason of any of the above recited causes, this lease shall remain in full force and effect.

32. THIRD PARTIES' RIGHTS

32.01 For the purposes of inspection, the people of the Commonwealth shall have the same access to the leased premises, to Lessee's facilities on the leased premises, and to relevant records as Department (representatives of the Bureau of Forestry) has hereunder, provided that such access to Lessee's facilities on the leased premises is limited to non-hazardous areas during normal business hours, upon written approval, when in the accompaniment of a representative of Lessee; and provided further that access to records shall be limited to those records which are non-confidential in nature.

33. PUBLICATION AND NOTICE

33.01 Within thirty (30) days following the receipt by Lessee of a copy of this lease, fully executed, Lessee shall record the lease in the county or counties in which the leased premises lie. Within thirty (30) days following the recording, Lessee shall advise Department, in writing, of the recording reference data. Thereafter, Department shall cause to be published in the Pennsylvania Bulletin at least the following information:

(1) the subject of this lease;

(2) the general location of the leased premises;
(3) the names of Department and Lessee; and
(4) the recording reference date for this lease.

34. LIABILITY

34.01 Lessee shall be alone liable and responsible for any pollution or other damage to any portion of the environment in or adjacent to the leased premises which occurs as a result or consequence of Lessee's occupation and use of the leased premises, irrespective of whether or not such pollution or damage be due to negligence or to the inherent nature of Lessee's operations, unless an independent intervening cause be found to be the sole proximate cause of the pollution or damage. In any action for civil damages brought under this section, there shall be a presumption that, but for Lessee's occupation and use of the leased premises, the pollution or other damage would not have occurred; it shall then be incumbent upon Lessee to come forward with evidence to rebut this presumption. Any action for civil damages on account of such pollution brought by Department against Lessee shall not bar Department from bringing other actions under the Clean Streams Law or other pertinent law, rule, or regulation of the Commonwealth.

35. RIGHTS RESERVED BY DEPARTMENT

35.01 Department reserves the right to use the leased premises in any and all respects not specifically limited by the terms of this lease.

35.02 Department reserves all minerals within the leased premises other than oil, gas and liquid hydrocarbons and shall have the right to lease those mineral rights to third parties insofar as Department is otherwise legally entitled to lease the same, subject to rights granted to Lessee under this lease.

35.03 Department reserves the right to approve, in writing, all plans for the construction upon the leased premises of structures, rigs, machinery, communication facilities, ways and roads, well locations, pipelines and equipment and for drilling of wells. Detailed written plans for any such construction shall be submitted to Department at least thirty (30) days prior to planned commencement of construction on the leased premises unless, upon due cause shown, Department waives the thirty (30) day requirement and allows a lesser, but reasonable, time for review.

35.04 The surface rights of Department shall be considered dominant and the oil and gas rights of Lessee servient. Any dispute between the parties hereto concerning surface use shall be resolved in favor of the interests of the public.

36. IDENTIFICATION OF WELL LOCATION AND WELLS

36.01 During drilling operation, a legible sign listing the name and address of the well operator, the permit number, the farm name and well number shall be placed in a conspicuous place near where the access road enters the well location.

36.02 The name of the operator and well number, legibly printed, shall be attached or painted on the pumping unit, wellhead or meter box of each well, in addition to a well number placed in a conspicuous place near where the access road enters the well location.

37. PROTECTION AND CONSERVATION

37.01 Lessee covenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS, identified as Exhibit "B", attached hereto and made a part hereof.

37.02 Lessee shall construct a fence around all potentially dangerous surface structures or equipment to prevent public access. District Forester shall have the discretion to order such fencing where protection of the public is deemed necessary. All equipment which is unguarded and unfenced shall be posted with hazard warning signs.

37.03 Lessee convenants and agrees to conduct all operations in such a manner as to comply with the provisions set forth in the OIL AND GAS LEASE ACCESS ROAD SPECIFICATIONS FOR STATE FOREST LANDS, identified as Exhibit "D", attached hereto and made a part hereof.

IT IS HEREBY MUTUALLY UNDERSTOOD AND AGREED that this agreement shall be legally binding on the parties hereto, their heirs, administrators, executors, successors, and assigns.

IN WITNESS WHEREOF, Department and Lessee have caused this agreement to be duly executed and have caused their seals to be hereto affixed and attached by their proper officers, all hereunto duly authorized, on the date first above written.

ATTEST:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

Nicholas DeBenedictis, Secretary

ATTEST:

TEXACO INC.

ASST. SECRETARY/~~TREASURER~~ (SEAL)

L. E. CASE, ATTORNEY-IN-FACT

APPROVED AS TO LEGALITY AND FORM:

OFFICE OF ATTORNEY GENERAL

APPROVED:

CHIEF/ASSISTANT COUNSEL
DEPARTMENT OF ENVIRONMENTAL RESOURCES

GOVERNOR

Recorded in the office for the recording of Deeds, etc in and for Centre County in RECORD Book No. 491 at page 422
17th day of April A. D. 19 87
Witness my hand and seal of office

Hazel M. Futer Recorder

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DAUPHIN

On this the 24th day of November, 1986 before me, a Notary Public, the undersigned officer, personally appeared NICHOLAS DeBENEDICTIS, who acknowledged himself to be Secretary of Environmental Resources of the Commonwealth of Pennsylvania; and that he, as such Secretary of Environmental Resources, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing his name as NICHOLAS DeBENEDICTIS, Secretary.

In Witness Whereof, I hereunto set my hand and official seal.

Kimberly L Dekoren
Notary Public

My Commission Expires:

Aug. 6, 1990

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

OIL AND GAS LEASE FOR STATE FOREST LANDS ATTACHMENT

EXHIBIT "A"

Attached to and made a part of Oil and Gas Lease for State Forest Lands, No. M-110706-10, by and between: COMMONWEALTH OF PENNSYLVANIA and TEXACO INC.

Tract 706

State Tract 706 containing 2760 acres of Sproul State Forest land comprising all of the Andrew Pettit, Blair McClanahan, George McClanahan, Jeremiah Jackson and William Gray, Jr. Warrants and overlapping Joseph Wallace and Thomas Hamilton Warrants and parts of the Charles Pettit, Robert Gray and William Brady Warrants in Burnside Township, Centre County, Pennsylvania, conveyed to the Commonwealth of Pennsylvania from Lillie C. Etters by deed dated December 12, 1928, from the Midland Mining Company by deed dated January 28, 1929, from the City of Philadelphia, Trustee Elias Boudinot by deed dated December 26, 1930 and from James H. Corl by deed dated August 22, 1906, and described as follows:

Beginning at the southeast corner of the George McClanahan Warrant, also being the southwest corner of the Ann McClanahan Warrant, also being a point on the Sproul State Forest boundary line; thence westward approximately 14,250 feet along the south lines of the George McClanahan, Blair McClanahan, Andrew Pettit and Charles Pettit Warrants to a point on the south line of the Charles Pettit Warrant; thence northward approximately 2475 feet within the Charles Pettit Warrant to a point within the Charles Pettit Warrant; thence eastward approximately 2640 feet within the Charles Pettit Warrant to a point on the east line of the Charles Pettit Warrant, also being a point on the west line of the Andrew Pettit Warrant; thence northward approximately 2991 feet along the west line of the Andrew Pettit Warrant to the northwest corner of the Andrew Pettit Warrant; thence eastward approximately 2500 feet along the north line of the Andrew Pettit Warrant to a point on the north line of the Andrew Pettit Warrant, also being the southwest corner of the Jeremiah Jackson Warrant; thence northward approximately 2808 feet along the west line of the Jeremiah Jackson Warrant to the northwest corner of the Jeremiah Jackson Warrant; thence eastward approximately 5280 feet along the north line of the Jeremiah Jackson Warrant to the northeast corner of the Jeremiah Jackson Warrant, also being the southwest corner of the Robert Gray Warrant; thence northward approximately 1564 feet along the west line of the Robert Gray Warrant to a point on the west line of the Robert Gray Warrant; thence northeastward approximately 4261 feet within the Robert Gray Warrant to a point on the north line of the Robert Gray Warrant, also being a point on the south line of the William Brady Warrant; thence north-northeastward approximately 4293 feet within the William Brady Warrant to the northeast corner of the William Brady Warrant; thence southward approximately 10,500 feet along the east lines of the William Brady, Robert Gray and William Gray Warrants to the southeast corner of the William Gray Warrant; thence westward approximately 1050 feet along the south line of the William Gray Warrant to a point on the south line of the William Gray Warrant, also being the northeast corner of the George McClanahan Warrant; thence southward approximately 5450 feet along the east line of the George McClanahan Warrant to the southeast corner of the George McClanahan Warrant, the place of the beginning.

(1-86)
Stipulation Form

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES

EXHIBIT "B"

STIPULATIONS FOR PROTECTION AND CONSERVATION
OF STATE FOREST AND PARK LANDS

The lands embraced in this lease or permit[1] are leased by the Commonwealth of Pennsylvania, acting through the Department of Environmental Resources, hereinafter designated as "Lessor" or "Department". Lessee or Permittee hereby agrees to the following stipulations:

1. ENVIRONMENTAL QUALITY CONTROL

1.01 Lessee shall take all necessary precautions and measures throughout the entire course of this lease to insure strict compliance with all pertinent laws and rules and regulations promulgated thereunder, whenever enacted, including: the Air Pollution Control Act, as amended (Act of January 8, 1960, P.L. 2119, 35 P.S. 4001, et seq.); the Clean Streams Law, as amended (Act of June 22, 1937, P.L. 1987, 35 P.S. 691.1, et seq.); the Solid Waste Management Act, as amended (Act 241, July 31, 1968); the Gas Operations Well Drilling Petroleum and Coal Mining Act, as amended (Act of November 30, 1955, P.L. 756, and known as the Act of the General Assembly No. 38); the Surface Mining Conservation and Reclamation Act, as amended (Act of May 31, 1945, P.L. 1198).

1.02 Notwithstanding any provision in this lease, Lessee shall be held liable by the Commonwealth of Pennsylvania, or any agency of the Commonwealth, for the violation of any relevent laws, rules and regulations.

1.03 Before any mining, drilling or quarrying, Lessee shall acquaint itself with all of the applicable rules and regulations governed by each respective Act.

1.04 Prior to undertaking actual mining, drilling or quarrying, Lessee shall confirm, in writing, to Lessor that he has reviewed and thoroughly understands the applicable requirements as contained in each of the aforementioned Acts.

1.05 During mining, drilling or quarrying, Lessee shall comply with all of the current applicable rules and regulations of the foregoing Acts. Where any of the rules and regulations differ concerning abatement of pollution, the more stringent rule shall apply.

[1]When a lease is granted, it shall be understood that the terms "lease" and "Lessee" shall apply; when a permit is granted, it shall be understood that the terms "permit" and "Permittee" shall apply.

1.06 Lessee shall, at all times, perform its work in such a manner as to substantially minimize the possibility of polluting the air, land, or bodies of water with any materials harmful to the environment.

1.07 As development of the leased premises progresses and unforeseen circumstances arise that were not evident during the design, emergency pollution control programs may be put into effect immediately. In such cases, instructions will be issued by Lessor and will be carried out by Lessee.

1.08 The Air Pollution Control Act of the Commonwealth prohibits the burning of any refuse, rubbish, brush, etc. in the designated air basins of the State, except by approval of the Department of Environmental Resources' respective Regional Air Pollution Control Engineer. Other emissions into the atmosphere are not permitted if they are injurious or hazardous to people, animals or vegetation.

1.09 Lessee shall strictly adhere to all rules and regulations for collection, removal, transportation, and disposal of solid wastes. Littering of the leased premises will not be permitted.

1.10 The discharge of wastes to streams within the Commonwealth will not be permitted unless such discharges meet the standards of the Department of Environmental Resources.

2. PROTECTION OF PROPERTY AND OPERATIONS

2.01 Lessee shall not use or allow to be used the State Forest lands for any other purpose than that authorized by this lease. District Forester[2] will be advised when operations begin and end. Any changes in the original plans, which may be necessary subsequent to the beginning of operations, must be approved by District Forester and Lessor.

2.02 Permission to remove overburden must first be obtained from District Forester who will designate the extent of such removal.

2.03 Lessee shall carry out no actual mining, quarrying, excavating, drilling, or stripping operations within sight of publicly traveled roads, as indicated by District Forester.

3. PUBLIC LAND USE

3.01 Lessee hereby recognizes and admits that the leased premises are dedicated to the purposes set forth in Environmental, Health, Park, Fish and Game Laws, and Rules and Regulations and Department's Forest Resource Plans promulgated thereunder and Lessee agrees to conduct operations with deference to such purposes.

[2]When this lease is granted in whole or in part on State Park land, then the words "District Forester" shall be understood to mean "Park Superintendent", whenever the words appear in the lease and State Park lands are involved.

4. HUNTING AND FISHING

4.01 Employees of Lessee, its agents, contractors and subcontractors, and employees of contractors and subcontractors shall not engage in hunting or fishing upon said land, except as permitted by law, and shall not injure or destroy wildlife and fish.

5. ANIMALS

5.01 Lessee shall prevent access of animals to pits or excavations dug for Lessee's operations by erecting, maintaining fences, or by other means approved by Department.

6. SLUSH PIT

6.01 Each slush pit will consist of two compartments; one to contain fluids from the drilling operations and the second to contain surface runoff from the drilling site. Unless authorized by Department, all slush pits will be located at approximately the same elevation as the drilling site. Depending on the topography and slope conditions, the slush pit to contain surface runoff may be located below the drilling site and at a safe and reasonable distance from the stream in which the effluent will be discharged. The slush pit used to contain drilling fluids, mud, and water will be lined with plastic so that no escape of these fluids will occur. If said fluids contain oil or other chemical substances which are harmful to the forest environment, Lessee shall transport these fluids from State Forest lands for disposal. All trash, rubbish, or waste materials from each drilling site will be stored in one area and may be disposed of in the slush pit prior to restoration. All pits shall be filled with earth and leveled at Lessee's expense upon completion of each well. However, nothing in this paragraph shall be construed to permit a violation of any laws, rules and regulations of the Commonwealth.

6.02 Before any operations commence, the location, design, construction, and maintenance of any slush pit must be approved by Lessor. Pollution potential and aesthetics shall be among the factors to be considered by Lessor.

6.03 If drilling operations are conducted by air, gas, or airfoam, Lessee shall also provide sufficient means by which dust and/or foam dispersal are abated, kept to a minimum, and shall not become a nuisance.

7. SILTATION

7.01 Lessee realizes that, as a result of its operation, large areas of land which will be cleared to provide for compressor stations, pipeline rights-of-way, and drilling sites, and which will be exposed to the forces of erosion for varying periods of time, could create siltation to nearby streams. Lessee agrees, therefore, to regrade such areas immediately and reseed to either temporary or permanent grasses. Any other type of remedial work necessary to prevent erosion on such areas shall be performed by Lessee.

7.02 Lessee shall, upon initial construction of all drilling sites, restore all highwalls and reseed said highwalls and downslope embankment of each drilling site immediately. Department's representative shall be consulted for final design and approval of each drilling site prior to final restoration.

7.03 Lessee's contractors and subcontractors shall not construct earthen dams across any stream to obtain a water supply for its operations unless approved by Lessor.

7.04 Lessee shall, on pipeline rights-of-way and access roads, construct water bars or similar diversion channels to carry surface runoff away from the rights-of-way and roads to prevent siltation. During construction, if excess siltation is expected, Lessee shall construct a settling basin at the base of the right-of-way or road to impound runoff and allow sediments to settle prior to discharge into nearby streams.

7.05 Lessee shall construct all access roads to all drilling sites along existing pipeline rights-of-way, which are built to service the drilling site, provided that a ten percent (10%) grade can be maintained. All road locations and grades must be approved by District Forester as provided hereunder. All roads will be maintained in a passable condition.

8. WATERS

8.01 Without prior approval of Department, Lessee shall not locate any bore or core hole or any part of rig or slush pit within one hundred (100) feet of any stream or body of water on State Forest lands, and hereby agrees to prevent the contamination or pollution of springs, brooks, streams, or other waters on these lands in any manner whatsoever, by such means and measures as may be lawfully required by the Environmental Quality Board of the Commonwealth of Pennsylvania or its successors in function. Lessee shall be familiar with and abide by all rules and regulations of the Environmental Quality Board and shall promptly, when ordered by the Environmental Quality Board, comply with any specific rulings concerning its operations.

8.02 Where construction, operation, or maintenance of any of the facilities on or connected with this lease causes damage to the watershed or pollution of the water resources, Lessee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by an authorized representative of Department and to pay for any and all damage or destruction of property, fish, and wildlife resulting from operations under this lease.

8.03 The cost of said property, wildlife, or fish destroyed shall be determined by Department, Pennsylvania Game Commission, or Pennsylvania Fish Commission using recognized procedures to establish the value of damage.

8.04 Upon termination of drilling or producing operations, Lessee shall obtain a certificate from Department certifying that it has complied with all requirements of law and that it has taken all necessary measures to prevent any future contamination or pollution of waters as a result of its operations. Lessee

shall continue to be liable for any such damages up to one (1) year after the cessation of operations under the provisions of this lease.

9. FOREST GROWTH

9.01 Lessee shall not cut, injure, destroy, or remove any forest growth, except that which shall be absolutely unavoidable in conducting its operations and shall obtain prior approval of District Forester ninety (90) days before removal is to be commenced. The full ninety (90) days prior notice may be reduced upon the discretion of District Forester.

9.02 Lessee, under direction of Department, shall remove all tree tops, limbs, brush, slash and any other forest growth not to be sold or utilized by Department or Lessee which have resulted from clearing operations from strip mine sites, well sites, access roads, pipeline rights-of-way, and other construction sites.

9.03 Lessee shall bury or dispose of all tree stumps and large rocks resulting from its clearing and construction operations using a plan approved by District Forester.

9.04 Lessee shall pay Department for all forest growth cut or injured on State Forest land as a result of Lessee's operations, regardless of the ownership of the oil, gas, mineral or surface support rights. Even though the Department has been paid for the damage by Lessee, the title to all forest growth will still belong to the Commonwealth, except as provided in paragraph 9.06(a). Damage is defined as the cutting or injuring of the forest growth by clearing a site so that men and equipment can be brought onto the location to establish a base from which Lessee may undertake its operation.

9.05 Prior to the clearing of the forest growth by Lessee, District Forester will mark and/or designate the area from which forest growth will be removed. The value of the forest growth that will be cut or damaged for the clearing of a road, drilling site, or area to be mined, will be determined by Department based upon timber type, size and market data, or upon replacement value for young stands or plantations. Lessee shall then be invoiced for the value, as determined by Department. Payment to Department of said invoice must be made before any forest growth may be cut or damaged.

9.06 Lessee shall pay for said damages by one of the following methods:

(a) Lessee shall pay for the forest growth damage at two (2) times its value, as determined by Department; the forest growth shall then become Lessee's property, which then may be removed and sold by Lessee as job requirements dictate. Upon termination of this Agreement, ownership of any forest growth, not removed and sold by Lessee under this subsection, shall revert to Department.

(b) Lessee shall pay for the minimum value of the forest growth damage and must notify District Forester at least

ninety (90) days in advance of Lessee's need to occupy a cleared forested site for its operations. With sufficient lead time, District Forester shall mark and/or designate, advertise, and offer for sale and removal to the highest bidder, the computed forest growth volume located within the affected area. If time does not permit the sale of the forest growth by District Forester, Lessee shall then cut the forest growth to District Forester's specifications and shall stockpile the forest growth at specified locations, as determined by District Forester, for later disposal and/or sale.

9.07 Lessee shall, upon completion of its operations and at its own expense, secure and plant with grasses and/or trees or shrub seedlings and/or game foods all strip mine sites, well sites, access roads, pipeline rights-of-way and other cleared areas using a plan approved by District Forester.

9.08 Lessee shall make full compensation to Department at three (3) times the value of such forest growth cut, injured, destroyed, or removed, to be computed by Department should additional damage result at any time from the work incident to this lease or the construction, operation, maintenance, or removal of facilities not herein contemplated or specifically mentioned, but which may occur as a result of said work or facilities, or should any forest growth be cut, injured, destroyed or removed prior to payment thereof under paragraph 9.05 hereof.

10. FIRE

10.01 Lessee's employees, agents, contractors and subcontractors, and employees of contractors and subcontractors shall do everything within their power to prevent or suppress forest fires and shall not allow fires to be set on or adjacent to State Forest lands by Lessee, his agents, contractors and subcontractors, and employees of contractors and subcontractors, except in pursuance and in accordance with the conditions prescribed in the permission first obtained from District Forester fixing the time, place, and manner of burning. The burning of refuse, brush, slash, debris, or other materials, upon approval of District Forester, shall be so conducted that no living forest growth is damaged or killed.

10.02 Should any fire set by Lessee or any of the persons mentioned above escape in any manner or damage any State Forest land or other property, Lessee shall be liable for all such damages resulting from such escape and for all costs incurred by Department in fighting such fires; and Lessee's officers, agents, and employees in the vicinity, as well as contractors and subcontractors, shall with such assistance as Lessee may have at hand, or be able to summon, render aid in fighting said fire without cost to the Commonwealth.

10.03 Lessee further agrees that during periods of abnormal forest fire danger, District Forester may suspend all or part of the drilling, or other operations on all or part of the State Forest lands until the forest fire danger subsides.

10.04 Lessee, or its employees, shall report promptly all forest fires detected by them to District Forester.

11. REPLACEMENT AND REPAIR OF IMPROVEMENTS

11.01 Lessee shall replace or repair, as Department may direct, all State Forest signs, markers, corners, fences, other structures, and service utility lines, owned or used by Department which cross or otherwise lie within the State Forest lands destroyed or damaged in any work incident to this lease.

12. ROADS, QUARRY AND DRILLING SITES

12.01 Lessee shall not construct any roads, clear any quarry or drilling sites, or excavate any trenches without prior written approval from District Forester, who shall set forth the type and grade of roads, trenches and area to be cleared. The access roads shall be held to a maximum grade of ten percent (10%). However, if steeper grades are necessary, written approval must be obtained from District Forester prior to their construction. Any roads built at the expense of Lessee in its operations shall not be removed or destroyed and shall become a part of the road system of the State Forest lands.

12.02 Lessee recognizes that all roads and trails owned or maintained by Department, which are used in the execution of this lease, were constructed and improved for the use of Department and for the general public having business in and making use of State Forest land. Lessee, therefore, agrees that its operations will not be conducted in such a manner as to prevent, hinder, or obstruct the customary use of such roads and trails by Department or by the public.

12.03 Where roads built by Lessee cross any fence, Lessee shall construct a gate and keep it closed except when the passageway is in use. Lessee shall keep all said roads and trails free at all times from obstruction by logs, brush, or debris resulting from Lessee's operation. District Forester may require Lessee to temporarily discontinue the use of said roads whenever, in his opinion, such action is necessary to prevent their serious damage.

12.04 Upon termination of this lease, Lessee shall repair said roads and trails and leave them in as good condition as at the beginning of this lease of which condition Department shall be the sole judge. In addition, Lessee shall make any repairs to said roads and trails deemed necessary by District Forester to insure adequate and proper drainage, road surface conditions, horizontal alinement, and cross slope.

12.05 Lessee, in its operations, is hereby granted the right to use all State Forest roads, both on or off the leased premises, provided that Lessee agrees to obtain prior written approval from District Forester and to repair any damage to all State Forest roads, on or off the leased premises, when such damage is caused by Lessee's operations; provided, however, if in the opinion of the District Forester in charge, the roads or portions thereof are used by others sufficiently to warrant the apportionment of the maintenance costs, then Lessee may be relieved of the burden of sole maintenance and be required to provide only Lessee's proportionate share as decided by Department through District Forester.

12.06 It is understood that the bond required, under the terms of this lease, shall cover the use and repair of all State Forest roads on or off the leased premises.

12.07 Lessee recognizes the rights and privileges afforded to Grantees by rights-of-way and other agreements executed with Department, prior to this lease, which cross or otherwise lie within the area of this lease; and, therefore, agrees to relocate at Lessee's own expense, all portions adversely affected by work incident to this lease in accordance with the then current rules and orders of the Public Utility Commission of the Commonwealth of Pennsylvania. In the event the Public Utility Commission does not have any jurisdiction, any necessary relocation shall be completed subject to the approval of Grantor.

13. BUILDINGS

13.01 Lessee shall not drill any bore or core hole, carry on operations, make excavations, or otherwise disturb the surface of the lands within two hundred (200) feet of any building. However, if a lesser distance to any building is needed, written approval must be obtained from District Forester, or from the owner of the building if not the property of the Commonwealth.

13.02 Lessee shall consult with District Forester and obtain written approval prior to the construction and erection of any storage facilities, buildings, work sheds or any other physical structure upon State Forest lands outside of the leased premises.

14. APPEARANCE

14.01 In its appearances hereunder, Lessee shall, at all times, maintain State Forest lands in a neat and presentable manner, removing all rubbish and debris as it accumulates and restoring each individual area within thirty (30) days to as near as possible its original condition when its use is abandoned.

15. EXPLOSIVES

15.01 Lessee shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during periods of fire danger unless permission is granted by District Forester.

15.02 Explosives shall not be used in fish spawning or rearing areas, and/or nesting areas of wildlife concentration, during periods of intense activity or at any other time or in any manner that might damage any wildlife resource.

16. RESTORATION AND REVEGETATION

16.01 Restoration and revegetation shall be accomplished in accordance with Lessee's approved reclamation plan under the Surface Mining Conservation and Reclamation Act. However, should Lessee not qualify for licensing under this Act, as amended, then Lessee shall comply with Sections 16.02, 16.03 and 16.04 as described hereafter which provides for restoration and revegetation of all areas disturbed by Lessee.

16.02 Upon completion of drilling, mining, quarrying, excavating, stripping, or any other operation, the surface of the site shall be backfilled to as near as possible to the original contour of the surface. Where necessary, the top of the highwall shall be graded into the drill, mine, quarry, excavation, strip, or any other site area, so that all safety hazards to both humans and wildlife have been eliminated and the highwall restored to a safe and reasonable grade. Department shall be the sole judge as to what is safe and reasonable. If terraces or benches are present upon completion of operations or if restoration of the drill site, mine site, quarry site, excavation site, strip site, or any other site, is enhanced by such terraces or benches, the terraces or benches, upon approval of Department, may be cut into the highwall or left standing. The backfill material from the drilling, mining, quarrying, excavating, stripping, or any other operation, shall be graded to form a gradual slope away from the highwall and all peaks and ridges shall be leveled so that water shall not accumulate in pools over the restored area.

16.03 Upon completion of drilling, mining, quarrying, excavating, stripping, and backfilling of an area or any portion thereof and after backfilling has settled so as to provide an acceptable planting site, Lessee shall revegetate all disturbed or cleared areas. Such revegetation is to be done according to a planting plan prepared by Department. Lessee guarantees an establishment of not less than an average of five hundred (500) live and growing trees per acre one (1) year after date of planting. If area is planted in grasses, or shrubs, or trees and grasses, Lessee shall guarantee an establishment of sixty-five percent (65%) survival of said grasses or shrubs one (1) year after date of planting. If such growth has not resulted, Lessee shall replant such areas unless, in the opinion of Department, the lack of a satisfactory growth was due to soil conditions or other causes beyond the control of Lessee. Department shall be the sole judge in determining if replanting is required and shall notify Lessee in writing of areas to be revegetated. This provision may be waived by Department upon the recommendation of District Forester.

16.04 Restoration and revegetation plans of Lessee must be approved in advance of any operations by Department or its representatives. Department shall have the sole right to determine the time of backfilling and revegetation.

17. WATER WELLS

17.01 Any plan by Lessee for the drilling of water wells on State lands, and use of any water found, must be approved in writing by Department.

17.02 A final plat will be submitted within thirty (30) days after completion of each water well showing exact location, elevation, depth of well, formations penetrated and depth, type of shows, and volume of water or hydrocarbons present.

17.03 Lessee further agrees to supply Department with any other records, memoranda, accounts, reports, cuttings, cores, or other information relative to the drilling, completion, or operation of water wells on the above described premises. This will include true copies of any electrical or radioactivity surveys made in the wells.

17.04 Lessee shall be familiar with and comply in every respect with the provisions now existing or hereafter enacted of the Water Well Drillers License Act 610 of May 29, 1956 (P.L. 1840), providing for the orderly development of the ground water resources of the Commonwealth of Pennsylvania.

18. PIPELINES

18.01 Lessee shall refill to contour all ditches or other excavations caused by the construction, operation, maintenance or removal of pipelines; construct cross ditches; lime, fertilize and seed or replant the right-of-way; keep the pipeline and right-of-way in good repair and appearance, and take such other measures as may be deemed necessary by Department to control erosion and sedimentation and to maintain or restore the natural and aesthetic values as directed by Department.

19. RARE AND ENDANGERED SPECIES

19.01 If in the course of his operations, Lessee encounters any fauna or flora listed on federal or state registers of threatened or endangered species, or habitat critical to their survival, Lessee shall immediately cease operations and contact the District Forester so that arrangements can be made with Bureau of Forestry specialists to field check the site to make all necessary preparations to protect and preserve the fauna and flora which may be endangered.

20. HISTORICAL AND ARCHAEOLOGICAL SITES

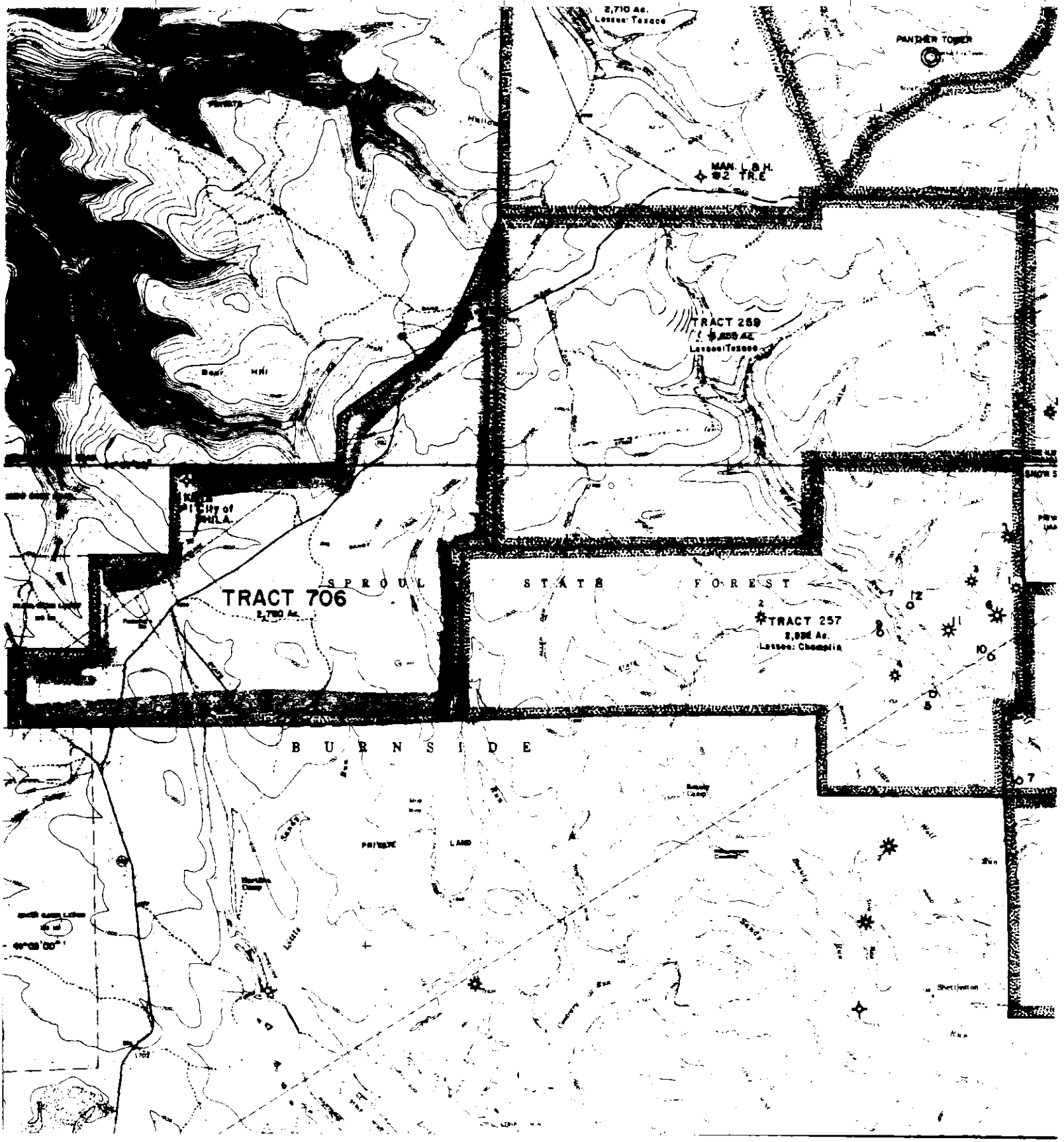
20.01 If in the course of his operations, Lessee encounters any historical or archaeological sites, Lessee shall immediately cease operations and contact the District Forester so that arrangements can be made with Bureau of Historical Preservation specialists to field check the site to make all necessary preparations to protect and preserve the artifacts which may be endangered.

21. CONTACT WITH STATE AGENCIES

21.01 Lessee shall periodically contact the following State agencies or their successors to keep informed on up-to-date information, policies, rules and regulations applicable to this lease.

Department of Environmental Resources	Brief Statement of Agency's Jurisdiction
Bureau of Forestry, Minerals Section P.O. Box 1467 Harrisburg, Pennsylvania 17120 (717-787-4835)	Leasing programs, terms, policies and geophysical regulations for State owned land and waters. Rare and endangered species.
District Forester Forest District (where applicable) Park Superintendent State Parks (where applicable)	Restoration and replanting of leased premises, timber damages, location of well sites, rights-of-way, roads, etc.
Bureau of Solid Waste Management P.O. Box 2063 Harrisburg, Pennsylvania 17120 (717-787-9870)	Disposal of water polluting materials and hazardous industrial wastes
Bureau of Air Quality Control P.O. Box 2063 Harrisburg, Pennsylvania 17120 (717-787-9702)	Blowing gas wells and air drilling, burning of waste materials, trash, etc.
Bureau of Soil & Water Conservation Regional Office (where applicable) or P.O. Box 1467 Harrisburg, Pennsylvania 17120 (717-787-5267)	Soil Erosion & Sedimentation Control Plan
Bureau of Water Quality Management P.O. Box 2063 Harrisburg, Pennsylvania 17120 (717-787-2666)	Slush pits, siltation, pollution, etc. Disposal of produced water; notification of fires, breaks, leaks, spills or blowouts
Bureau of Dams and Waterway Management Division of Waterways and Storm Water Management P.O. Box 2357 Harrisburg, Pennsylvania 17120 (717-783-1384)	Locating structures or pipelines in streams, rivers and lakes. Crossing streams - impoundment of stream for water supply
Bureau of Topographic & Geologic Survey Division of Oil & Gas Geology 7th Floor, Highland Building 121 South Highland Avenue Pittsburgh, Pennsylvania 15206-3988 (412-665-2155)	Instructions before sample delivery

Bureau of Oil & Gas Management 7th Floor, Highland Building 121 South Highland Avenue Pittsburgh, Pennsylvania 15206-3988 (412-665-2900)	Oil and gas regulations and enforcement (drilling permits, plugging, etc.)
Bureau of Mining and Reclamation P.O. Box 2357 Harrisburg, Pennsylvania 17120 (717-787-5103)	Regulations and enforcement (when drilling in coal areas); blasting, seismic surveys, etc.
Pennsylvania Fish Commmission Executive Director P.O. Box 1673 Harrisburg, Pennsylvania 17120 (717-657-4515)	Regulations for the protection of fish life
Pennsylvania Game Commission Executive Director P.O. Box 1567 Harrisburg, Pennsylvania 17120 (717-787-3633)	Regulations for the protection of wildlife
Pennsylvania Historical and Museum Commission Executive Director P.O. Box 1026 Harrisburg, Pennsylvania 17120 (717-787-2891)	Protection and documentation of historical and archaeological sites.



LEGEND

- STATE FOREST BOUNDARY
- STATE PARK BOUNDARY
- WILD/NATURAL AREA BOUNDARY
- CHUCK KEIPER TRAIL
- TRACT BOUNDARY
- GAS WELL
- DRY HOLE

(Nondev)	TRACT NO. 669	68 Ac.
	TRACT NO. 691	2,554 Ac.
	TRACT NO. 696	6,524 Ac.
	TRACT NO. 700	1,581 Ac.
	TRACT NO. 706	2,760 Ac.
	TRACT NO. 707	2,050 Ac.
	TRACT NO. 708	1,627 Ac.
	TRACT NO. 709	1,333 Ac.
	TRACT NO. 710	1,829 Ac.

AREA OF MAP

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF RESOURCES MANAGEMENT
MINERALS SECTION - BUREAU OF FORESTRY

REVISIONS
10/30/85 WIL

OIL & GAS TRACTS
669, 691, 696, 700 & 706 THRU 710
SPROUL STATE FOREST

CENTRE CO. — BURNSIDE TWP
CLINTON CO. — NOYES, BEECH CREEK } TWPS.
GRUGAN, CHAPMAN }

J.T. WALKER, P.R. MYERS

MAY 1985

SCALE 1" = 4,000'

0 2000 4000 6000 8000 10,000 12,000 FEET

N.E., HOWARD N.W., SNOW SHOE S.E., HOWARD, & PARTS OF KEATING, RENOVO WEST, RENOVO EAST GLEN UNION SNOW SHOE N.W., FARRANDSVILLE, SNOW SHOE, & BEECH CREEK 7 1/2' TOPO QUAD'S

EXHIBIT (C)

BOOK 481 PAGE 457

APPENDIX J
Wetland and Watercourse Reports

Wetland Investigation & Delineation Report

COP 324 Well Site

Hess & Fisher Engineers, Inc.

Girard Township
Clearfield County, Pennsylvania

Water's Edge Hydrology, Inc.

Report Date: July 18, 2011

Wetland Investigation & Delineation Report

COP 324 Well Site

Girard Township
Clearfield County, Pennsylvania

Prepared for:

Hess & Fisher Engineers, Inc.
36 North Second Street
Clearfield, Pa, 16830

Prepared by:

Water's Edge Hydrology, Inc.
PO Box 868
Clearfield, Pa, 16830

Principal Investigators:

Terry A. Rightnour, PH, PWS

Tomas Pluto, PhD

Report Date: July 18, 2011

TABLE OF CONTENTS

INTRODUCTION

FIELD METHODOLOGY

RESULTS

REFERENCES

TABLES AND FIGURES

Table 1: Summary of Wetlands on Site

Figure 1: Project Location Map
Figure 2: COP 324 Aerial Photography of Project Area
Figure 3: COP 324 National Wetlands Inventory Map of Project Area
Figure 4: Key to NWI Classifications
Figure 5: COP 324 Soils and Hydric Ratings within the Project Area
Figure 6: COP 324 Map of Study Area and Delineated Wetlands

APPENDICES

Appendix A: Wetland Determination Data Form
Appendix B: Site Photographs

INTRODUCTION

Water's Edge Hydrology, Inc. (Water's Edge) was retained by Hess & Fisher Engineers, Inc. to conduct an investigation of wetlands in the vicinity of the proposed COP 324 natural gas well pad located on Moshannon State Forest Lands in Girard Township, Clearfield County, Pennsylvania. The location of the wetland study area is shown on Figure 1, with site aerial photography shown by Figure 2. The purpose of this investigation was to identify and delineate wetlands that occur within the proposed well pad and access route. The study was specific to these areas and did not cover the full extent of the property.

The study area included approximately 9.5 acres of open mature forest surrounding a reclaimed shallow natural gas pad. Prior to the field study, the U.S. Fish and Wildlife Service, Division of Habitat and Resource Conservation, Wetlands Geodatabase, Wetlands Mapper was used to identify mapped National Wetlands Inventory (NWI) wetlands in the vicinity of the study area. Figure 3 shows the results of this review, with a key to the abbreviations provided by Figure 4. Soils information was obtained from the Web Soil Survey 2.0 National Cooperative Soils Survey for Clearfield County. Figure 5 shows the soils hydric rating map for the study area and the hydric characteristics of the individual map units.

FIELD METHODOLOGY

The investigation was a field review of the study area as flagged by Hess & Fisher Engineers. The perimeter of the study area was walked by the investigators and traverses were made internal to the boundary to observe habitat conditions that could be considered potential wetland areas. Where potential wetlands were observed, verification, identification and delineation followed the Routine method described in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987) as applied using the *Eastern Mountains and Piedmont Regional Supplement* (Environmental Laboratory, 2010). Vegetation, hydrology, and soils were characterized from a representative location (plot) within the wetlands, and data were recorded on a Wetland Determination Data Form contained in Appendix A of this report. Wetland boundaries were marked by sequentially numbered flags and subsequently surveyed by Hess & Fisher Engineering. Color photographs, included in Appendix B, were taken of representative wetland and upland areas to document site conditions at the time of the study.

The wetland investigation was conducted on June 1, 2011 by Terry A. Rightnour and Tom Pluto of Water's Edge. Mr. Rightnour is a certified Professional Wetland Scientist with over 20 years of experience in the jurisdictional delineation of wetlands in Pennsylvania. Dr. Pluto has 25 years of wetland experience as a representative of the U.S. Army Corps of Engineers.

RESULTS

The investigation found that the site is primarily forested uplands except for the restored shallow gas well pad located in approximately the center of the study area. The NWI survey showed no mapped wetlands in the vicinity of the study area. All of the soils in the study area are rated as non-hydric. However, the investigation identified four (4) small, isolated depressions within the restored gas pad area that meet the definition of jurisdictional wetlands based on observed vegetation, local soil conditions, and evidence of hydrology. These wetland areas are clearly man-made and exist primarily as local depressions in the landscape that collect and retain water for a sufficient period during the growing season to create hydric soil conditions and support wetland plants. While there are drainage patterns that suggest a hydrologic connection between Wetlands A, B, and C during periods of heavy precipitation, the plant community between the pockets was insufficient to consider the three areas as a single wetland complex.

As shown on Figure 6, the four wetland areas total 1,522 square feet. Table 1 provides a summary of each wetland area in terms of size, Cowardin Classification, and interpreted Corps of Engineers (COE) jurisdictional category.

Table 1: Summary of Wetlands Identified on Site

Wetland ID	Square Feet	Cowardin Classification	Interpreted COE Jurisdictional Category
A	358	**PEM**	Isolated
B	210	**PEM**	Isolated
C	854	**PEM**	Isolated
D	100	**PEM**	Isolated

BOLD Letters indicate predominant Wetland Classification

REFERENCES

COE Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

COE Environmental Laboratory. 2010. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region. Technical Report 10-09, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Dept. of the Interior, Fish & Wildlife Serv., FWS/OBS-79/31, Washington, DC. 103pp.

Little, Elbert L. 1987. The Audubon Society Field Guide to North American Trees – Eastern Region. Alfred A. Knoph, Inc., New York, NY.

Munsell Color. 1975. Munsell Color Charts. Kollmorgen Corp., Baltimore, MD.

Niering and Olmstead 1988. The Audubon Society Field Guide to North American Wildflowers – Eastern Region. A. Knoph, Inc., New York, NY.

Reed, P. B., Jr. 1988. National List of Plant Species That Occur in Wetlands: 1988 – Northeast (Region 1). U.S. Dept. of Inter., Fish & Wildlife Serv., National Wetlands Inventory. NERC-88/18.38. St. Petersburg, FL.

Sabine, B.J. editor 1992. National List of Plant Species That Occur in Wetlands: Northeast (Region 1). U.S. Dept. of Inter., Fish and Wildlife Serv. in cooperation with the National and Regional Interagency Review Panels. Grand Haven, Michigan.

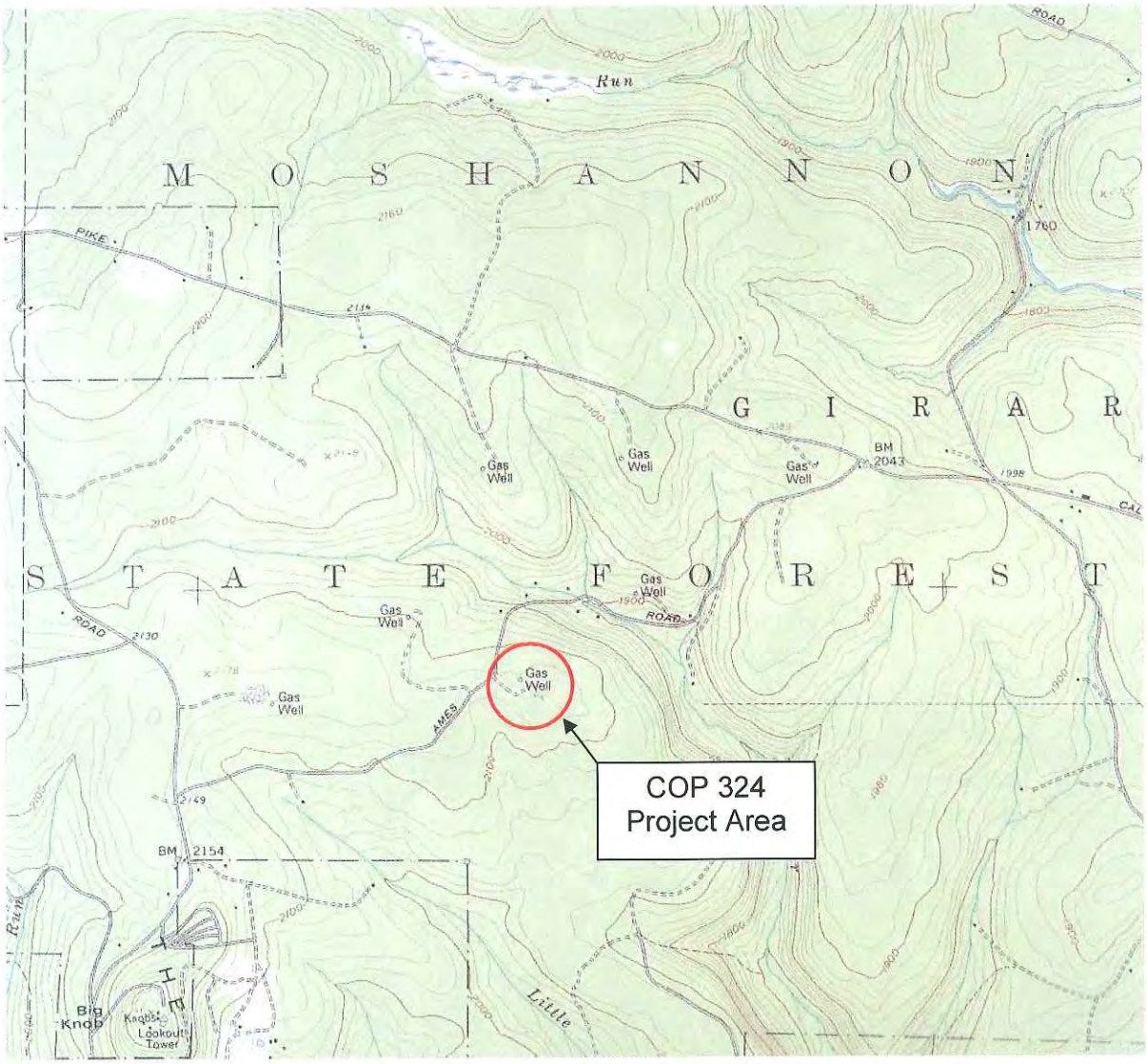
Tiner, R. W., Jr. 1988. Field Guide to Nontidal Wetland Identification. Maryland Dept. Natural Res., Annapolis and U.S. Dept. Inter., Fish & Wildlife Serv. Coop. publ.

USDA United States Department of Agriculture, Natural Resource Conservation Service, Plants Database, http://plants.usda.gov/

USDA Natural Resources Conservation Service, Web Soil Survey National Cooperative Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

U.S. Fish and Wildlife Service, Division of Habitat and Resource Conservation, Wetlands Geodatabase, Wetlands Mapper. http://wetlandsfws.er.usgs.gov/NWI/index.html

Willams, Arthur E. 1992. Clarification and Interpretation of the 1987 Manual. Department of the Army. Memorandum. 4pp.

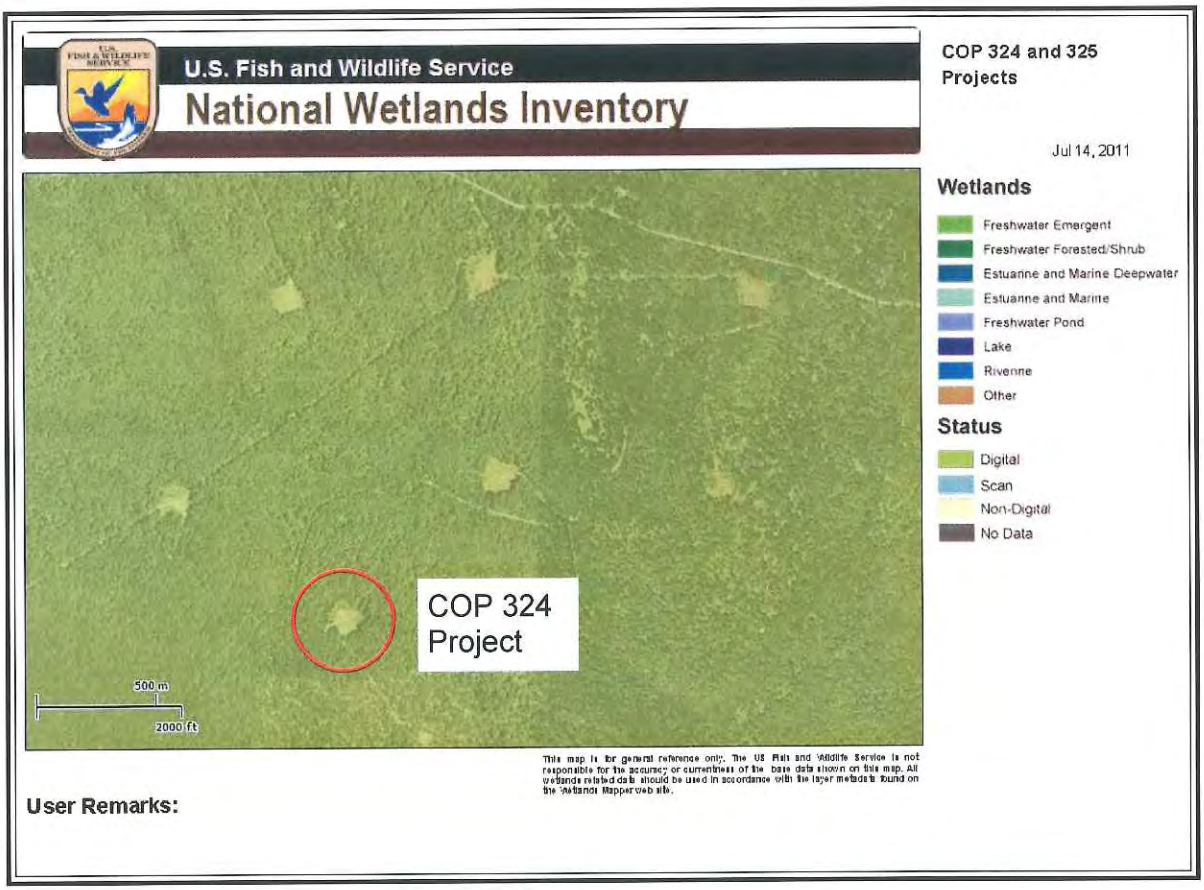


Base Map Source: The Knobs PA 7 1/2' USGS Quadrangle Map

Figure 1: Project Location Map

Map Source: Google Earth

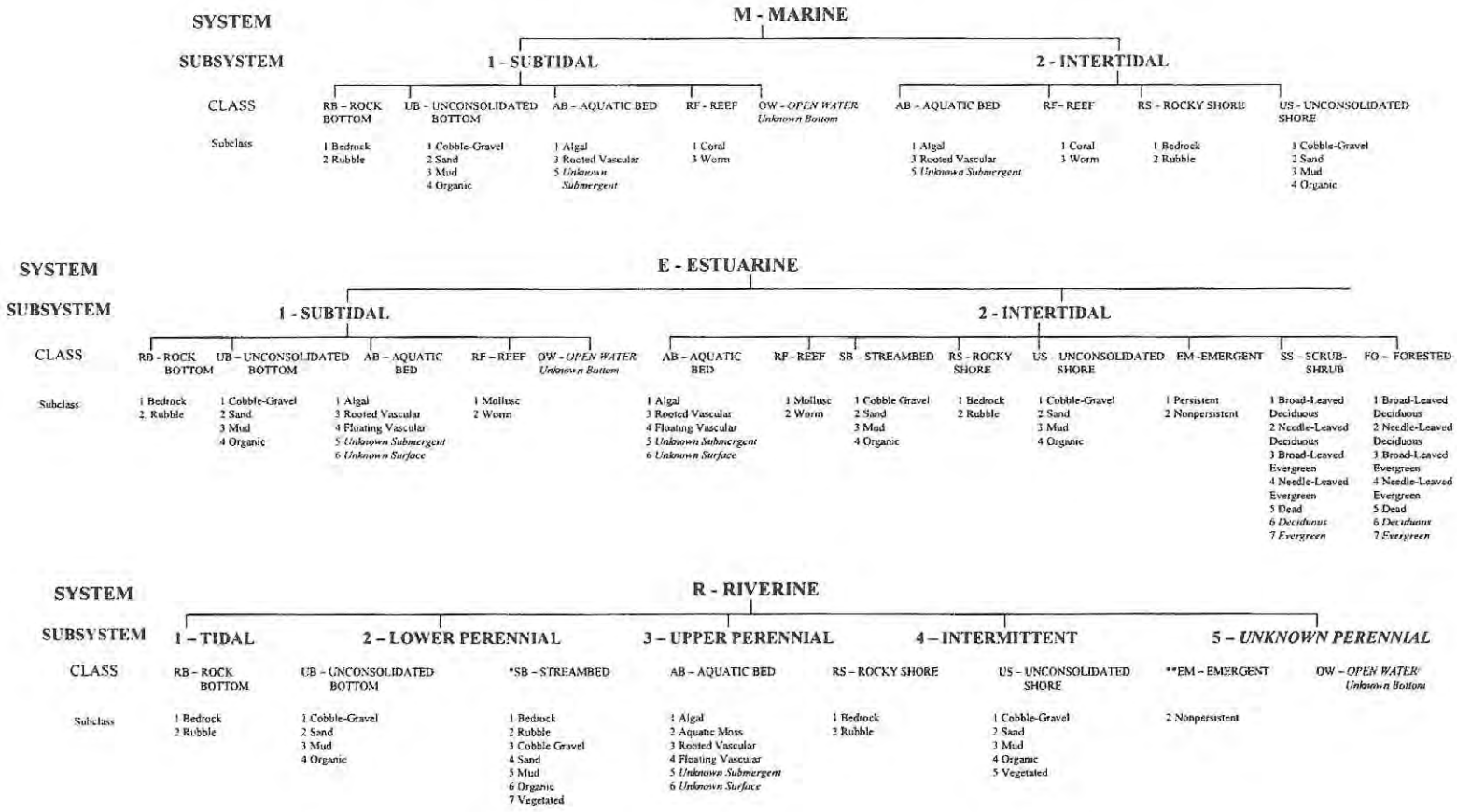
Figure 2: COP 324 Aerial Photography of Project Area



Map Source: U. S Fish and Wildlife Service Wetland Mapper

Figure 3: COP 324 National Wetland Inventory Map of Project Area

WETLANDS AND DEEPWATER HABITATS CLASSIFICATION

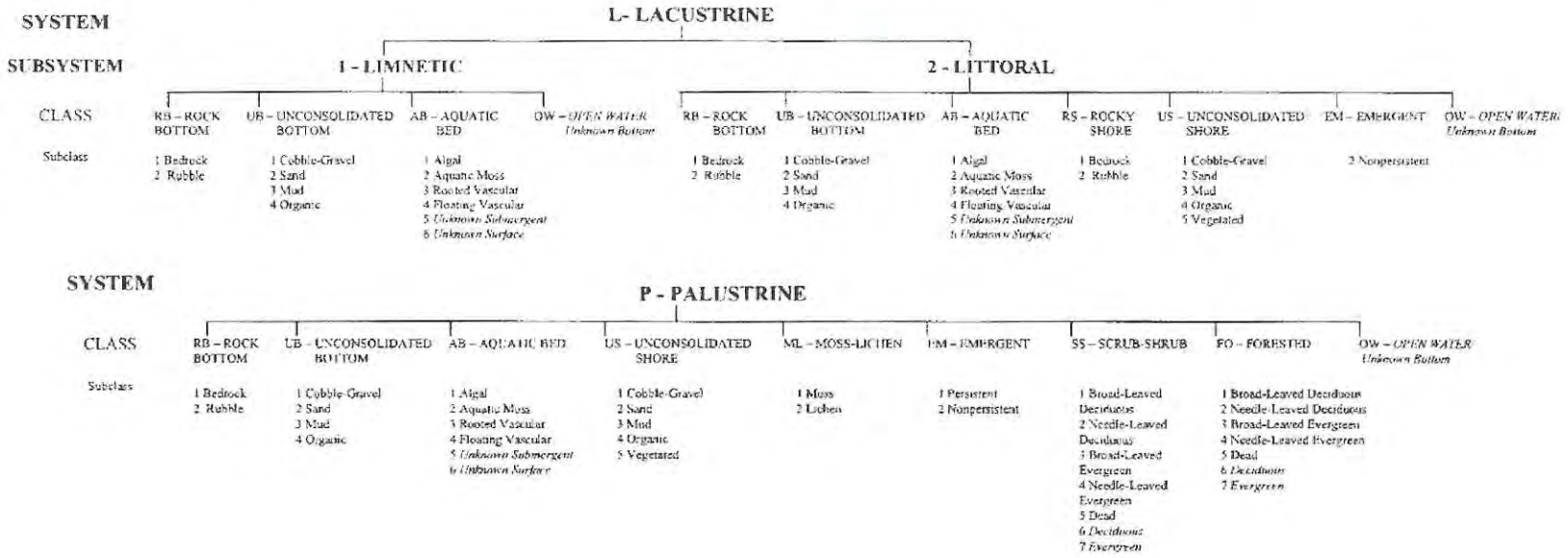


* STREAMBED is limited to TIDAL and INTERMITTENT SUBSYSTEMS, and comprises the only CLASS in the INTERMITTENT SUBSYSTEM.
** EMERGENT is limited to TIDAL and LOWER PERENNIAL SUBSYSTEMS.

Classification of Wetlands and Deepwater Habitats of the United States
Cowardin ET AL. 1979 as modified for National Wetland Inventory Mapping Convention

Figure 4: Key to NWI Classifications

WETLANDS AND DEEPWATER HABITATS CLASSIFICATION



MODIFIERS

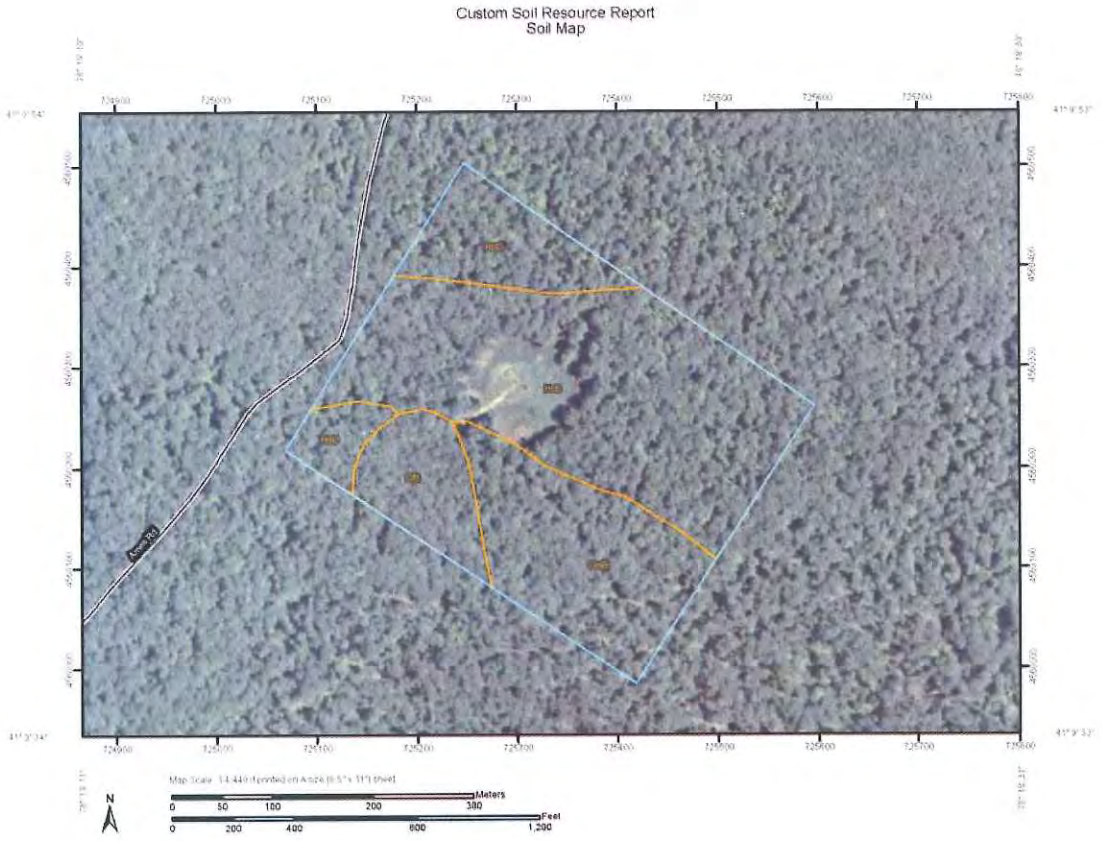
In order to more adequately describe the wetland and deepwater habitats one or more of the water regime, water chemistry, soil, or special modifiers may be applied at the class or lower level in the hierarchy. The farmed modifier may also be applied to the ecological system.

WATER REGIME				WATER CHEMISTRY			SOIL	SPECIAL MODIFIERS	
Non-Tidal		**Tidal**		**Coastal Salinity**	**Inland Salinity**	**pH Modifiers for all Fresh Water**			
A Temporarily Flooded	H Permanently Flooded	K *Artificially Flooded*	*S Temporary-Tidal	1 Hypersaline	7 Hypersaline		g Organic	b *Beaver*	h *Diked/Impounded*
B Saturated	J Intermittently Flooded	L Subtidal	*R Seasonal-Tidal	2 Euhaline	8 Eusaline	a Acid	n Mineral	d *Partially Drained/Ditched*	r Artificial Substrate
C Seasonally Flooded	K Artificially Flooded	M Irregularly Exposed	*T Semipermanent-Tidal	3 Mixohaline *(Brackish)*	9 Mixosaline	i Circumneutral		f Farmed	s *Spoil*
D *Seasonally Flooded/ Well Drained*	W Intermittently Flooded/Temporary	N Regularly Flooded	*V Permanent-Tidal	4 Polyhaline	0 Fresh	t Alkaline			x Excavated
E *Seasonally Flooded/ Saturated*	Y Saturated/Semipermanent/ Seasonal	P Irregularly Flooded	U *Unknown*	5 Mesohaline					
F Semipermanently Flooded	Z Intermittently Exposed/Permanent			6 Oligohaline					
G Intermittently Exposed	U *Unknown*			0 Fresh					

*These water regimes are only used in tidally influenced, freshwater systems

NOTE Italicized terms were added for mapping by the National Wetlands Inventory program

Figure 4: Key to NWI Classifications (continued)



Custom Soil Resource Report

Table—Hydric Rating by Map Unit

Hydric Rating by Map Unit— Summary by Map Unit — Clearfield County, Pennsylvania				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ClB	Clymer channery loam, 3 to 8 percent slopes	Not Hydric	3.3	9.6%
CmB	Clymer very stony loam, 0 to 8 percent slopes	Not Hydric	8.3	23.8%
HbD	Hazleton very stony loam, 8 to 25 percent slopes	Not Hydric	5.1	14.8%
HcB	Hazleton-Clymer channery loams, 3 to 8 percent slopes	Not Hydric	18.0	51.7%
Totals for Area of Interest			34.7	100.0%

Source: USDA Web Soil Survey

Figure 5: COP 324 Soils and Hydric Ratings within the Project Area

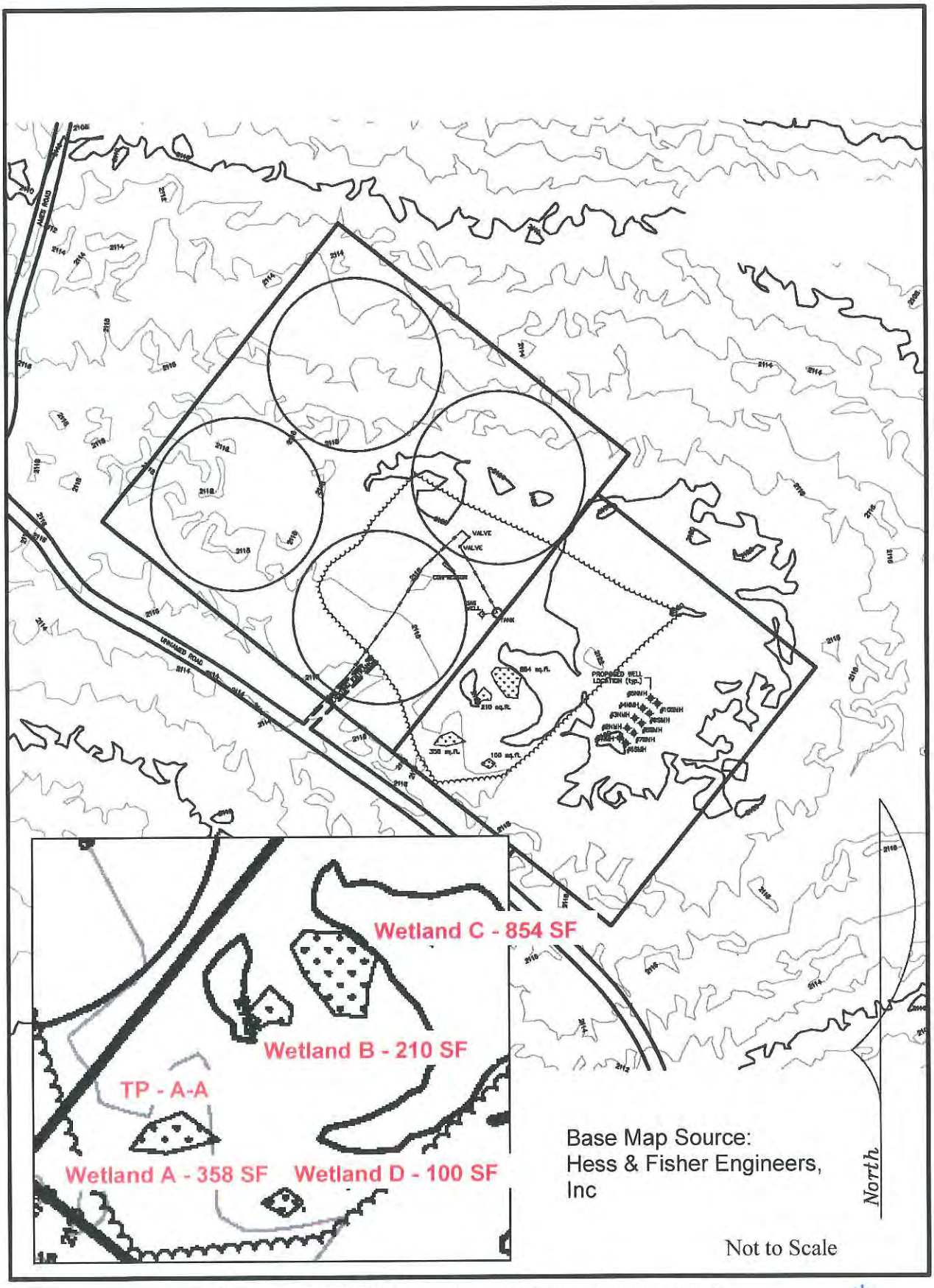


Figure 6: COP 324 Location of Delineated Wetlands

this drawing doesn't match others - 1 large trailer shown here

Appendix A
Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project Site: **COP 324 Well Pad** City/County: **Clearfield** Sampling Date: **6-1-11**

Applicant/Owner: **Hess and Fisher Engineers, Inc.** State: **PA** Sampling Point: **TP A-A**

Investigator(s): **Terry A. Rightnour, PH, PWS & Tom Pluto, PhD** Section, Township, Range: **Girard**

Landform (hillslope, terrace, etc.): **Ridge Top** Local relief (concave, convex, none): **None** Slope: **0%**

Subregion (LRR or MLRA): **LLR N** Lat: **41.162397** Longitude: **78.314667** Datum: **NAD 83**

Soil Map Unit Name: **Hazelton-Clymer channery loams** NWI classification: **Not Mapped as NWI**

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☒, Soil ☒, or Hydrology ☐, significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐, naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?**	**Yes ☒**	**No ☐**
Hydric Soil Present?	Yes ☒	No ☐			
Wetland Hydrology Present?	Yes ☒	No ☐	If yes, optional Wetland Site ID: _____		

Remarks: **Wetland located on restored natural gas well pad. Localized man-made depressions. Pit is typical of Wetlands A, B, C, and D.**

VEGETATION (Four Strata) – Use scientific names of plants

Tree Stratum (Plot size: **30**)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____			
2. _____			
3. _____			
4. _____			
50% = _____, 20% = _____		= Total Cover	
Sapling/Shrub Stratum (Plot size: **15**)			
1. _____			
2. _____			
3. _____			
4. _____			
5. _____			
50% = _____, 20% = _____		= Total Cover	
Herb Stratum (Plot size: **5**)			
1. *Juncus effusus*	50	Y	FACW
2. *Juncus tenuis*	20	Y	FAC-
3. *Scirpus cyperinus*	20	Y	FACW+
4. *Dicanthelium clandestinium*	10	N	FAC+
5. _____			
6. _____			
7. _____			
8. _____			
9. _____			
10. _____			
11. _____			
50% = 50, 20% = 20	100	= Total Cover	
Woody Vine Stratum (Plot size: 30)			
1. _____			
2. _____			
50% = _____, 20% = _____		= Total Cover	
% Bare Ground in Herb Stratum _____			

Dominance Test Worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	_____	x1 =	_____
FACW species	_____	x2 =	_____
FAC species	_____	x3 =	_____
FACU species	_____	x4 =	_____
UPL species	_____	x5 =	_____
Column Totals:	_____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒** **No ☐**

Remarks:

SOIL

Sampling Point: TP A-A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR4/2	50	10YR5/6	50	RM	M	Clayey	Subangular, blocky
5-12	10YR4/2	50	10YR5/6	50	RM	M	Clayey	High contrast, more compact

[1]Type: C= Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ 2 cm Muck (A10) **(LRR N)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1) **(LRR N, MLRA147, 148)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7)
- ☐ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ☐ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ☐ Umbric Surface (F13) **(MLRA 136, 122)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) **(MLRA 147)**
- ☐ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 136, 148)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? Yes ☒ No ☐

Remarks: Disturbed/compacted soils

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☒ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☒ Water-Stained Leaves (B9)
- ☒ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☒ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☒ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	☒	No	☐	Depth (inches):	Surface
Water Table Present?	Yes	☐	No	☒	Depth (inches):	_____
Saturation Present? (includes capillary fringe)	Yes	☒	No	☐	Depth (inches):	Surface

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix B
Site Photographs

COP 324 Overview of Delineated Wetlands

COP 324 Wetlands at Test Pit A-A

COP 324 Standing Water in Delineated Wetlands

COP 324 Typical Uplands in Study Area

Resource Identification and Wetland Delineation Report COP Tract 284 Pad A

Grugan Township
Clinton County, PA

May 2012

Prepared for:

Anadarko E&P Company LP

Prepared by:

BERAN
ENVIRONMENTAL SERVICES
Boyers, PA 724-735-2766

CONTENTS

	Page
EXECUTIVE SUMMARY	3
1.0 SITE DESCRIPTION	4
2.0 SITE LOCATION	4
3.0 METHODOLOGY	5
4.0 REVIEW OF SECONDARY DATA	6
5.0 RESULTS OF FIELD INVESTIGATION	6
6.0 REFERENCES	7

FIGURE(S)

Figure 1: Location and NWI Map for the COP Tract 284 Pad A
Figure 2: Soils and Project Map for the COP Tract 284 Pad A

APPENDICES

Appendix A: Wetland Determination Data Form
Appendix B: Photographs
Appendix C: Qualifications

EXECUTIVE SUMMARY

Beran Environmental Services, Inc. was retained by Anadarko E&P Company LP to conduct a resource investigation of the proposed COP Tract 284 Pad A natural gas well site in Grugan Township, Clinton County, PA. Beran Environmental Services, Inc. conducted the field investigation on April 3rd 2012.

The wetland portion of the investigation was conducted according to methodologies outlined in the U.S Army Corps of Engineers (COE) *1987 Wetland Delineation Manual* (Technical Report Y-87-1) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region: July 2010*. This delineation procedure is based on examination of hydrologic conditions, soil characteristics, and identification and classification of dominant vegetation. This report is intended to document these parameters. A physical description of the site is provided along with the methodology used to delineate wetland areas. The following abbreviations are used as descriptors for vegetative strata: (H) = Herbaceous, (S) = Shrub, (T) = Tree, and (V) = Vine.

The area of investigation is located within the Eastern Mountain and Piedmont Region. This region is known as an area of hilly to mountainous terrain. Most of the region receives between 40 to 59 inches of rainfall annually, with a mean annual air temperature between 52 to 59 °F. (U.S. Army Corps of Engineers, 2010)

The investigation area consisted of approximately 28 acres and an additional 7 acres within the 300-foot buffer for the access road. Land-use within the area of investigation consists of forest and an open area used for a utility tower. Soil map units designated non-hydric are located within the investigation area. Mapped National Wetland Inventory (NWI) wetlands were not mapped within the investigation area. The field investigation identified no wetlands or watercourses.

1.0 SITE DESCRIPTION

The study area is located in Grugan Township, Clinton County, Pennsylvania. Land-use within the area of investigation consists of forest.

Forest Vegetation

Scientific Name	Common Name	Stratum
Acer rubrum	red maple	T,S,H
Apocynum cannabinum	clasping-leaf dogbane	H
Comptonia peregrina	sweet-fern	H
Gaultheria procumbens	teaberry	H
Gaylussacia baccata	black huckleberry	S
Kalmia latifolia	mountain laurel	S
Pinus rigida	pitch pine	T
Pinus strobus	eastern white pine	T,S,H
Quercus alba	white oak	T
Quercus prinus	chestnut oak	T
Quercus rubra	northern red oak	T
Sassafras albidum	sassafras	T
Tsuga canadensis	eastern hemlock	S
Vaccinium sp.	blueberry	S

The investigation area drains southwest to Johnson Run. (Figure1).

2.0 SITE LOCATION

SITE:	COP Tract 284 Pad A
MUNICIPALITY:	Grugan Township
COUNTY:	Clinton
STATE:	Pennsylvania
USGS QUADRANGLE:	Glen Union
APPROX. CENTER LOCATION (NAD 83):	Latitude: 41.340121 Longitude: -77.577282
WATERSHED:	Johnson Run
TITLE 25, CHAPTER 93 DESIGINATION:	HQ-CWF

3.0 METHODOLOGY

The investigation was initiated by researching available reference material in order to anticipate site conditions (Section 4.0, Review of Secondary Data). Available references include the County Soil Survey, the National Wetlands Inventory (NWI) Map(s), the USGS Topographic Map(s), and aerial photography. Examination of these resources revealed the portions of the site that would have the highest probability of containing jurisdictional wetlands. The field investigation was conducted to locate and identify wetland resources not designated in the NWI and/or streams not shown on the USGS Topographic maps.

A 600-foot radius centered on the proposed well pad and a 140-foot swath centered on the proposed access road was investigated. A 300-foot buffer extending from the proposed access road right-of-way on all sides was also investigated. Within this 300-foot buffer, a meandering transect was performed to identify additional streams and/or wetlands. Features identified between the area of investigation and the 300-foot buffer, were located in a cursory manner.

Wetlands within the study area were delineated following methodology for routine determinations outlined in the 1987 COE *Wetlands Delineation Manual* and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region: July 2010*. If areas exhibiting wetland characteristics were encountered (hydrophytes, inundation, water staining, etc.), they were investigated to determine if the area is jurisdictional wetland. When wetlands were encountered, transitional features were identified. Site-specific indicators of transition from wetland to upland were examined in the field to locate the line corresponding to a jurisdictional boundary. Data including dominant vegetation, soil characteristics, and hydrology was collected at each observation point to determine which areas exhibited wetland characteristics.

The locations of relevant features were surveyed using a Trimble GPS unit.

Vegetation data was interpreted using the U.S. Fish and Wildlife Service's 1988 northeast (Region 1) plant list. The plant list categorizes species according to the following system:

> Obligate (OBL) Occur almost always in wetlands under natural conditions (frequency > 99%), but may persist in non-wetlands if planted there by man or in wetlands that have been drained, filled, or otherwise transformed into non-wetlands.
>
> Facultative Wetland (FACW) Usually found in wetlands (66% to 99% frequency), but occasionally found in non-wetlands.
>
> Facultative (FAC) Sometimes found in wetlands (34% to 66% frequency), but also occur in non-wetlands.
>
> Facultative Upland (FACU) Seldom occur in wetlands (1% to 33% frequency) and usually occur in non-wetlands.
>
> Non-wetland (UPL) Occur in wetlands in another region, but not found (<1% frequency) in wetlands in the region specified. If a species does not occur in wetlands in any region, it is not on the list.

The following abbreviations are used as descriptors for vegetative strata: (H) = Herbaceous, (S) = Shrub, (T) = Tree, and (V) = Vine.

The soil hue, value and chroma was determined using the Munsell Soil Color Charts.

4.0 REVIEW OF SECONDARY DATA

Secondary data for this delineation was obtained by reviewing the United States Geological Survey Topographic Map(s) (Glen Union), Clinton County Soil Survey, the National Wetland Inventory Map(s) (Glen Union), and PAMAP Program, PADCNR, Bureau of Topographic and Survey, and NAIP USDA-FSA aerial photography (Clinton County).

The Clinton County Soil Survey map (Figure 2) identifies the following soil map units within the study area:

Soil Series	Symbol	Slope (%)	Drainage Class	Depth to seasonal water table	Hydric Soil
Clymer	CfB	0-8	Well Drained	--	No
Hazelton-Laidig complex	HoF	25-50	Well Drained	27-47”	No
Cookport	CpD	8-25	Moderately Well Drained	15-22”	No

According to the NWI mapping, there are no mapped wetlands within the investigation area. (Figure 1)

5.0 RESULTS OF THE FIELD INVESTIGATION

No wetlands or watercourses were identified within the investigation area.

6.0 REFERENCES

Gleason, Henry A. and Arthur Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. The New York Botanical Garden, New York, New York.

Holmgren, Noel H. 1998. *Illustrated Companion To Gleason and Cronquist's Manual*. New York Botanical Garden, NewYork, New York.

Newcomb, Lawrence. *Newcomb's Wildflower Guide*. Little, Brown and Company. Boston, MA. 1977.

Munsell Soil Color Charts, Munsell Color, 2000 Revised Edition

Petrides, George A. *A Field Guide to Trees and Shrubs*. Houghton Mifflin Co. Boston, MA. 1972.

Reed, P.B., Jr. 1988. *National list of plants species that occur in wetlands: Northeast (Region 1).* U.S. Fish Wildl. Serv. Biol. Rep. 88(26.1). 111 pp.

Rhoads, Ann Fowler and Block, Timothy A. *The Plants of Pennsylvania: An Illustrated Manual*. University of Pennsylvania Press. Philadelphia, PA. 2000.

Schoeneberger, P.J., Wysocki, D.A., Benham, E.C., and Broderson, W.D. (editors). *Field Book for Describing and Sampling Soils, Version 2.0*. Natural Resources Conservation Service, National Soil Survey Center. Lincoln, NE. 2002.

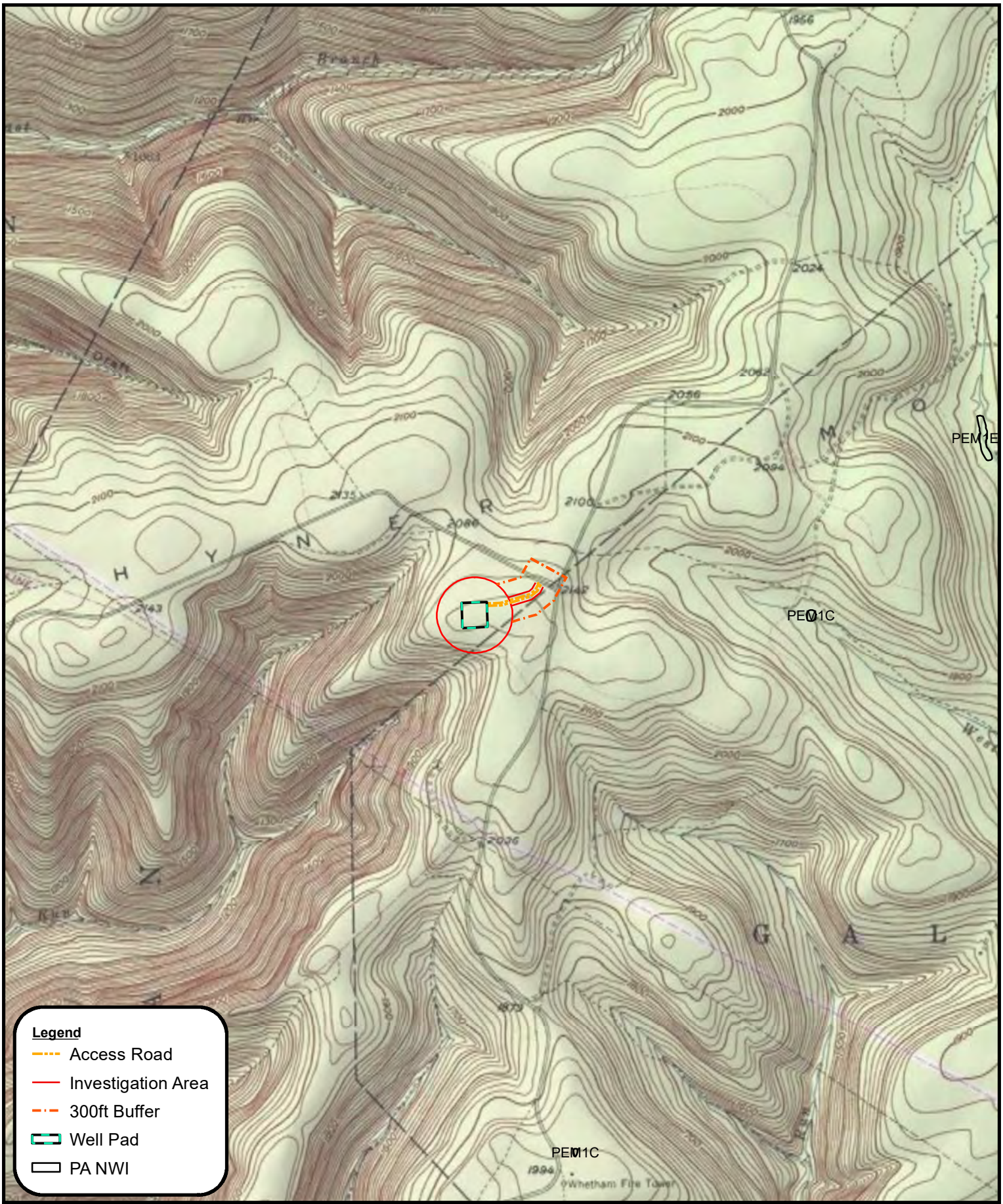
Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil survey of Clinton County, Pennsylvania [Online WWW]. Available URL: "http://soildatamart.nrcs.usda.gov/Report.aspx?Survey=PA035&UseState=PA" [Accessed May 2012].

U.S. Army Corps of Engineers. 2010. *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region*, ed. J.S. Wakeley, R.W. Lichvar, C.V. Noble, and J.F. Berkowitz. ERDC/EL TR-10-9. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Environmental Laboratory. (1987). "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

U.S. Soil Conservation Service. *Soil Survey of Clinton County.*

FIGURES



Sources:

USGS: NGS Topo US 2D
NWI Quad: Glen Union

Figure 1: Location and NWI Map for COP Tract 284 Pad A

Municipality: Grugan Twp. County: Clinton

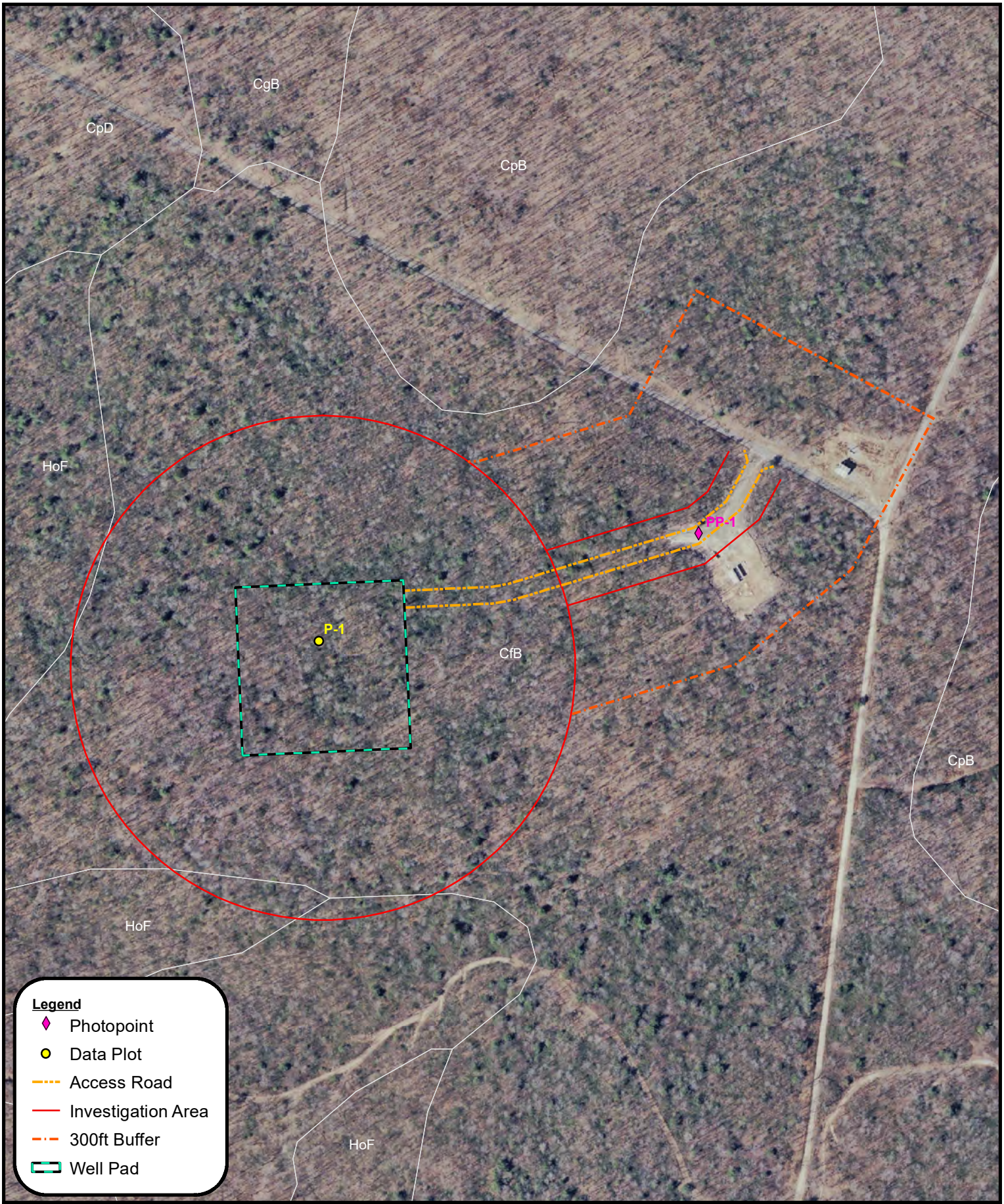
0 2,000 4,000 Feet

Prepared for:

Anadarko E&P Company LP
The Woodlands, TX

Prepared by:

BERAN ENVIRONMENTAL SERVICES
Boyers, PA 724-735-2766



Sources:

PASDA: PAMAP Program
USGS: NGS Topo US 2D
NRCS: Soil Survey & National Aerial Imagery Program

Figure 2: Soils and Project Map for COP Tract 284 Pad A

Municipality: Grugan Twp. County: Clinton

0 300 600 Feet

N

Prepared for:

Anadarko E&P Company LP
The Woodlands, TX

Prepared by:

BERAN ENVIRONMENTAL SERVICES
Boyers, PA 724-735-2766

APPENDIX A: WETLAND DETERMINATION DATA FORM

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: COP Tract 284 Pad A | County: Clinton | Sampling Date: 4/3/12

Applicant/Owner: Anadarko E&P Company LP | State: PA | Sampling Point: P-1

Investigator(s): BF, NT | Section, Township, Range: Grugan Twp.

Landform (hillslope, terrace, etc.): | Local relief (concave, convex, none): None

Subregion(LRR or MLRA): | Slope (%): 1

Datum: NAD 83 | Lat: 41.340121 | Long: -77.577282

Soil Map Unit Name: CfB- Clymer channery loam | NWI Classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** **Yes** ☐ **No** ☒ If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ True Aquatic Plants (B14)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Stunted or Stressed Plants (D1)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ Microtopographic Relief (D4)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth: ____"

Water Table Present? Yes ☐ No ☒ Depth: ____"

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth: ____"

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. **Sampling Point: P-1**

Tree Stratum (Plot size: 30 ft)	Indicator Status	Absolute % Cover	Dominant Species?
Quercus prinus	UPL	10%	Yes☐ No☒
Acer rubrum	FAC	40%	Yes☒ No☐
Quercus rubra	FACU	20%	Yes☒ No☐
Sassafras albidum	FACU	5%	Yes☐ No☒
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	= Total Cover

Sapling Stratum (Plot size:)	Indicator Status	Absolute % Cover	Dominant Species?
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	= Total Cover

Shrub Stratum (Plot size: 15 ft)	Indicator Status	Absolute % Cover	Dominant Species?
Kalmia latifolia	FACU	50%	Yes☒ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
			Yes☐ No☐
		%	= Total Cover

Herb Stratum (Plot size: 5 ft)	Indicator Status	Absolute % Cover	Dominant Species?
Vaccinium sp		20%	Yes☒ No☐
Gaultheria procumbens	FACU	15%	Yes☒ No☐
Gaylussacia baccata	FACU	5%	Yes☐ No☒
Kalmia latifolia	FACU	10%	Yes☒ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	= Total Cover

Woody Vine Stratum (Plot size: _____)	Indicator Status	Absolute % Cover	Dominant Species?
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	Yes☐ No☐
		%	= Total Cover

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1 (A)
Total Number of Dominant Species Across All Strata:	6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	17% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ☐ **No** ☒

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: P-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix Color	Matrix %	Redox Features Color	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3.5”		100%		%				Organic
3.5-5.5”	10YR 4/2	100%		%			Sand	
5.5-9”	10YR 5/6	100%		%				
”		%		%				
”		%		%				
”		%		%				
”		%		%				
”		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7)
- ☐ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ☐ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ☐ Umbric Surface (F13) **(MLRA 136, 122)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10) **(MLRA 147)**
- ☐ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth: 9”

Hydric Soil Present? Yes ☐ No ☒

Remarks:

APPENDIX B: PHOTOGRAPHS

Facing North From PP-1

Facing East From PP-1

Facing South From PP-1

Facing West From PP-1

Typical Habitat Facing North From P-1

Typical Habitat Facing East From P-1

Typical Habitat Facing South From P-1

Typical Habitat Facing West From P-1

P-1 Soil

APPENDIX C: QUALIFICATIONS

Qualifications of Brian Fleming

Education

Penn State University - 2008

Bachelors of Science – Forest Science (Biology Option)

Relevant Courses

- Field Dendrology
- Forest Ecology
- Silviculture
- Forest Ecosystem Management
- Invasive Species Identification and Control

Employment Experience

Currently employed with Beran Environmental Services, Inc. While working at Beran Environmental Services, Brian has gained experience in:

- GIS mapping
- Wetland delineations
- Wetland delineation report writing

Prior to working at Beran Environmental Services, Brian was employed at Wallace and Pancher Inc. as an assistant environmental scientist. While there, responsibilities included

- Monitoring stream velocity and discharge
- Classification of streams as ephemeral, intermittent, or perennial
- Macroinvertebrate sampling (collection and identification)
- Backpack electrofishing (collection and identification)
- Habitat mapping
- Wetland delineations

Professional Training

- 38 hour Army Corps of Engineers Wetland Delineation course
- PEC Basic Orientation / SafeGulf / SafeLand / T.R.A.P.

Qualifications of Nick Trivelli

Education

Slippery Rock University – 2007

Biology B.A., minor: Geographic Information Technology

Relevant Courses

- Botany
- Ecology
- Freshwater Biomonitoring
- Advanced GIS
- Cartography

Employment Experience

Currently employed with Beran Environmental Services, Inc. While working at Beran Environmental Services, Nick has gained experience in:

- GIS mapping
- Wetland delineations
- Wetland delineation report writing

Prior to working at Beran Environmental Services, Nick was employed at Wallace and Pancher Inc. as an environmental scientist. While there, responsibilities included

- Monitoring stream velocity and discharge
- Classification of streams as ephemeral, intermittent, or perennial
- Macroinvertebrate sampling (collection and identification)
- Backpack electro fishing (collection and identification)
- Habitat mapping

Professional Training

- 8 hour Wetland Training Institute, Inc Field Indicators of Hydric Soils
- PEC Basic Orientation / SafeLand / T.R.A.P.

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

March 30, 2012

IN REPLY REFER TO
SIR # 38387

JAY RUSSELL
BERAN ENVIRONMENTAL SERVICES
2322 W SUNBURY RD
BOYERS, PA 16020

RE: Secondary Species Impact Review (SIR) – Timber Rattlesnake
PNDI Search No. 20120312343567
COP TRACT 284 PAD A
GALLAGHER, and GRUGAN Townships, CLINTON County, Pennsylvania

Dear Mr. Russell:

I have reviewed the map accompanying your recent correspondence, which concerns the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and Pennsylvania Fish & Boat Commission (PFBC) files, the **timber rattlesnake (*Crotalus horridus*, PA candidate)** is known from the vicinity of the proposed project site. Timber rattlesnakes occur in the forested, mountainous regions of the Commonwealth. They prefer forested areas to forage for small mammals (e.g., mice and chipmunks) and southerly-facing slopes for hibernating and other thermoregulatory activities. The timber rattlesnake is threatened by habitat loss/alteration, wanton killing, and poaching.

Although there have been observations of timber rattlesnakes in the immediate vicinity of the project area, we do not anticipate any direct adverse impacts to the timber rattlesnake from the proposed project. Your project area, however, is used as foraging habitat by timber rattlesnakes. This warrants some concern about rattlesnake-human conflicts. Although the nature of the timber rattlesnake is rather docile, it can be dangerous if cornered or handled. Rattlesnakes are attracted to open, rocky, or log-strewn areas for basking. We recommend that the workers responsible for implementing this project be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. **These workers should also be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes without a proper permit is prohibited by the Commission pursuant to 58 Pa. Code Section 79.6. If any timber rattlesnakes are observed on-site, please notify this office.**

Note that this office performed no field inspection of the project area. Consequently, comments in this letter are not meant to address other issues or concerns that might arise concerning matters under Pennsylvania Fish and Boat Commission jurisdiction or that of other authorities. If you have any

questions regarding this response, please contact Jim Chestney at 717-776-5236 and refer to the SIR number at the top of this letter. Thank you for your cooperation and attention to this matter of endangered species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/JEC/kn

1. PROJECT INFORMATION

Project Name: **COP Tract 284 Pad A**
Date of review: **3/12/2012 4:08:53 PM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **24.0** acres
County: **Clinton** Township/Municipality: **Gallagher,Grugan**
Quadrangle Name: **GLEN UNION** ~ ZIP Code: **17745**
Decimal Degrees: **41.341247 N, -77.574902 W**
Degrees Minutes Seconds: **41° 20' 28.5" N, -77° 34' 29.6" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Eric D. Dougherty
Company/Business Name: Penn Environmental Services, Inc.
Address: 2322 West Sunbury Road
City, State, Zip: Boyers PA 16020
Phone:(724) 735-2766 x13 Fax:(724) 735-9992
Email: edougherty@pennenvironmental.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Eric D. Dougherty 3/12/12
applicant/project proponent signature date

RETTEW
We answer to you.
3020 Columbia Avenue, Lancaster, PA 17603
Phone: (717) 394-3721 Fax: (717) 394-1063
E-mail: rettew@rettew.com • Web site: www.rettew.com

M E M O R A N D U M

TO: Doug Kepler, Seneca Resources Corporation

FROM: Joshua Grabel, Chad Lobley

DATE: April 13, 2012

PROJECT NAME: Tract 100 Pad R and Pad N **PROJECT NO.:** 085042038

SUBJECT: Wetland Investigation

INTRODUCTION

On behalf of Seneca Resources Corporation (Seneca), RETTEW Associates, Inc. (RETTEW) conducted a wetland investigation of the proposed Tract 100 Pad R and Pad N area on March 6 & 7, 2012 by qualified wetland biologists (Joshua Grabel and Dennis Strouse). The proposed project includes the construction of two natural gas well pads which will be used to drill for and collect natural gas found within the region. A previously constructed pipeline right of way (ROW) exists through the central portion of the two well pads' Area of Investigation (AOI) along Narrow Mountain Road. The project area of Tract 100 Pad R and Pad N is west of State Route 0014 in Lewis Township, Lycoming County, Pennsylvania, and appears on the Trout Run, Pennsylvania 7.5-minute United States Geological Survey (USGS) quadrangle (Pad R Latitude: 41.419385 and Longitude: -77.059603; Pad N Latitude: 41.430080 and Longitude: -77.058346; refer to the Topographic Basemap, **Figure 1**). The Area of Investigation (AOI) for the proposed Tract 100 Pad R and Pad N is provided on the Aerial Basemap, **Figure 2.**

METHODS

RETTEW conducted the wetland investigation of the proposed natural gas well pad using the wetland delineation methodology outlined in the 1987 *Corps of Engineers Wetland Delineation Manual* and the 2012 Version Two *Regional Supplement to the Corps of Engineers Wetland Delineation Manual*: *Northeast and Northcentral Region*. This approach recognizes the three parameters of vegetation, soils, and hydrology to identify and delineate wetlands. The purpose of this investigation is to identify jurisdictional wetland and stream boundaries within the AOI and avoid and/or minimize impacts to these natural resources.

AGENCY COORDINATION

An online Pennsylvania Natural Diversity Inventory (PNDI) search of the Tract 100 Pad R and Pad N project area (Project Search ID: 20111003319057) was performed on October 3, 2011. The PNDI search receipt identified that the proposed project area has a potential impact to the special concern species *Crotalus horridus* (timber rattlesnake) according to the Pennsylvania Fish & Boat Commission (PFBC). Seneca coordinated with the PFBC and received clearance on February 22, 2012. A copy of the PNDI search receipt and PFBC correspondence with specific information pertaining to clearance conditions is included in **Attachment A**.

RESULTS

Wetlands

Based upon RETTEW's investigation, the AOI contains one palustrine open water (POW) wetland. Sample Point 1 (SP-1) is located in Wetland 1 (W-1) within a forested area of the Tract 100 Pad R and Pad N AOI. No vegetation was present within the POW wetland, which was surrounded by *Quercus rubra* (red oak, FACU), *Quercus prinus* (chestnut oak, UPL), and *Kalmia latifolia* (mountain laurel, FACU). A depleted matrix hydric soil indicator was met at this SP location, which revealed with a layer meeting the adequate depth requirements containing a matrix color 10YR 5/2 with fifteen percent 10YR 5/8 redoximorphic concentrations. Wetland hydrology observed at SP-1 included surface water, a high water table, saturation, sparsely vegetated concave surface, and microtopographic relief. Please refer to representative field data sheets provided in **Attachment B** for additional information specific to this sample point.

Uplands

The Tract 100 Pad R and Pad N AOI was primarily dominated by areas of upland forest. The central portion of the AOI along Narrow Mountain Road contains a previously cleared pipeline ROW. SP-2 through SP-26 are located within the upland forested areas. Dominant vegetation observed during the time of evaluation included *Q. rubra*, *Q. prinus*, *K. latifolia*, *Acer saccharum* (sugar maple, FACU), *Hamamelis virginiana* (American witchhazel, FAC), *Dennstaedtia punctilobula* (eastern hayscented fern, UPL), *Vaccinium angustifolium* (lowbush blueberry, FACU), *Quercus velutina* (black oak, UPL), *Betula lenta* (sweet birch, FACU), *Fraxinus americana* (white ash, FACU), *Acer rubrum* (red maple, FAC), *Pinus strobus* (eastern white pine, FACU), *Pinus resinosa* (red pine, FACU), *Quercus alba* (white oak, FACU), *Acer pensylvanicum* (striped maple, FACU), and *Dryopteris intermedia* (intermediate woodfern, FACU). Evidence of wetland hydrology in the form of saturation was observed at SP-6, however other wetland parameters were observed at this sample point location. No other sample points exhibited wetland hydrology. No hydric soil indicators were met at these sample point locations. Please refer to **Figure 2**: Aerial Basemap for the sampling point locations, and **Attachment B** for representative datasheets with information specific to each sample point.

Streams

RETTEW did not identify any streams within the Tract 100 Pad R and Pad N AOI (please refer to the **Figure 2**: Aerial Basemap for additional information).

Hagerman Run and Trout Run are two streams which are present on either side of the AOI. The Pennsylvania Code, Title 25, Chapter 93, Water Quality Standards assigns Trout Run a water quality designation of High Quality Cold Water Fishes (HQ-CWF), Migratory Fishes (MF). Hagerman Run has no water quality standards designation; therefore it acquires its receiving waterbody of Lycoming Creek's designation of CWF, MF. Hagerman Run and Trout Run are identified by the PFBC as stream sections that support naturally reproducing trout. All wetlands within the floodplain of these streams are considered to be EV and require a Joint Permit Application (JPA) for any future proposed wetland impacts. W-1 is located within the watershed of Hagerman Run; however it is an isolated feature, and therefore is not considered an EV wetland.

DISCUSSION

RETTEW identified one wetland within and adjacent to the AOI. There were no streams or waterways identified. Please refer to the attached site mapping figures (**Figure 1**: Topographic Basemap, **Figure 2**: Aerial Basemap) for the location of the sampling points. Data sheets, recent color photographs, and qualifications are included in **Attachments B**, **C**, and **D** respectively.

The wetland boundary determination was made using the best available indicators at the time of the delineation. Seasonal changes in wetland indicators (such as hydrology and vegetation) may require adjustment of the boundary during the growing season. This wetland boundary should be considered preliminary and used for planning purposes only. Wetland boundary confirmation will be required during the growing season before this wetland delineation meets accepted standards for permitting purposes.

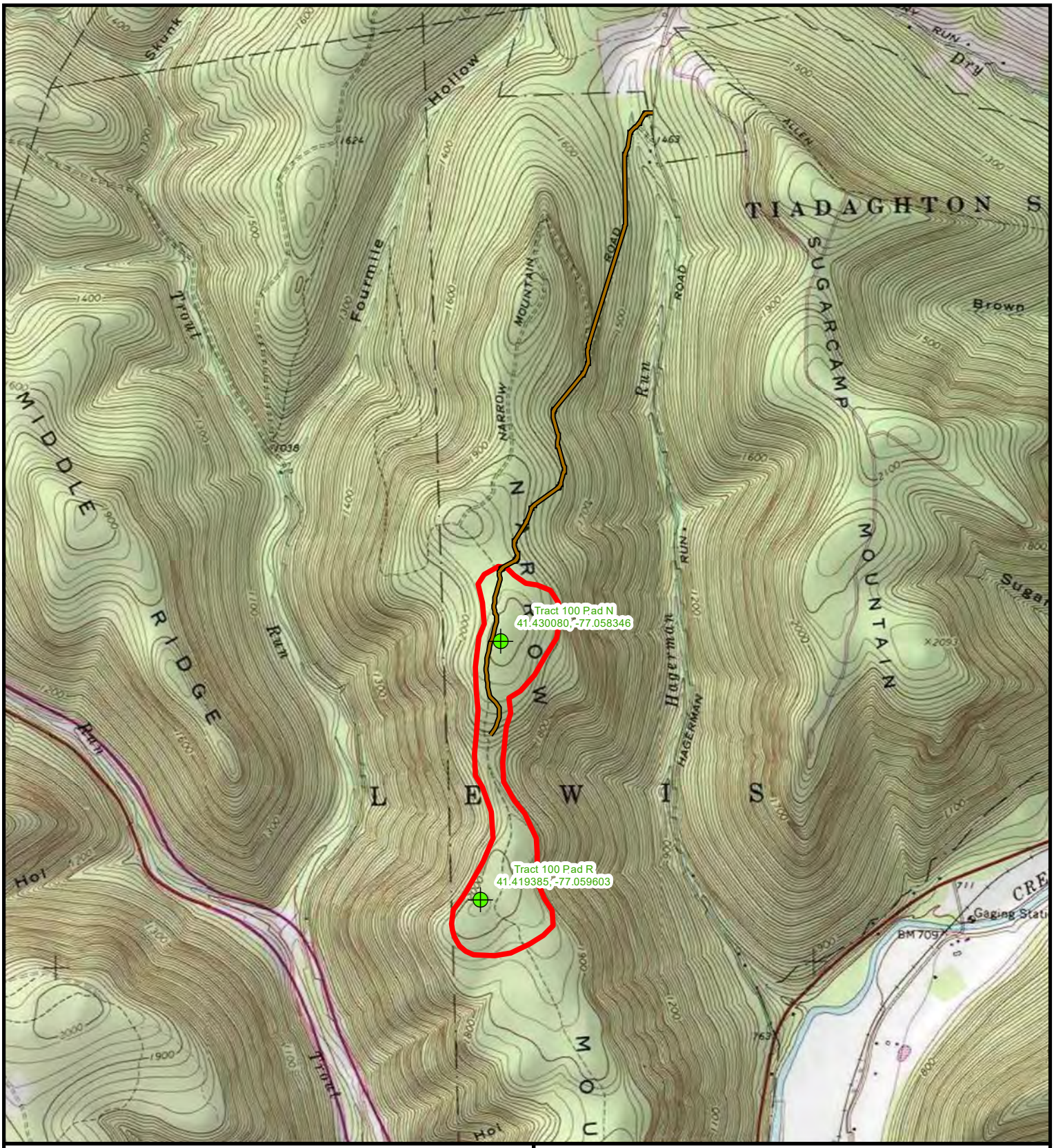
Wetlands, man-made ponds, and intermittent or perennial stream channels, are regulated by the United States Army Corps of Engineers (USACE) and the Pennsylvania Department of Environmental Protection (PADEP). Any encroachments, fills, or crossings of these areas will require approved State and Federal permits. Data for which this report is based are on file at RETTEW's Lancaster, Pennsylvania office.

Professional qualifications are included as **Attachment D**.

Prepared by: _____
Joshua Grabel, Environmental Scientist

Reviewed by: _____
Chad G. Lobley, Senior Biologist

H:\Projects\08504\085042038\NS\Wetland Memo\Wetland Memo-Tract 100 Pads R & N 04-13-12.doc



t Éäãm~Ç÷ çÅ-íáçå

mûçéçëÉÇ≈ ÅÅÉëë=o ç~Ç

^ ëÉ~çÑfåîÉëíáÖ-íáçå
EMVK=ÅéÉëF

Lewis Township, Lycoming County, PA
Trout Run, PA USGS 7.5' Topographic Quadrangle

_~ëÉã ~éWr kpKd Éçäç0åÄ-ä¬pì ã ÉóI=“k d p|q çéç r p| OavI¬k ~íáçå~äd ÉçÖêéÜåÄ=
pçÅáÉíóI=OMMNF=Üí éWëÉëíáÅÉë¬KêÅÖáçäáåå ÉKÅç ã IïVPII¬êÉíêáÉÉ Ç-çå=PILILOMNNK

Seneca Resources Corporation

Tract 100 Pad R and Pad N

cáÖìêÉ=N÷Ì¬qçéçÖê~éÜåÄ=_ ~ëÉã ~é
mûçäÉÅí=kçÇ=MUNRQMRU
i Éï áë=qçï åëÜåêI=íóÅç ã åäÖ='çìåí óI=m

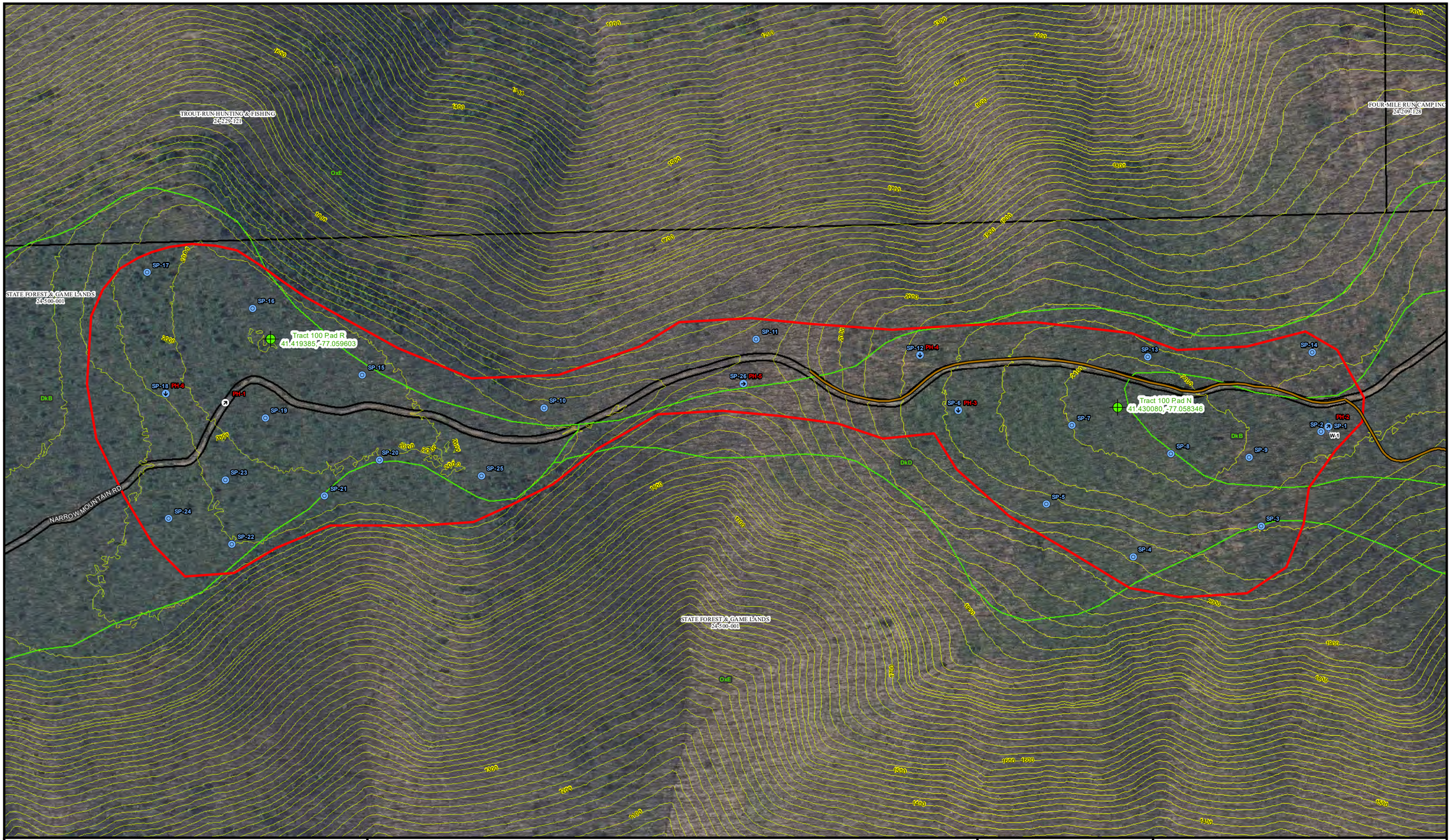
N
W E
S

M NIMMM OIMMM
cÉÉí

N=áäÜ÷Z=OIMMM=ÑÉ

SENECA RESOURCES RETTEW

e WmçáÉÅëyMURMQQURMQQMPLyfpybñÜåÅëyt Éí=j Éã çyqê-Åí|NMMm-Ç| o| ~å Ç|k |q çéç|_ ~ëÉã ~é kí ñÇ



Seneca Resources Corporation

Tract 100 Pad R and Pad N

Figure 2 - Aerial Basemap
Project No. 085042038
Lewis Township, Lycoming County, PA

H:\Projects\08504\085042038\GIS\Exhibits\Wet Memo\Tract_100_Pad_R_and_N_Aerial_Basemap.mxd

3/15/2012

- Well Pad Location
- Sample Point
- Photo Location and Direction
- Sample Point with Photo Location and Direction
- Proposed Access Road
- Contour (20 ft Interval)
- Field Delineated Stream (None Present)
- Field Delineated Wetland
- NRCS, USDA Soil Survey
- Area of Investigation (109.0 Acres)
- Lycoming County Parcel Boundary

0 400 Feet

1 inch = 400 feet

SENECA RESOURCES

RETTEW

Table 1: Wetland Summary Table - Tract 100 Pad R and N

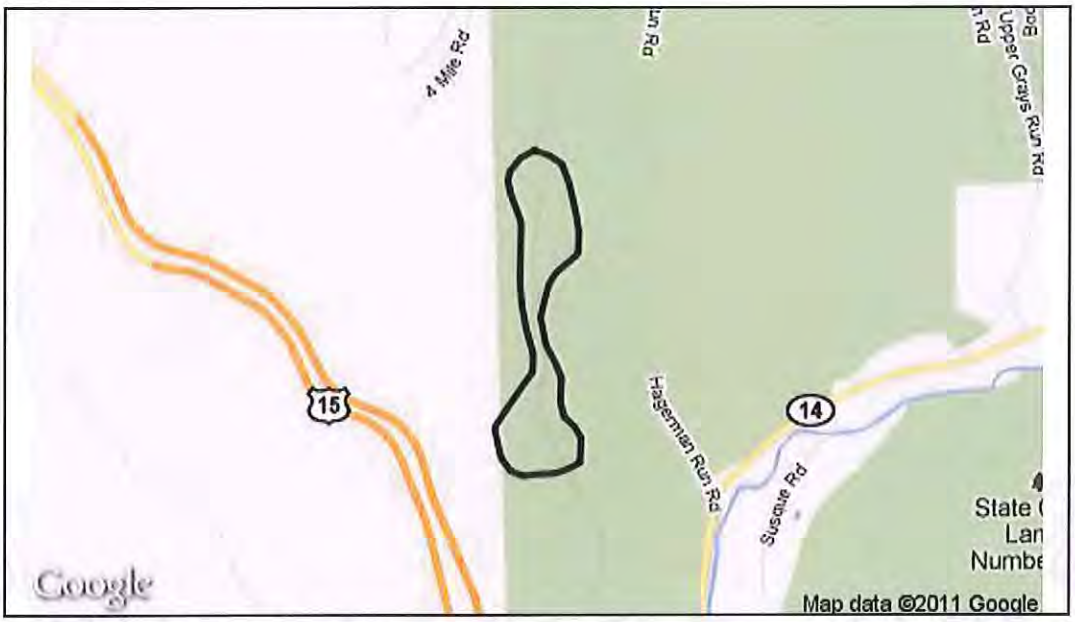
Wetland ID	Wetland Classification	Acreage	Coordinates		Location Description
			Latitude	Longitude	
W-1	POW	0.01	41.432742	-77.057996	Exists in the northern section of Pad N of the Tract 100 Pads R & N AOI.

ATTACHMENT A

PENNSYLVANIA NATURAL DIVERSITY INVENTORY SEARCH RECEIPT AND AGENCY CORRESPONDENCE

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad N**
Date of review: **10/3/2011 9:34:06 AM**
Project Category: **Mining,Oil or Gas (including roads and pipelines),New Well**
Project Area: **181.9** acres
County: **Lycoming** Township/Municipality: **Lewis**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17771**
Decimal Degrees: **41.431047 N, -77.054200 W**
Degrees Minutes Seconds: **41° 25' 51.8" N, -77° 3' 15.1" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

__X__ **SIGNED** copy of this Project Environmental Review Receipt
__X__ Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
__X__ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
__X__ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
__X__ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____ The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Greg Kimmel
Company/Business Name: Seneca Resources Corporation
Address: 51 Zents Blvd.
City, State, Zip: Brookville PA 15856
Phone:(814) 220-1523 Fax:( )
Email: KimmelG@SRCX.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Rachelle A Sappler FOR: Greg Kimmel 2/28/12
applicant/project proponent signature date

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

February 22, 2012

IN REPLY REFER TO
SIR# 38075

SENECA RESOURCES
GREG KIMMEL
51 ZENTS BOULEVARD
BROOKVILLE, PA 15825

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 20111003319057
DCNR 100 PADS N & R
LEWIS Township, LYCOMING County, Pennsylvania

Dear Mr. KIMMEL:

I have reviewed the map and material accompanying your recent correspondence, which concerns the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and Pennsylvania Fish & Boat Commission (PFBC) files, the timber rattlesnake (Crotalus horridus, PA candidate) is known from the vicinity of the proposed project site. Timber rattlesnakes occur in the forested, mountainous regions of the Commonwealth. They prefer forested areas to forage for small mammals (e.g., mice and chipmunks) and southerly-facing slopes for hibernating and other thermoregulatory activities. The timber rattlesnake is threatened by habitat loss/alteration, wanton killing, and poaching.

We are concerned about direct and indirect effects that the proposed project could have on the local population of the timber rattlesnake. You sent the results of a timber rattlesnake habitat assessment conducted on the project area in 2011. Although potential critical habitat was identified in the vicinity of the project, there will be no direct impacts to this habitat. Therefore, if the work is to be conducted out of the active season of the timber rattlesnake, then I do not anticipate any adverse impacts to this species of special concern. **However, if work is to be conducted from April 15-October 15, then I will ask you to take the following precautions to safeguard workers and rattlesnakes:**

1. A PFBC approved timber rattlesnake biologist who has the proper permits (Scientific Collector's Permit), and the proper skills to handle this venomous species will be on-site prior to and during construction.

2. The PFBC approved timber rattlesnake biologist will be on-site prior to and during construction activities, during the above time frame, to inspect and clear the area (including staging areas and access roads) of timber rattlesnakes and to capture and remove any rattlesnakes that may interfere with work activities. Note: After the biologist has "cleared" the area of rattlesnakes, silt fences or other timber rattlesnake exclusion fencing may be installed depending on the size of the project. If fencing is used, Curlex or similar types of control netting should not be used due to potential entrapment of snakes within this material.

3. Timber rattlesnakes observed on-site are to be measured, sexed, and the habitat characterized where the snake was found. All captured snakes should be released within close proximity (under 100 meters) of the capture site if possible. Rattlesnake captures and relocations are to be documented by photographs, habitat descriptions, in addition to being mapped and labeled accordingly. The biologist is to submit a report to this office (Natural Diversity Section) following the completion of the project documenting all of the activity and herpetofauna encountered.

4. Workers responsible for implementing this project should be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. It is suggested a procedure be implemented for timber rattlesnake encounters and workers are to be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes is prohibited by the Commission pursuant to Chapter 79.6. subsection 2102 (b) of the fishing and boating regulations.

Enclosed is the list of PFBC approved rattlesnake biologists for your convenience.

If you have any questions regarding this response, please contact Kathy Gipe at 814-359-5186 and refer to the SIR number at the top of this letter. Thank you for your cooperation and attention to this matter of endangered species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/mr

Enclosure (1)

ATTACHMENT B

FIELD DATA SHEETS

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-1

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): Concave Slope (%) 2

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.432742 Long: -77.057996 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____		
Hydric Soil Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Wetland Hydrology Present?	Yes X No ____	If yes, optional Wetland Site ID:	W-1, POW

Remarks: (Explain alterative procedures here or within a separate report.)

Sample point located within a Palustrine Open Water (POW) wetland on an otherwise upland decidudous ridgetop. This POW is a depressional area surrounded by upland forest. No vegetation is present in this wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

X	Surface Water (A1)	____	Water-Stained Leaves (B9)	____	Surface Soil Cracks (B6)
X	High Water Table (A2)	____	Aquatic Fauna (B13)	____	Drainage Patterns (B10)
X	Saturation (A3)	____	Marl Deposits (B15)	____	Moss Trim Lines (B16)
____	Water Marks (B1)	____	Hydrogen Sulfide Odor (C1)	____	Dry-Season Water Table (C2)
____	Sediment Deposits (B2)	____	Oxidized Rhizospheres on Living Roots (C3)	____	Crayfish Burrows (C8)
____	Drift Deposits (B3)	____	Presence of Reduced Iron (C4)	____	Saturation Visible on Aerial Imagery (C9)
____	Algal Mat or Crust (B4)	____	Recent Iron Reduction in Tilled Soils (C6)	____	Stunted or Stressed Plants (D1)
____	Iron Deposits (B5)	____	Thin Muck Surface (C7)	____	Geomorphic Position (D2)
____	Inundation Visible on Aerial Imagery (B7)	____	Other (Explain in Remarks)	____	Shallow Aquitard (D3)
X	Sparsely Vegetated Concave Surface (B8)			X	Microtopographic Relief (D4)
				____	FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches):	8"	
Water Table Present?	Yes X	No ____	Depth (inches):	5"	
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches):	0"	**Wetland Hydrology Present? Yes X No ____**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

Location has standing water present. Soils are saturated at the surface. Depth of the water table is approximate and could not be verified due to the thickness of ice covering the area. Location is a depression formed on this ridgetop.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-1

Tree Stratum (Plot size: 20' x 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 20' x 30')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5' Radius)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
= Total Cover			

Woody Vine Stratum (Plot size: 20' x 30')			
1.			
2.			
3.			
4.			
5.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

X Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Sample point plot sizes altered to include only the defined POW area included within mapped boundaries. No vegetaton was observed within the wetland boundary. Wetland determination based upon hydrology and hydric soil indicators. Wetland surrounded by *Quercus rubra*, *Quercus prinus* (or *Q. montana*), and *Kalmia latifolia*. Problematic vegetation indicator selected due to absence of vegetation present.

SOIL

Sampling Point: SP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/3	100	None	-	-	-	SiL	A
2-10	10YR 5/2	85	10YR 5/8	15	C	M	SiL	BA
10-16	2.5Y 6/2	85	10YR 6/8	35	C	M	SiCL	Btg
16+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 16"

Hydric Soil Present? **Yes** X **No** ___

Soil Description Remarks:

Soil met F3, Depleted Matrix indicator due to a matrix meeting the color requirements of a value of 4 or more and a chroma of 2 or less, with 5 percent or more distinct or prominent redoximorphic features within the 2-10 inch 10YR 5/2 color horizon. Multiple soil profiles were attempted, however, all encountered refusal at 16" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-2

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%) 1

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.432641 Long: -77.057903 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-2 is located approximately 20 feet south of the POW wetland (W-1) located in an upland forest.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-2

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra* (red oak)	56	Y	FACU
2. *Quercus prinus* (chestnut oak)	22	Y	UPL
3. *Acer saccharum* (sugar maple)	8	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	86 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	10	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	10 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	62	Y	FACU
2. *Gaultheria procumbens* (eastern teaberry)	12	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	74 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-1	10YR 3/2	100	None	-	-	-	SiL	A
1-19	10YR 5/6	100	None	-	-	-	L	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-3

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 7

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.431878 Long: -77.056324 Datum: NAD 83

Soil Map Unit Name: OxE-Oquanga and Lordstown very stony loams, 25 to 70 pecent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

Sample point representative of upland conditions in this portion of the AOI. AP-3 is located in an upland deciduous forest.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-3

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra* (red oak)	22	Y	FACU
2. *Acer saccharum* (sugar maple)	37	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	59 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	7	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	21	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	28 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Dennstaedtia punctilobula* (eastern hayscented fern)	65	Y	NL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	65 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. NL species assumed as UPL.

SOIL

Sampling Point: SP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-4	10YR 2/1	100	None	-	-	-	SiL	A
4-16	10YR 5/8	100	None	-	-	-	SiCL	Bt
16+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. Multiple soil profiles were attempted, however, all encountered refusal at 16" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-4

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 3

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.430257 Long: -77.055826 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-4 is located approximately 100 feet from the northeast boundary of the well Pad N AOI within an upland forest.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-4

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra* (red oak)	35	Y	FACU
2. *Acer saccharum* (sugar maple)	16	Y	FACU
3. *Quercus prinus* (chestnut oak)	22	Y	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	73 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	16	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	13	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	29 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	42	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	23	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	65 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-1	10YR 2/1	100	None	-	-	-	L	A
1-2	10YR 4/2	100	None	-	-	-	SL	E
2-8	10YR 5/6	100	None	-	-	-	SL	Bw1
8-20	10YR 6/6	100	None	-	-	-	SL	Bw2

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 4/2 horizon is interpreted to be an "E" or ellvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-5

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 8

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.429169 Long: -77.056731 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-5 sample point is representative of the upland forest conditions in this portion of the AOI. The location is on an upland hillslope on the northeastern edge of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-5

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra* (red oak)	13	N	FACU
2. *Acer saccharum* (sugar maple)	22	Y	FACU
3. *Quercus prinus* (chestnut oak)	31	Y	UPL
4. *Quercus alba* (white oak)	9	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	75	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	48	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	21	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	69	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	37	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	16	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	53	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 17 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-5	10YR 3/2	100	None	-	-	-	SiL	A
5-11	10YR 5/2	100	None	-	-	-	SL	E
11-16	10YR 4/6	100	None	-	-	-	L	Bw1
16+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 5/2 horizon is interpreted to be an "E" or ellvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons. Multiple soil profiles were attempted, however, all encountered refusal at 16" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-6

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 1

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.428063 Long: -77.058312 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-6 is located approximately 50 feet east of a cleared pipeline within a ROW in an upland forest.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-6

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra* (red oak)	45	Y	FACU
2. *Acer saccharum* (sugar maple)	3	N	FACU
3. *Quercus prinus* (chestnut oak)	8	N	UPL
4. *Pinus strobus* (white pine)	5	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	61	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	22	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	8	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	30	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	85	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	10	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	95	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-4	10YR 4/2	100	None	-	-	-	SL	A
4-8	10YR 4/6	100	None	-	-	-	SL	Bw1
8-16	10YR 5/6	100	None	-	-	-	SL	Bw2
16+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. Soil observed to be very rocky. Multiple soil profiles were attempted, however, all encountered refusal at 16" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-7

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 4

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.429498 Long: -77.058044 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-7 sample point is located on an upland ridgetop and is representative of the upland forest habitat in the north central portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-7

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra* (red oak)	41	Y	FACU
2. *Acer saccharum* (sugar maple)	13	N	FACU
3. *Quercus prinus* (chestnut oak)	22	Y	UPL
4. *Betula lenta* (sweet birch)	8	N	FACU
5. *Quercus velutina* (black oak)	9	N	NL
6.			
7.			
8.			
9.			
10.			
	93 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	53	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	53 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	41	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	41 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-4	10YR 3/2	100	None	-	-	-	SiL	A
4-8	10YR 4/3	100	None	-	-	-	SiL	AB
8-20	10YR 5/6	100	None	-	-	-	L	Bw1

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. Soil observed to be very rocky.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-8

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 2

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.43075 Long: -77.05756 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-8 is located approximately 100 feet from an existing pipeline ROW in an upland forest in the north central portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-8

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra* (red oak)	25	Y	FACU
2. *Acer saccharum* (sugar maple)	8	N	FACU
3. *Quercus prinus* (chestnut oak)	23	Y	UPL
4. *Quercus velutina* (black oak)	22	Y	NL
5.			
6.			
7.			
8.			
9.			
10.			
	78 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	8	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	5	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	13 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	15	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	14	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	29 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-2	10YR 6/2	100	None	-	-	-	S	E
2-3	5YR 3/3	100	None	-	-	-	S	Bs
3-7	7.5YR 5/8	100	None	-	-	-	SL	Bt1
7-15	10YR 6/6	100	None	-	-	-	SL	Bt2
15+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 15"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 6/2 horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons. Multiple soil profiles were attempted, however, all encountered refusal at 15" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-9

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 4

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.431735 Long: -77.057487 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-9 sample point is representative of the upland conditions in the northern portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-9

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus rubra* (red oak)	40	Y	FACU
2. *Acer saccharum* (sugar maple)	8	N	FACU
3. *Quercus velutina* (black oak)	30	Y	NL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	78	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	31	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	13	Y	FAC
3. *Acer saccharum* (sugar maple)	7	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	51	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	39	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	39	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-2	10YR 3/2	100	None	-	-	-	SiL	A
2-3	10YR 4/3	100	None	-	-	-	SL	AB
3-14	10YR 5/6	100	None	-	-	-	SL	Bw
14+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 14"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. Multiple soil profiles were attempted, however, all encountered refusal at 14" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-10

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 10

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.422831 Long: -77.058412 Datum: NAD 83

Soil Map Unit Name: OxE-Oquanga and Lordstown very stony loams, 25 to 70 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-10 is located approximately 50 feet west of the exisiting pipeline ROW in an upland forest, near the center of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-10

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	10	N	FACU
2. *Pinus resinosa* (red pine)	8	N	FACU
3. *Quercus prinus* (chestnut oak)	55	Y	NL
4. *Betula lenta* (sweet birch)	8	N	FACU
5. *Amelanchier arborea* (common serviceberry)	3	N	FAC
6.			
7.			
8.			
9.			
10.			
	84	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	12	Y	FACU
2. *Betula lenta* (sweet birch)	25	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	37	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	12	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	28	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	40	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-2	10YR 5/2	100	None	-	-	-	S	E
2-3	7.5YR 3/4	100	None	-	-	-	SL	Bs
3-14	10YR 6/8	100	None	-	-	-	SL	Bw
14+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 14"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 5/2 horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons. Multiple soil profiles were attempted, however, all encountered refusal at 14" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-11

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop saddle Local relief (concave, convex, none): None Slope (%) 5

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.425521 Long: -77.059539 Datum: NAD 83

Soil Map Unit Name: OxE-Oquanga and Lordstown very stony loams, 25 to 70 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-11 is located on a ridgetop saddle. Sample point is representative of upland forest conditions in the saddle area, on the west side of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-11

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	61	Y	FACU
2. *Quercus rubra* (red oak)	19	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	8	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	23	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	31	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Vaccinium angustifolium* (lowbush blueberry)	62	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	62	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-2	10YR 3/2	100	None	-	-	-	SiL	A
2-3	10YR 4/3	100	None	-	-	-	SL	AB
3-14	10YR 5/8	100	None	-	-	-	L	Bw
14+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 14"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. Multiple soil profiles were attempted, however, all encountered refusal at 14" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-12

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 2

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.427588 Long: -77.059245 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-12 is located approximately 75 feet west of an existing pipeline ROW in an upland forest near the center of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-12

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	5	N	FACU
2. *Quercus rubra* (red oak)	5	N	FACU
3. *Fraxinus americana* (white ash)	32	Y	FACU
4. *Quercus prinus* (chestnut oak)	22	Y	UPL
5. *Quercus velutina* (black oak)	8	N	NL
6.			
7.			
8.			
9.			
10.			
	72	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	8	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	31	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	39	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Vaccinium angustifolium* (lowbush blueberry)	28	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	28	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-3	10YR 6/2	100	None	-	-	-	S	E
3-4	7.5YR 4/4	100	None	-	-	-	SL	Bs
4-16	10YR 6/6	100	None	-	-	-	SL	Bw
16+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 6/2 horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons. Multiple soil profiles were attempted, however, all encountered refusal at 16" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-13

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 6

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.430466 Long: -77.059185 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-13 sample point is representative of the upland forest conditions in the northwest portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-13

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	28	Y	FACU
2. *Quercus rubra* (red oak)	23	Y	FACU
3. *Pinus resinosa* (red pine)	9	N	FACU
4. *Quercus prinus* (chestnut oak)	17	Y	UPL
5.			
6.			
7.			
8.			
9.			
10.			
	77 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	52	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	52 = Total Cover		
Herb Stratum (Plot size: 5' Radius)			
1. *Vaccinium angustifolium* (lowbush blueberry)	31	Y	FACU
2. *Kalmia latifolia* (mountain laurel)	9	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	40 = Total Cover		
Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-3	10YR 3/2	100	None	-	-	-	SiL	A
3-9	10YR 4/3	100	None	-	-	-	S	AB
9-16	10YR 4/6	100	None	-	-	-	S	Bw
16+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. Multiple soil profiles were attempted, however, all encountered refusal at 16" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 7-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-14

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%) 1

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.432539 Long: -77.059239 Datum: NAD 83

Soil Map Unit Name: DkD-Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-14 located approximately 75 feet west of the existing pipeline ROW within an upland forest in the northwest portion of the Pad N AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **X**	Depth (inches): -		
Water Table Present?	Yes ____	No **X**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **X**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-14

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	53	Y	FACU
2. *Quercus rubra* (red oak)	11	N	FACU
3. *Acer rubrum* (red maple)	8	N	FAC
4. *Betula lenta* (sweet birch)	10	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	82	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	12	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	21	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	33	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Gaultheria procumbens* (eastern teaberry)	2	N	FACU
2. *Kalmia latifolia* (mountain laurel)	8	Y	FACU
3. *Dennstaedtia punctilobula* (eastern hayscented fern)	18	Y	NL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	28	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-2	7.5YR 4/2	100	None	-	-	-	SL	E
2-3	7.5YR 3/3	100	None	-	-	-	L	Bs
3-6	10YR 5/8	100	None	-	-	-	L	Bw1
6-20	10YR 6/6	100	None	-	-	-	SiL	Bw2

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 4/2 horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-15

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%) 1

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.420538 Long: -77.058985 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-15 sample point representative of the upland of the upland forest habitat in the south central portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-15

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	22	Y	FACU
2. *Quercus prinus* (chestnut oak)	26	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	48	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	64	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	9	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	73	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Vaccinium angustifolium* (lowbush blueberry)	8	Y	FACU
2. *Kalmia latifolia* (mountain laurel)	18	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	26	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. Area is dominated by *Kalmia latifolia* .

SOIL

Sampling Point: SP-15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-4	10YR 2/1	100	None	-	-	-	SL	A
4-14	10YR 4/3	100	None	-	-	-	SL	Bw
14+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 14"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. Many rocks observed throughout the soil profile. Multiple soil profiles were attempted, however, all encountered refusal at 14" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-16

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%) 1

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.419158 Long: -77.060116 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-16 is located approximately 30 feet east of the cleared pipeline ROW in an upland forest in the southwest portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-16

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	20	Y	FACU
2. *Quercus prinus* (chestnut oak)	65	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	85	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	64	Y	FACU
2. *Acer saccharum* (sugar maple)	12	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	76	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Vaccinium angustifolium* (lowbush blueberry)	15	Y	FACU
2. *Kalmia latifolia* (mountain laurel)	22	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	37	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. Area is dominated by *Kalmia latifolia* .

SOIL

Sampling Point: SP-16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-6	10YR 5/1	100	None	-	-	-	S	E
6-15	7.5YR 5/8	100	None	-	-	-	L	Bw
15+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 15"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 5/1 horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons. Multiple soil profiles were attempted, however, all encountered refusal at 15" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-17

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 4

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.417831 Long: -77.060737 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-17 sample point is representative of the upland habitat in the southwest portion of the AOI

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-17

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	10	N	FACU
2. *Quercus prinus* (chestnut oak)	22	Y	UPL
3. *Pinus strobus* (eastern white pine)	16	Y	FACU
4. *Betula lenta* (sweet birch)	6	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	54	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	41	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	4	N	FAC
3. *Quercus prinus* (chestnut oak)	16	Y	UPL
4. *Pinus strobus* (eastern white pine)	2	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	63	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	37	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	37	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. Area is dominated by *Kalmia latifolia* .

SOIL

Sampling Point: SP-17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-5	10YR 2/1	100	None	-	-	-	L	A
5-11	10YR 4/2	100	None	-	-	-	S	E
11-20	10YR 5/8	100	None	-	-	-	S	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 4/2 horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons. Large rocks observed throughout soil profile.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-18

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 4

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.418054 Long: -77.058703 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-18 is located approximately 30 feet east of the existing pipeline ROW within a deciduous forest in the south central portion of the Pad R AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-18

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	22	Y	FACU
2. *Quercus prinus* (chestnut oak)	36	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	58	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	65	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	10	N	FAC
3. *Quercus prinus* (chestnut oak)	13	N	UPL
4. *Acer saccharum* (sugar maple)	5	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	93	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	35	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	35	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. Area is dominated by *Kalmia latifolia* .

SOIL

Sampling Point: SP-18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
4-0	-	-	-	-	-	-	OM	Organic
0-1	10YR 2/1	100	None	-	-	-	L	A
1-4	10YR 5/2	100	None	-	-	-	S	E
4-7	5YR 3/4	100	None	-	-	-	SL	Bs
7-20	10YR 6/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Upland soil sample due to high chroma subsurface colors observed with no evidence of reduction or oxidation with redoximorphic features. Soil does not meet the indicator requirements for any applicable hydric soil indicators. The 10YR 5/2 horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. In addition, this layer lacks the required redoximorphic colors for hydric layers identified to be E horizons.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-19

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 2

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.419309 Long: -77.058279 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-19 is representative of the upland conditions for the south central portion of the site. Sample area if located on a mixed deciduous/coniferous ridgetop.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-19

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	9	N	FACU
2. *Quercus prinus* (chestnut oak)	26	Y	UPL
3. *Pinus resinosa* (red pine)	8	N	FACU
4. *Betula lenta* (sweet birch)	3	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	46	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	57	Y	FACU
2. *Cercis canadensis* (eastern redbud)	4	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	61	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	42	Y	FACU
2. *Pteridium aquilinum* (western brackenfern)	4	N	FACU
3. *Vaccinium angustifolium* (lowbush blueberry)	2	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	48	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. Area is dominated by *Kalmia latifolia* .

SOIL

Sampling Point: SP-19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-8	10YR 2/1	100	None	-	-	-	L	A
8-14	10YR 4/2	100	None	-	-	-	S	C
14+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 14+

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Soil does not meet the indicator requirements for any applicable hydric soil indicators due to absence of redoximorphic colors within the 10YR 4/2 horizon. Multiple soil profiles were attempted, however, all encountered refusal at 14" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-20

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 2

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.420474 Long: -77.057558 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-20 is located in an upland forested area where the pad meets the access road, in the southern portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-20

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	30	Y	FACU
2. *Quercus prinus* (chestnut oak)	55	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	85	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	45	Y	FACU
2. *Acer saccharum* (sugar maple)	12	N	FACU
3. *Hamamelis virginiana* (American witchhazel)	5	N	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	62	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	15	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	23	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	38	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. Area is dominated by *Kalmia latifolia* .

SOIL

Sampling Point: SP-20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	10YR 2/1	100	None	-	-	-	L	A
1-3	10YR 6/2	100	None	-	-	-	S	E
3-4	10YR 4/6	100	None	-	-	-	SL	Bw1
4-15	10YR 6/4	85	7.5YR 6/8	15	C	M	SL	Bw2
15+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 15"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Soil does not meet the indicator requirements for any applicable hydric soil indicators due to absence of redoximorphic colors within the 10YR 6/2 horizon. This horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. Additionally, this profile does not meet any hydric soil indicators due to the 10YR 6/4 horizon have too high of a matrix value, despite the redoximorphic concentrations present. Multiple soil profiles were attempted, however, all encountered refusal at 15" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-21

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 6

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.420052 Long: -77.056965 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-21 sample point is representative of the upland conditions in the southeast portion of the AOI. The sample point is located on the eastern edge of the AOI nearby a significant topographic change.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-21

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	13	Y	FACU
2. *Quercus prinus* (chestnut oak)	14	Y	UPL
3. *Betula lenta* (sweet birch)	21	Y	FACU
4. *Quercus rubra* (red oak)	7	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	55	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	61	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	61	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	34	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	34	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. Area is dominated by *Kalmia latifolia* .

SOIL

Sampling Point: SP-21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-5	10YR 2/1	100	None	-	-	-	L	A
5-11	10YR 5/2	100	None	-	-	-	S	E
11-20	10YR 3/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Soil does not meet the indicator requirements for any applicable hydric soil indicators due to absence of redoximorphic colors within the 10YR 5/2 horizon. This horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. Additionally, due to the absence of redoximorphic features in the 10YR 3/6, this horizon also does not meet an indicator.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-22

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%) 1

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.418878 Long: -77.056164 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-22 is located 25 feet west of the southeastern AOI boundary within an upland forest.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-22

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	31	Y	FACU
2. *Quercus prinus* (chestnut oak)	35	Y	UPL
3. *Quercus rubra* (red oak)	12	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	78 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	42	Y	FACU
2. *Quercus rubra* (red oak)	12	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	54 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	62	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	12	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	74 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant. Area is dominated by *Kalmia latifolia* .

SOIL

Sampling Point: SP-22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	-	-	-	-	-	-	OM	Organic
0-1	10YR 2/1	100	None	-	-	-	L	A
1-6	10YR 5/2	100	None	-	-	-	S	E
6-7	5YR 4/3	100	None	-	-	-	S	Bs
7-10	7.5YR 6/8	100	None	-	-	-	SL	Bw1
10-20	10YR 6/6	100	None	-	-	-	SL	Bw2

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Soil does not meet the indicator requirements for any applicable hydric soil indicators due to absence of redoximorphic colors within the 10YR 5/2 horizon. This horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. Additionally, due to the absence of redoximorphic features in lower horizons, this profile does not meet an indicator.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-23

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 5

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.418798 Long: -77.057245 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-23 is representative of the upland conditions in the southeast portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-23

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	19	Y	FACU
2. *Quercus prinus* (chestnut oak)	6	N	UPL
3. *Quercus rubra* (red oak)	15	Y	FACU
4. *Pinus resinosa* (red pine)	13	Y	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	53 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	71	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	71 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	14	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	4	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	18 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	-	-	-	-	-	-	OM	Organic
0-2	10YR 2/1	100	None	-	-	-	SiL	A
2-4	10YR 4/1	100	None	-	-	-	S	E
4-10	10YR 5/3	100	None	-	-	-	S	Bw1
10-15	10YR 4/6	100	None	-	-	-	S	Bw2
15+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 15"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Soil does not meet the indicator requirements for any applicable hydric soil indicators due to absence of redoximorphic colors within the 10YR 4/1 horizon. This horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. Additionally, due to the absence of redoximorphic features in lower horizons, this profile does not meet an indicator. Many rocks were observed throughout the soil profile. Multiple soil profiles were attempted, however, all encountered refusal at 15" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-24

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 5

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.418081 Long: -77.056603 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-24 is located within an upland area in the southeast corner of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-24

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	32	Y	FACU
2. *Pinus resinosa* (red pine)	17	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	49 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	58	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	6	N	FAC
3. *Quercus rubra* (red oak)	2	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	66 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	33	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	12	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	45 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
6-0	-	-	-	-	-	-	OM	Organic
0-1	10YR 2/1	100	None	-	-	-	SiL	A
1-8	10YR 6/2	100	None	-	-	-	S	E
8-9	5YR 3/2	100	None	-	-	-	SL	Bs
9-16	7.5YR 5/8	100	None	-	-	-	L	Bw
16+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Soil does not meet the indicator requirements for any applicable hydric soil indicators due to absence of redoximorphic colors within the 10YR 6/2 horizon. This horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. Additionally, due to the absence of redoximorphic features in lower horizons, this profile does not meet an indicator. Multiple soil profiles were attempted, however, all encountered refusal at 16" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-25

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 2

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.422035 Long: -77.057284 Datum: NAD 83

Soil Map Unit Name: DkB-Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-25 is a sample point located on a narrow ridgetop in the southern portion of the AOI. It is dominated by a mixed deciduoud/coniferous forest.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-25

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	22	N	FACU
2. *Pinus resinosa* (red pine)	21	N	FACU
3. *Quercus prinus* (chestnut oak)	34	Y	UPL
4. *Betula lenta* (sweet birch)	7	N	FACU
5. *Quercus rubra* (red oak)	27	Y	FACU
6. *Pinus strobus* (eastern white pine)	8	N	FACU
7.			
8.			
9.			
10.			
	119	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	21	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	21	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	28	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	16	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	44	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	-	-	-	-	-	-	OM	Organic
0-2	10YR 2/1	100	None	-	-	-	SL	A
2-8	10YR 4/2	100	None	-	-	-	S	E
8-14	10YR 5/4	100	None	-	-	-	S	Bw
14+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 14"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Soil does not meet the indicator requirements for any applicable hydric soil indicators due to absence of redoximorphic colors within the 10YR 4/2 horizon. This horizon is interpreted to be an "E" or eluvial horizon. These are commonly found within forested ecosystems and are indicative of forest soil processes and not related to the same process creating the low chroma wetland soil matrix colors. Additionally, due to the absence of redoximorphic features in lower horizon, this profile does not meet an indicator. Many rocks observed throughout soil profile. Multiple soil profiles were attempted, however, all encountered refusal at 14" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad R and Pad N City/County: Lewis Township/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-26

Investigator(s): Joshua R. Grabel, Dennis W. Strouse Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop saddle Local relief (concave, convex, none): None Slope (%) 6

Subregion (LRR or MLRA): LRR R, MLRA 140 Lat: 41.42535 Long: -77.058795 Datum: NAD 83

Soil Map Unit Name: OxE-Oquaga and Lordstown very stony loams, 25 to 70 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

SP-26 sample point is located in a ridgetop saddle on the eastern side of the existing pipeline ROW. The location is at the lowest topographical point along the ridgetop within the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): -		
Water Table Present?	Yes ____	No X	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No evidence of primary or secondary wetland hydrology indicators observed during time of evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-26

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer saccharum* (sugar maple)	18	Y	FACU
2. *Quercus rubra* (red oak)	16	Y	FACU
3. *Quercus alba* (white oak)	24	Y	FACU
4. *Acer pensylvanicum* (striped maple)	4	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	62	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Acer pensylvanicum* (striped maple)	7	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	2	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	9	= Total Cover	
Herb Stratum (Plot size: 5' Radius)			
1. *Dennstaedtia punctilobula* (eastern hayscented fern)	8	Y	NL
2. *Vaccinium angustifolium* (lowbush blueberry)	3	N	FACU
3. *Dryopteris intermedia* (intermediate woodfern)	11	Y	FACU
4. *Lycopodium obscurum* (rare clubmoss)	2	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	24	= Total Cover	
Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations [1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Vegetation does not pass dominance test. Hydrophytic vegetation is not dominant.

SOIL

Sampling Point: SP-26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	-	-	-	-	-	-	OM	Organic
0-3	10YR 2/1	100	None	-	-	-	SiL	A1
3-5	10YR 3/2	100	None	-	-	-	SiL	A2
5-14	10YR 5/6	100	None	-	-	-	SiL	Bw
14+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 14"

Hydric Soil Present? **Yes** ___ **No** **X**

Soil Description Remarks:

Soil does not meet the indicator requirements for any applicable hydric soil indicators due to presence of high chroma subsoil matrix colors without the presence of redoximorphic features. Multiple soil profiles were attempted, however, all encountered refusal at 14" or less.

ATTACHMENT C

SITE PHOTO DOCUMENTATION

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad R and N

Project Number: 085042038

DATE:
March 6, 2012

DIRECTION:
northwest

COMMENTS:
PHOTO 1
View of existing pipeline right of way (ROW) that follows Narrow Mountain Road.

DATE:
March 7, 2012

DIRECTION:
northwest

COMMENTS:
PHOTO 2
View of W-1, a palustrine open water (POW) wetland, located in the northeastern section of Pad N at SP-1.

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad R and N

Project Number: 085042038

DATE:
March 7, 2012

DIRECTION:
east

COMMENTS:
PHOTO 3
View of SP-6 in forested upland area that is dominant on Pads R & N.

DATE:
March 7, 2012

DIRECTION:
east

COMMENTS:
PHOTO 4
View of forested upland area on the western portion of Pad N at SP-12.

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad R and N

Project Number: 085042038

DATE:
March 6, 2012

DIRECTION:
north

COMMENTS:
PHOTO 5
View of upland saddle area between two ridge tops at SP-26.

DATE:
March 6, 2012

DIRECTION:
east

COMMENTS:
PHOTO 6
View of SP-18 in upland forested area that dominates Pad R.

ATTACHMENT D

PROFESSIONAL QUALIFICATIONS

Chad G. Lobley – Mr. Lobley is a biologist with over eight years of experience and training in field ecology, wetlands, fisheries, aquatics and wildlife. In his current role Mr. Lobley has a multitude of responsibilities, which include; management and coordination with sub-contractors and regulatory agencies, prepare and monitor permit documents to ensure compliance, and providing technical support. Mr. Lobley is efficient at field ecology and has managed numerous projects involving biological investigations of linear development (pipeline), wind farm siting, and industrial sites in Pennsylvania, Ohio, New Jersey, New York, Delaware, Maryland, West Virginia, Virginia, Illinois, Michigan, and other states. These projects included tasks such as wetlands delineation, wetland and stream restoration/mitigation/monitoring, avian and wildlife surveys/management/and studies, threatened and endangered species surveys, ecological risk assessment, stream assessments, aquatic life studies, baseline ecological evaluations, water quality/wastewater management, and other various habitat evaluations.

David J. Durofchalk – Mr. Durofchalk is a Professional Wetland Scientist (PWS) and a Project Management Professional (PMP). He holds a Bachelor's degree in Geography/Environmental Planning from Bloomsburg University of Pennsylvania, and a Master's of Science in Biology/Environmental Studies from East Stroudsburg University of Pennsylvania. Mr. Durofchalk has twenty-three years of natural resource consulting expertise garnered throughout the Mid-Atlantic and East Coast. He is experienced in all aspects of wetland field investigations, federal and state wetland regulations, Clean Water Act Section 404/401 and Pennsylvania Chapter 105 permitting, wetland function and value assessments, and habitat assessments for sensitive species. Mr. Durofchalk has directed interdisciplinary team members and coordinated with agency personnel in the preparation of a wide range of National Environmental Policy Act (NEPA) documents for a wide variety of transportation and energy infrastructure projects.

Joshua Grabel– Mr. Grabel has a Bachelor's degree in Environmental Studies from the University of North Carolina at Asheville and a master's degree in Environmental Sciences from Oregon State University. As an undergrad, he was employed by the Environmental Quality Institute, testing water quality throughout North Carolina. His master's studies focused on wetlands, water quality, GIS, and water resources management. In addition, he has extensive experience that includes: environmental consultant focusing on stormwater and erosion controls, forest hydrologist for the Watersheds Research Cooperative, wetland delineator for the Center for Environmental Management of Military Lands, and graduate teaching assistant for Biology. Mr. Grabel has received training in wetland delineation according to the *U.S. Army Corps of Engineers Wetland Delineations Manual* and regional supplements for the Northcentral and Northeast Region, and Eastern Mountains and Piedmont Region.

Dennis W. Strouse – Mr. Strouse has a bachelor's degree in fisheries management from Mansfield University. Mr. Strouse has worked with the Northumberland and Montour County Conservation Districts for ten years where he was responsible for permitting and inspections on projects regulated under Pennsylvania's stream and wetland encroachment and erosion control programs. He was also responsible for construction oversight on numerous nutrient management related projects and streambank stabilization and rehabilitation projects. Mr. Strouse facilitated procurement of Pennsylvania Growing Greener funding and oversaw permitting for the rehabilitation and construction of wetlands on several sites throughout Montour County. Mr. Strouse has received training in wetland delineation techniques using the *U.S. Army Corps of Engineers Wetland Delineation Manual* and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*.

Jocelyn L. Robinson – Ms. Robinson has a bachelor degree in geography, and a bachelor of science degree with a double major in environmental soil science and agriculture and natural resources, from the University of Delaware. After receiving her degree in geography, Ms. Robinson gained experience in soil science through site evaluations for on-site wastewater treatment and disposal systems (OWTDS)/septic, stormwater management structure siting/permitting, basement investigations, and rapid and comprehensive assessments of tidal and non-tidal wetlands in Delaware. Ms. Robinson is knowledgeable with aspects of hydric soils and soil classification, wetlands delineation and wetland assessment. She has conducted many field investigations which include culvert replacements and wetland surveys for roadway improvements projects in Pennsylvania. Such projects include wetland reports and encroachment permits through Pennsylvania Department of Environmental Protection (PADEP) Chapter 105 regulations. Ms. Robinson has attended numerous continuing education courses pertaining to soils science and wetland delineation and is actively seeking multiple certifications.

RETTEW SM

We answer to you.

3020 Columbia Avenue, Lancaster, PA 17603
Phone: (717) 394-3721 Fax: (717) 394-1063
E-mail: rettew@rettew.com • Web site: www.rettew.com

M E M O R A N D U M

TO: Doug Kepler, Seneca Resources Corporation

FROM: Amber S. Amelingmeier, Chad G. Lobley

DATE: March 30, 2012

PROJECT NAME: Tract 100 Pad P **PROJECT NO.:** 085042037

SUBJECT: Wetland Investigation

INTRODUCTION

On behalf of Seneca Resources Corporation (Seneca), RETTEW Associates, Inc. (RETTEW) conducted a wetland investigation of the proposed Tract 100 Pad P on March 5 and 6, 2012 by qualified wetland biologists (Jocelyn L. Robinson and Rachelle A. Shiffler). The proposed project includes the construction of a well pad which will be used to collect natural gas found within the region. The project area of the Tract 100 Pad P is located east of Hagerman Run Road, and north of Pennsylvania State Route 14. The project is located in Lewis Township, Lycoming County, Pennsylvania and appears on the Trout Run, Pennsylvania 7.5-minute United States Geological Survey (USGS) quadrangle (Tract 100 Pad P Latitude: 41.433159 and Longitude: -77.039971; as provided on the Topographic Basemap in **Attachment A, Figure 1**. The Area of Investigation (AOI) for the proposed Tract 100 Pad P is provided on the Aerial Basemap in **Attachment A, Figure 2.**

METHODS

RETTEW conducted the wetland investigation of proposed Tract 100 Pad P using the updated wetland delineation methodology outlined in the 1987 *Corps of Engineers Wetland Delineation Manual* and the 2012 *Version 2.0 Regional Supplement to the Corps of Engineers Wetland Delineation Manual*: *Northeast and Northcentral Region*. This approach recognizes the three (3) parameters of vegetation, soils, and hydrology to identify and delineate wetlands. The purpose of this investigation was to identify wetland and stream boundaries within the AOI and avoid and/or minimize impacts to these natural resources.

AGENCY COORDINATION

An online Pennsylvania Natural Diversity Inventory (PNDI) search of the Tract 100 Pad P (project search ID: **20111003319052**) was performed on October 3, 2011. The PNDI search receipt identified that the proposed project area has a potential impact to a special concern species under the jurisdiction of the Pennsylvania Fish and Boat Commission (PFBC). To date, PNDI conflict resolution has been coordinated by Seneca for the resulting special concern species of the timber rattlesnake (*Crotalus horridus*). A November 2011 rattlesnake survey was conducted by Wildlife Specialists, LLC and found that potential denning habitat was found within the search area, however no potential denning or gestation habitat exists within the areas of proposed disturbance. Copies of the PNDI and timber rattlesnake survey report are included in **Attachment B**.

RESULTS

Wetlands

Based upon RETTEW's investigation, the AOI was dominated by deciduous hardwood forests. No wetlands, waterbodies, or watercourses were identified within the AOI. Please refer to the Aerial Basemap in **Attachment A, Figure 2** for the location of the proposed Tract 100 Pad P and **Attachment C** for the datasheets with specific information for each sample point.

Uplands

Wetland hydrology, hydrophytic vegetation, and soil characteristic indicators for all Sample Points (SP-1, SP-2, SP-3, SP-4, SP-5, SP-6, SP-7, SP-8, SP-9, SP-10, SP-11, SP-12, SP-13, SP-14, SP-15, SP-16, SP-17, and SP-18) did not meet the criteria for a jurisdictional wetland. Please refer to representative field data sheets provided in **Attachment C** for additional information specific to these sample points.

18 sample points were taken throughout the AOI, which consisted of approximately 96.4 acres. The typical dominant vegetation throughout the deciduous hardwood forest consisted of *Acer pensylvanicum* (striped maple, FACU)*, Acer rubrum* (red maple, FAC)*, Acer saccharum* (sugar maple, FACU)*, Hamamelis virginiana* (American witchhazel, FAC)*, Kalmia latifolia* (mountain laurel, FACU)*, Mitchella repens* (partridgeberry, FACU), *Pinus strobus* (eastern white pine, FACU)*, Quercus prinus* (chestnut oak, UPL)*, Thelypteris noveboracensis* (New York fern, FAC)*,* and *Vaccinium angustifolium* (lowbush blueberry, FACU). Companion species found with the dominant vegetation consisted of *Quercus velutina* (black oak, NL), *Gaultheria procumbens* (eastern teaberry, FACU), and *M. repens*. The composition of the dominant species resulted in less than 50 percent dominance test, indicating a lack of dominant hydrophytic vegetation. Hydric soils and evidence of wetland hydrology were typically absent. It was determined that due to an absence of wetland hydrology, hydrophytic vegetation, and hydric soils all sample points were located within an upland area.

Streams

RETTEW did not identify any waterbodies or watercourses within or immediately adjacent to the AOI.

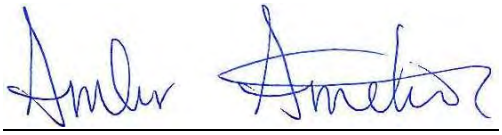
DISCUSSION

RETTEW did not identify any wetlands, waterbodies, or watercourses within the AOI. Please refer to the site mapping figures in **Attachment A** (**Figure 1**: Topographic Basemap, **Figure 2**: Aerial Basemap). The PNDI and timber rattlesnake survey, data sheets, recent color photographs, and qualifications are included in **Attachments B, C**, **D,** and **E** respectively.

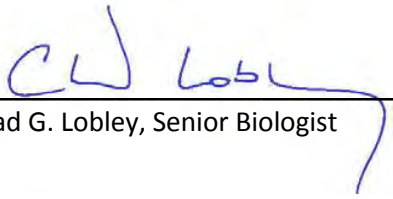
Wetlands, man-made ponds, and intermittent or perennial stream channels, are regulated by the United States Army Corps of Engineers (USACE) and the Pennsylvania Department of Environmental Protection (PADEP). Any encroachments, fills, or crossing of these areas will require appropriate State and Federal permits. Data on which this report is based is on file at RETTEW's Lancaster, Pennsylvania office.

The wetland boundary determination was made using the best available indicators at the time of the delineation. Seasonal changes in wetland indicators (such as hydrology and vegetation) may require adjustment of the boundary during the growing season. This wetland boundary should be considered preliminary and used

for planning purposes only. Wetland boundary confirmation will be required during the growing season before this wetland delineation meets accepted standards for permitting purposes.

Prepared by: 

Amber S. Amelingmeier, Environmental Scientist

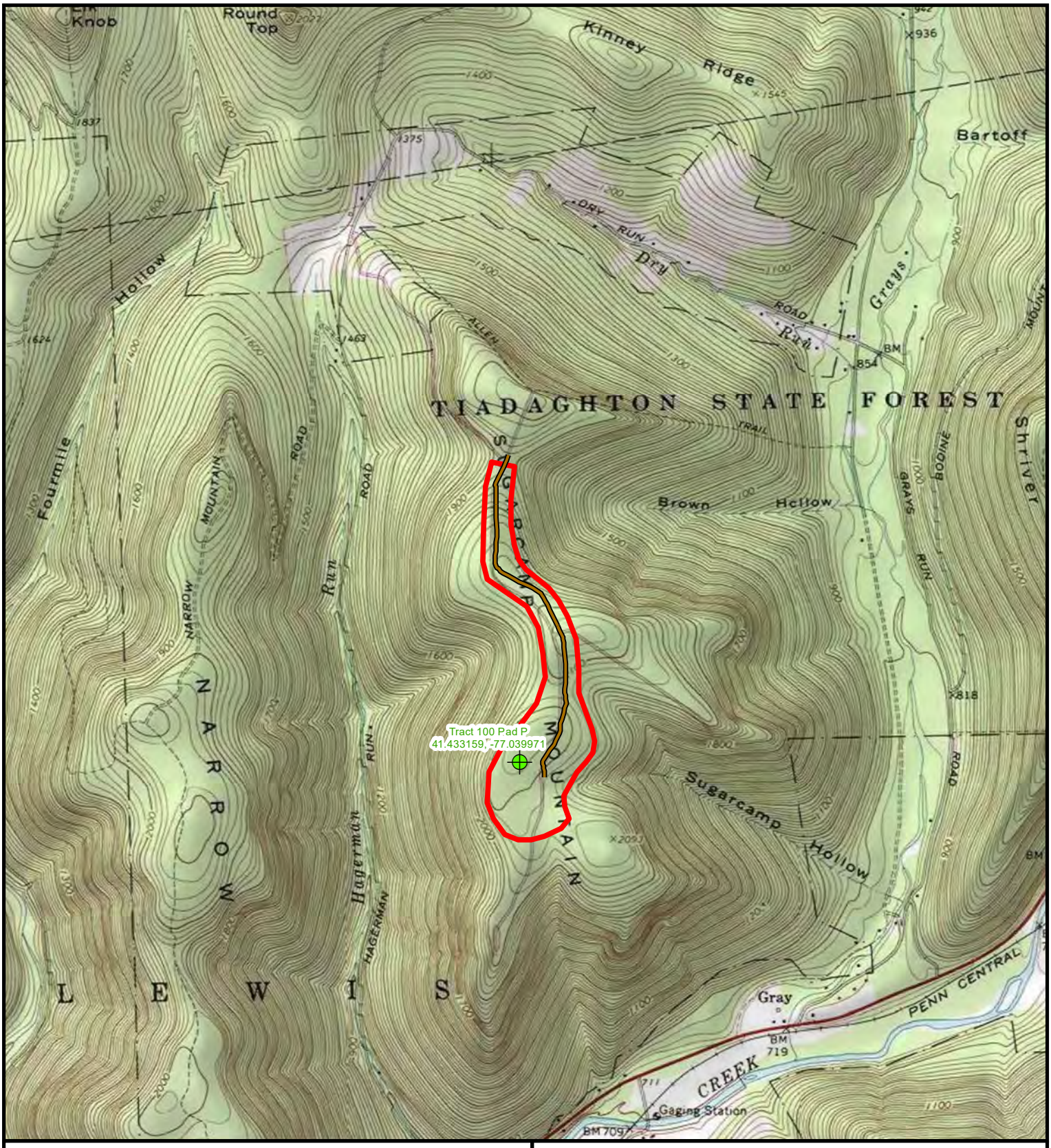
Reviewed by: 

Chad G. Lobley, Senior Biologist

H:\Projects\08504\085042037\NS\Wetland Memo\WetMemo-Tract100PadP.doc

ATTACHMENT A

FIGURES



t Éäãm~Ç÷çÅ-íáçå

bñáëíáåÖ≐ ÅÅÉëëo ç~Ç
Ëpì Ö-êÅ-â é=j çìå í~áå¬o ç~ÇF

^ ëÉ~çÑ¬åîÉëíáÖ-íáçå
ÉVSKQ≐ÅéÉëF

Lewis Township, Lycoming County, PA
Trout Run, PA USGS 7.5' Topographic Quadrangle

_~ëÉã ~éW¬ kpKd Íçäç Öå-ä¬pì ã ÍóI“k d p|q çéç r p| OavlHk ~íáçå~äd ÍçÖêé ÜåÅ=
pçÅéÉíóI=OMMNF Ü íéWëÉëíáÅÉëKêÅÖéçåäåå ÉKÅç ã ÍíVPIÍ=êÉíëáÉÍÉ Ç÷çå=PIPMOMNOK

Seneca Resources Corporation

Tract 100 Pad P

cáÖìê É=N¬Ì¬qçéçÖê-éÜíåÅ_ ~ëÉã ~é
mêçäÉÅí=kçK=MUNRQMFT
i Éí áë=qçï åëÜëê I=íóÅç ã åäÖ=`çìåí óI=m

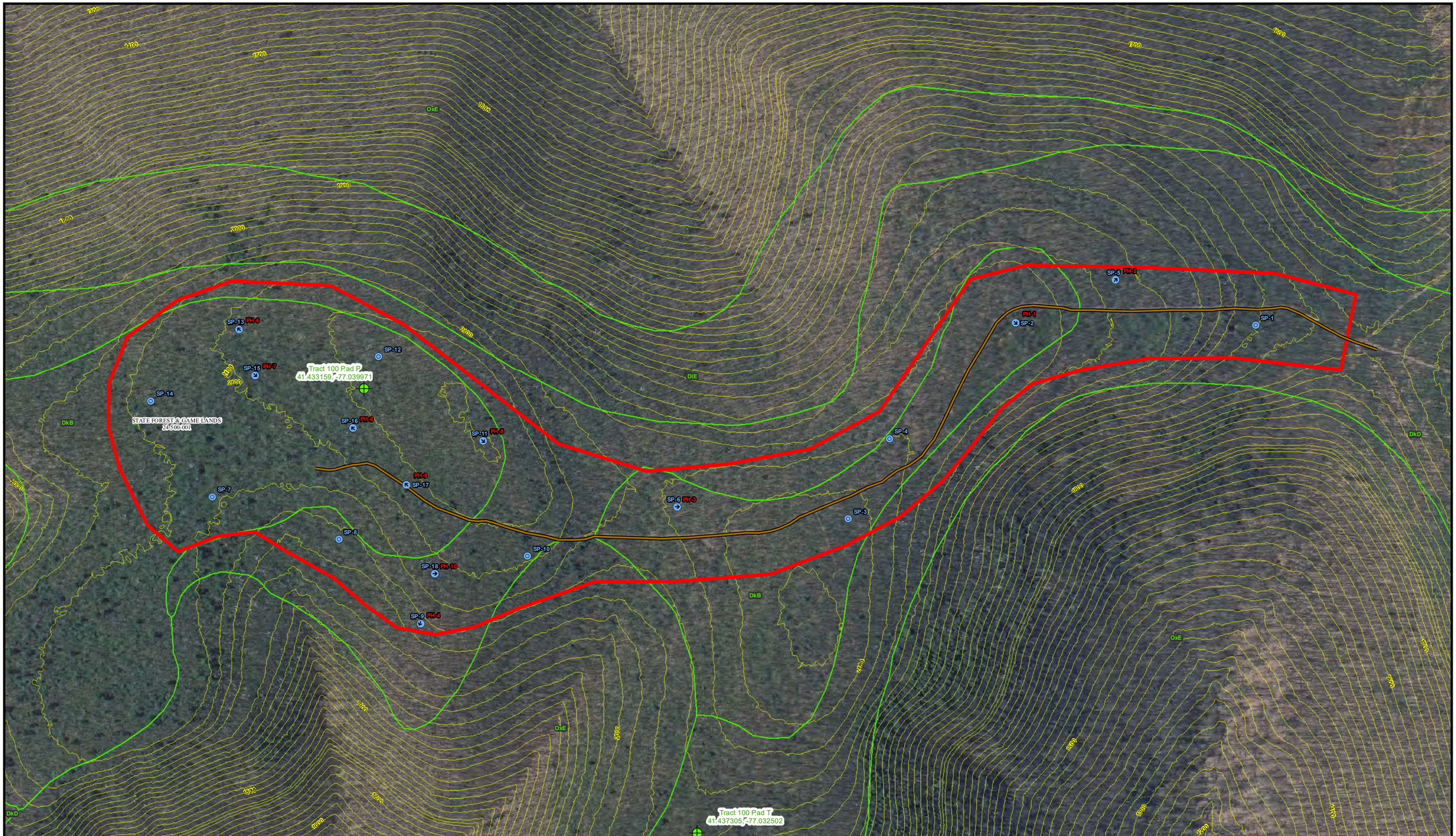
N
W E
S

M NIMMM OIMMM
cÉÉí

N÷äÅÜ¬Z=OIMMH¬ÑÉ

SENECA RESOURCES RETTEW

e Wmçáí Éí ëçyMURMQMURMQMPTy fpybñÜÅíëyt Éí=j Éã çyqê-Á|NMMm-Ç| mj qçé ç|_ ~ëÉã ~éKã ñÇ



Seneca Resources Corporation

Tract 100 Pad P

Figure 2 - Aerial Basemap
Project No. 085042037
Lewis Township, Lycoming County, PA

H:\Projects\08504\085042037\GIS\Exhibits\Wet Memo\Tract_100_Pad_P_Aerial_Basemap.mxd

3/30/2012

- Well Pad Location
- Sample Point
- Sample Point and Photo Location with Direction
- Field Delineated Stream (None Present)
- Contour (20 ft Interval)
- Existing Access Road (Sugarcamp Mountain Road)
- Field Delineated Wetland (None Present)
- NRCS, USDA Soil Survey
- Area of Investigation (96.4 Acres)
- Lycoming County Parcel Boundary

0 400 Feet

1 inch = 400 feet

SENECA RESOURCES

RETTEW

ATTACHMENT B

PENNSYLVANIA NATURAL DIVERSITY INVENTORY SEARCH RECEIPT

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad P**
Date of review: **10/3/2011 9:30:49 AM**
Project Category: **Mining,Oil or Gas (including roads and pipelines),New Well**
Project Area: **108.8** acres
County: **Lycoming** Township/Municipality: **Lewis**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17771**
Decimal Degrees: **41.441407 N, -77.036347 W**
Degrees Minutes Seconds: **41° 26' 29.1" N, -77° 2' 10.9" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

__X__ **SIGNED** copy of this Project Environmental Review Receipt
__X__ Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
__X__ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
__X__ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
__X__ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____ The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Greg Kimmel
Company/Business Name: Seneca Resources Corporation
Address: 51 Zents Blvd.
City, State, Zip: Brookville PA 15856
Phone:(814) 220-1523 Fax:( )
Email: Kimmelg@srcx.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Rachelle A. Shaffer FOR: Greg Kimmel 2/28/12
applicant/project proponent signature date

Timber Rattlesnake Habitat Assessment Report

DCNR 007 Well Pad P Project

For Seneca Resources

Prepared By:

Wildlife Specialists, LLC

2785 Hills Creek Rd.

Wellsboro, PA 16901

570-376-2255

www.wildlife-specialists.com

November 2011

Table of Contents

Executive Summary 3
Site Description 3
Survey Goals 5
Survey Methods 5
Findings 5
Recommendations 9
Appendix I. PA Fish & Boat Commission Timber Rattlesnake Habitat Assessment Data Forms 10

List of Figures

Figure 1. Seneca Resource's DCNR 100 Tract Well Pad P Project, Lycoming County, Pennsylvania, October 2011 4

Figure 2. Timber rattlesnake habitat survey area at Seneca Resources's DCNR 100 Well Pad P Project, Lycoming County, Pennsylvania, October 2011, showing search areas and habitat points 6

Figure 3. Timber rattlesnake habitat survey area at Seneca Resource's DCNR 100 Well Pad P Project, Lycoming County, Pennsylvania, October 2011, showing search areas and habitat points 7

Figure 4. Timber rattlesnake habitat survey area at Seneca Resource's DCNR 100 Well Pad P Project, Lycoming County, Pennsylvania, October 2011, showing search areas and habitat points 8

Executive Summary

Wildlife Specialists, LLC conducted a habitat field survey for environmental review on state forest lands investigated by Seneca Resources for their proposed DCNR 100 Tract Pad P well pad project. The proposed well pad is located in Lewis Township, Lycoming County, Pennsylvania. Through a Pennsylvania Natural Diversity Inventory Environmental Review (PNDI), the Pennsylvania Fish and Boat Commission (PFBC) identified a potential impact from this project on the timber rattlesnake (*Crotalus horridus*), a *Special Concern Species* under their jurisdiction. Seneca Resources decided to conduct a Phase I survey of the project route to expedite the review process and locate any sensitive habitats or species occurrences.

The survey areas encompassed the proposed project route, and included a 300-foot buffer around the limits of disturbance in those areas. Habitat within the survey area was primarily mature mixed deciduous forest and mixed forest with blueberry-rubus shrub and fern herbaceous layers combined with shrub/scrub and open grassy fields. Stan Boder, A PFBC qualified timber rattlesnake biologist, and staff biologists from Wildlife Specialists, LLC searched the survey areas for sign and suitable habitat for the timber rattlesnake. Potential denning habitat was found within the search area on the slope and consisted of isolated boulders with some larger ledges and outcrops. No potential denning or gestation habitat was found within the disturbance area of the proposed project. This report summarizes the findings of the habitat surveys conducted throughout the survey areas during October, 2011.

Site Description

Wildlife Specialists surveyed an approximately 1.2 mile portion of Seneca Resource's proposed 100 pad P well pad project between Sugarcamp Hollow and Hagerman Run, Lewis Township, Lycoming County, Pennsylvania (Fig. 1). The approximate coordinates of the proposed well pad are 41° 26' 18.34"N, 77° 2' 17.82"W (center point). The proposed development areas are situated within the *Mountainous High Plateau Section* of the *Appalachian Plateau Physiographic Province*. The entire site is on state forest land, with mature mixed deciduous forest and some open fields along the top.

The overstory is composed primarily of red maple (*Acer rubrum*), red (*Quercus rubra*), chestnut (*Q. prinus*), and white (*Q. alba*) oak, American beech (Fagus grandifolia), black (*Betula lenta*) and gray (*B. populifolia*) birch, eastern hemlock (*Tsuga canadensis*), and white pine (*Pinus strobus*), with smaller amounts of American hophornbeam (*Ostrya virginiana*). The forest understory includes Allegheny blackberry *(Rubus allegheniensis*), lowbush blueberry (*Vaccinium spp.*), mountain laurel (*Kalmia latifolia*), striped maple (*Acer pensylvanicum*), and witch hazel (*Hammamelis virginiana)*. The herbaceous layer consists of hay-scented fern (*Dennstaedtia punctilobula*), goldenrod (*Solidago spp*.), and a wide variety of other ferns, broad-leaved herbs, and grasses making up minor components.

2785 Hills Creek Rd
Wellsboro, PA 16901
570-376-2255

Web: www.wildlife-specialists.com
Email: info@wildlife-specialists.com

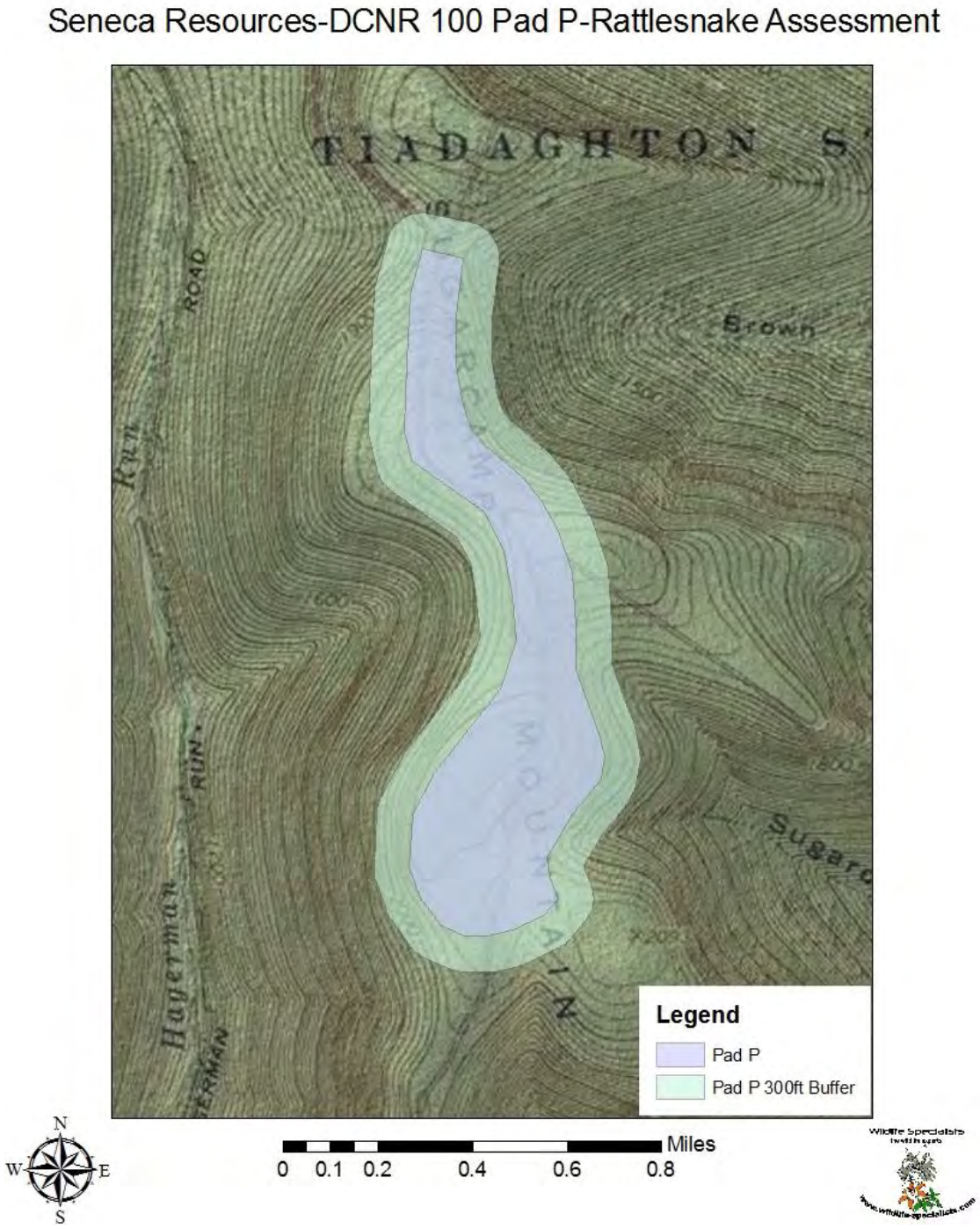


Figure 1. Seneca Resource's DCNR 100 Tract Well Pad P Project, Lycoming County, Pennsylvania, October 2011.

Survey Goals

Seneca Resources is in the planning process for the construction of DCNR 100 well pad P which will be located in Lewis Township, Lycoming County, Pennsylvania. The goal of this habitat survey was to search the area proposed for development for evidence of use or suitable habitat for timber rattlesnakes, so that any such occurrences can be conserved on this site and to ensure any new development will minimize impact to this species or its preferred habitat.

Survey Methods

In October, 2011, Wildlife Specialists, LLC, surveyed the areas of the proposed DCNR 100 well pad P project, including a 300-foot buffer around the limits of disturbance for timber rattlesnake denning and gestating habitat. The site was surveyed using the Pennsylvania Fish and Boat Commission's timber rattlesnake habitat assessment methodology and data forms (Appendix I). Timber rattlesnake habitat was evaluated and classified as either basking/gestating or denning habitat. Any areas of potential habitat were documented using handheld GPS units and digital photographs (Figures 3-4). GIS maps were generated to illustrate search areas, proposed development, digital photo locations and significant findings. Detailed information on vegetative and geological characteristics was recorded.

Findings

Several low potential denning sites were found within the search area during Phase I habitat surveys (Fig. 2). Most of the potential denning habitat is located on a moderate northwest facing slope under 85 – 90% canopy cover. There is little shrub or herbaceous cover at sites higher up the slope, but ground vegetative cover becomes thicker closer to the boundary between the forest and mountain top. The rocky potential denning habitat consists of embedded boulders and slabs (up to 5ft x 7ft) scattered across the hillside. The potential denning habitat is located approximately 40 ft or greater from the proposed disturbance area. No potential denning habitat was documented within the propsoed disturbance area.

Figure 2. Timber rattlesnake habitat survey area at Seneca Resource's DCNR 100 Well Pad P Project, Lycoming County, Pennsylvania, October 2011, showing search areas and habitat features.

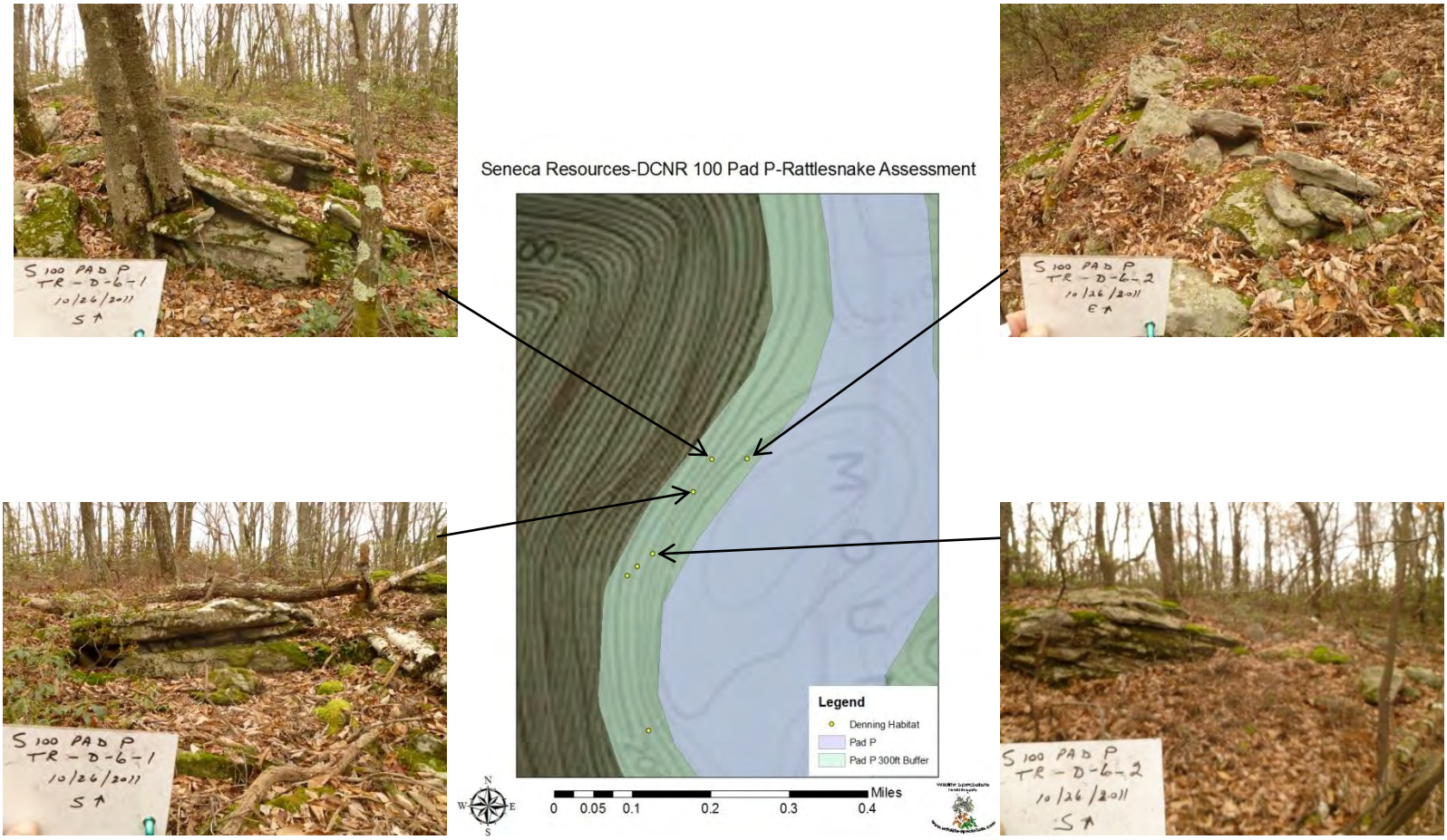


Figure 3. Timber rattlesnake habitat survey area at Seneca Resource's DCNR 100 Well Pad P Project, Lycoming County, Pennsylvania, October 2011, showing search areas and habitat features.

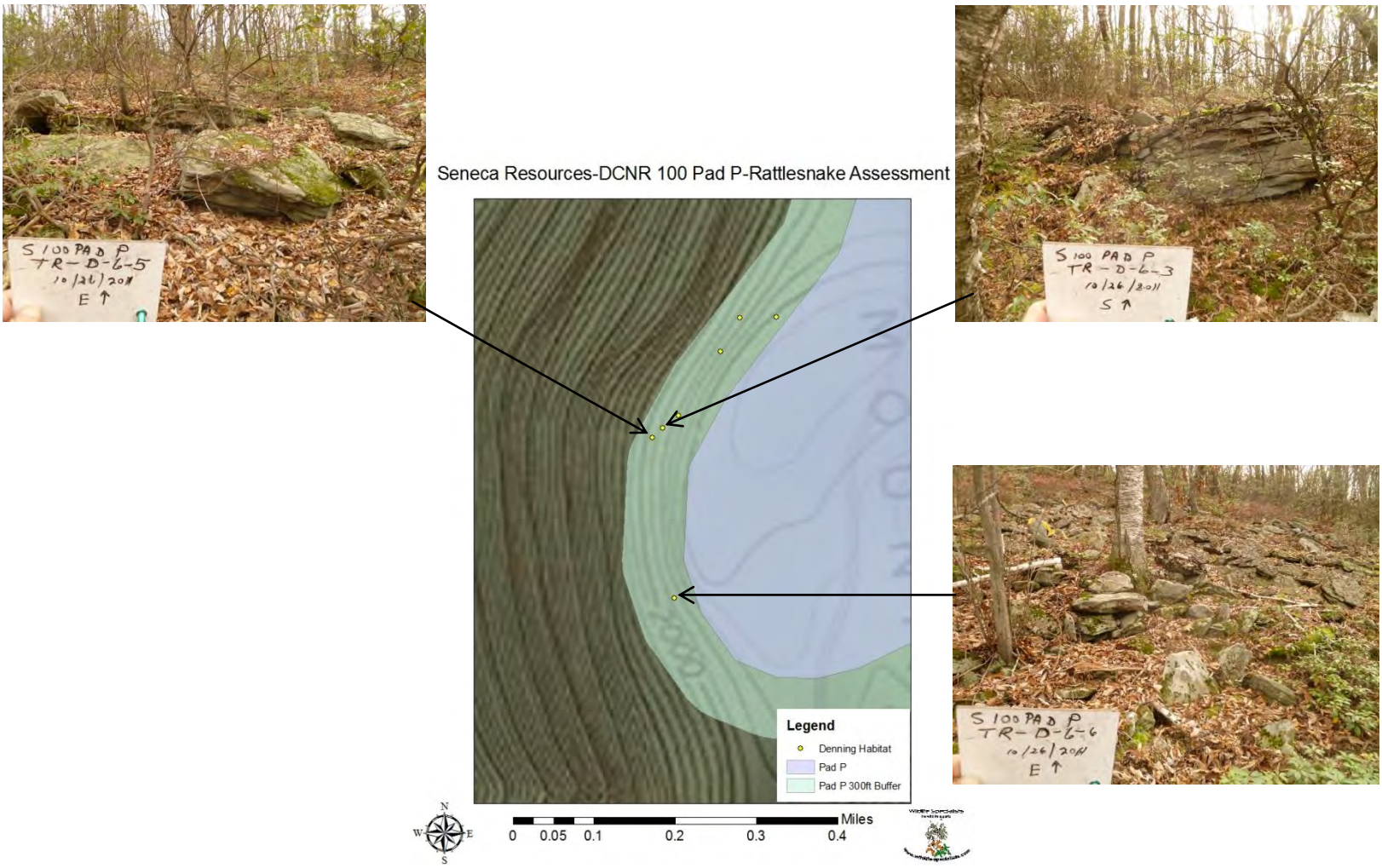


Figure 4. Timber rattlesnake habitat survey area at Seneca Resource's DCNR 100 Well Pad P Project, Lycoming County, Pennsylvania, October 2011, showing search areas and habitat features.

Recommendations

It is the observation of Wildlife Specialists, LLC that low potential denning habitat for the timber rattlesnake does exist within the search area of the DCNR 100 Well Pad P Project. However, no potential denning or gestating habitat was found within the disturbance area of the proposed project. The project should proceed as planned and presented in this document without impacting timber rattlesnake denning or gestating habitat.

Wildlife Specialists recommends that Seneca Resources employs the following mitigation measures:

1) Inform site workers about the proximity to rattlesnakes, the regulations addressing rattlesnakes, and who to call to remove rattlesnakes that enter the construction zone.

Appendix I. PA Fish & Boat Commission Timber Rattlesnake Habitat Assessment Data Forms

Pennsylvania Fish & Boat Commission, Natural Diversity Section
Timber Rattlesnake Habitat Assessment Form (revised 02/11/10)

Project Information
Project/Property Name: DCNR 100 Well Pad P SIR# _____
Project Type/Description: Natural Gas Well Pad
Project Size* (acreage): 198 acres
Applicant/Landowner Name: Seneca Resources
County: Lycoming Quad: Trout Run Township/Municipality: Lewis

* Attach a copy of topographic map and a site sketch showing survey site and natural features identified.

Assessment Site Information [Areas within and at least 300 feet around the entire project area need to be assessed.]
Date: October 26, 2011 Time: 10:30 AM
Site ID**: _____
Latitude: 41° 26' 18.34" N Longitude: 77° 2' 17.82" W
Map Datum Used: NAD 83
Assessment Size** (acreage): 20

** The surveyor should use his/her judgement on the size of the area that a single assessment encompasses. **Additional assessment forms should be used to accurately describe and evaluate large contiguous areas by utilizing a separate form for separate habitat areas within the project boundaries. Each separate area assessed should be assigned a Site ID name that is referenced to the overall site sketch.**

Weather Conditions (Note: Assessment cannot be conducted in snow cover.)
Air temperature (°F) 55 % Cloud Cover 40

Habitat Description
General description: The site is a small shaded ledge system on the slope below the the mountain top of Sugarcamp Mountain. The ledge goes across the west slope with some open rock below the ledge.

Level of remoteness/nearby disturbance (roads, homes, buildings, utility right-of-ways, etc.):
Hagerman Run Rd Runs across the top of the mountain.

Topographical description: Flat on top to moderately steep south facing slope

Slope (Degrees) 0 on top, 45 on slope

Aspect W (compass orientation, i.e., direction hillside faces)

Ground Cover:

% rocky ground cover: 30%

% rocky ground cover that receives direct sunlight: 5%

List size range and shape of rocks (round, flat, etc.): rock outcrops (up to 10ft across) embedded boulders and slabs (up to 5ft x 7ft)

Are there rock outcrops or ledges present? yes

Are boulder fields, and/or talus/scree slopes present? no

Are flat gestation slabs present? no

Project Name DCNR 100 Pad P ***Site ID #*** Habitat 1 ***(con't)***

Vegetative Composition:

% Tree Canopy Cover: mostly 90-95%

Dominant species present in and surrounding the described habitat:

Trees: Chestnut oak, hemlock, red and white oak, white pine, black, gray, yellow birch, red maple

Shrubs: striped maple, Allegheny blackberry, blueberry, mountain laurel, witch hazel

Other plant species of note: hay-scented fern, golden rod

Species Observations

Were herpetofauna species or their signs (e.g., sheds, scat, "forms") observed on-site (include timber rattlesnake observations)? If so, what species and how many?

no

Additional Comments/Observations: (use additional sheets if necessary)

INVESTIGATOR'S OPINION

In your opinion, is there timber rattlesnake critical habitat? Yes■ or No☐
If Yes, what timber rattlesnake critical habitat occurs in this area? See below.

Hibernaculum/Den Yes■ or No☐
Gestation/Birthing Yes☐ or No■

I certify that to the best of my knowledge, all of the information provided herein is accurate and complete.

Stan Boder	Stanley P. Boder	10/26/2011
Investigator's Name (print)	**Investigator's Signature**	**Date**

Reporting. The following items need to be submitted for review:

(1) Timber rattlesnake habitat assessment form.
(2) A project narrative/description, exact project location, equipment to be used in earth moving activities
(3) Color photographs of surveyed area showing: general panorama, rocky areas, and specimens observed.
(4) Site sketch showing the location and direction of photos taken.
(5) Topographic map showing location of area surveyed, the identified potential habitat delineated, the proposed project and associated boundaries.

Please mail these items to:

Natural Diversity Section
PA Fish & Boat Commission
450 Robinson Lane
Bellefonte, PA 16823

ATTACHMENT C

FIELD DATA SHEETS

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-1

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Backslope Local relief (concave, convex, none): Convex Slope (%) 8

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.44438692 Long: -77.04091597 Datum: NAD 83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Vegetation naturally problematic due to the time of year (dormant, not in growing season). SP located east of existing access road in *K. latifolia* dominated area. Snow present at 1" (approximately 25% cover), however, herbaceous stratum still visible.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **X**	Depth (inches): -		
Water Table Present?	Yes ____	No **X**	Depth (inches): -		
Saturation Present? (includes capilary fringe)	Yes ____	No **X**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **X**

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-1

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus velutina* (black oak)	5	N	NL
2. *Pinus strobus* (eastern white pine)	10	N	FACU
3. *Quercus prinus* (chestnut oak)	50	Y	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	65 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	30	Y	FACU
2. *Acer rubrum* (red maple)	5	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	35 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	4	N	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	25	Y	FACU
3. *Mitchella repens* (partridgeberry)	2	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	31 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species. NL species assumed to be UPL.

SOIL

Sampling Point: SP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	5YR 2.5/1	100	None	-	-	-	Sapric	Oa
0-2	10YR 3/2	100	None	-	-	-	L-	A, very stony L-
2-12	10YR 5/4	100	None	-	-	-	L-	Bw, stony L-
12+	Refusal							Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 12"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil present. Multiple soil profiles attempted, however all resulted in rock refusal at 12" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-2

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Backslope Local relief (concave, convex, none): Concave Slope (%) 5

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.44136425 Long: -77.04097866 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Upland sample point area taken in area of vegetation change. Sample point located east of existing access road in concave area. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **X**	Depth (inches): -		
Water Table Present?	Yes ____	No **X**	Depth (inches): -		
Saturation Present? (includes capilary fringe)	Yes ____	No **X**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **X**

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-2

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	18	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	18	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	60	Y	FACU
2. *Acer rubrum* (red maple)	10	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	70	Y	FACU
2. *Thelypteris noveboracensis* (New York fern)	5	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	75	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species.

SOIL

Sampling Point: SP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	7.5YR 3/2	100	None	-	-	-	Hemic	Oe, Frozen hemic
0-2	10YR 2/1	100	None	-	-	-	Mucky SL	A
2-3	10YR 5/1	100	None	-	-	-	SL	AE
3-13	10YR 5/4	50	None	-	-	-	SL	Bt, Flaggy SL
	10YR 6/4	50	None	-	-	-		
13+	Refusal							Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 13" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-3

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Shoulder Local relief (concave, convex, none): None Slope (%) 4

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43923775 Long: -77.03773005 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Snow cover 2" (30% cover), however herbaceous stratum still visible. SP located east of existing access road in *K. latifolia* dominated area. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-3

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	45	Y	UPL
2. *Acer rubrum* (red maple)	15	Y	FAC
3. *Quercus velutina* (black oak)	5	N	NL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	65	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	60	Y	FACU
2. *Acer rubrum* (red maple)	4	N	FAC
3. *Quercus prinus* (chestnut oak)	10	N	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	74	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	12	Y	FACU
2. *Acer rubrum* (red maple)	1	N	FAC
3. *Mitchella repens* (partridgeberry)	2	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	15	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species. NL species assumed to be UPL.

SOIL

Sampling Point: SP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	7.5YR 3/2	100	None	-	-	-	Hemic	Oe Frozen hemic
0-1	10YR 2/1	100	None	-	-	-	SL+	A
1-4	10YR 5/3	100	None	-	-	-	L+	AB
4-11	10YR 5/6	100	None	-	-	-	L+	Bt
11+	Refusal							Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 11"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 11" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-4

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Backslope Local relief (concave, convex, none): None Slope (%) 4

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.4397635 Long: -77.03906372 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located in an area with vegetation change, west of the existing access road. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **X**	Depth (inches): -		
Water Table Present?	Yes ____	No **X**	Depth (inches): -		
Saturation Present? (includes capilary fringe)	Yes ____	No **X**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **X**

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-4

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	25	Y	UPL
2. *Acer saccharum* (sugar maple)	12	N	FACU
3. *Hamamelis virginiana* (American witchhazel)	14	Y	FAC
4. *Acer pensylvanicum* (striped maple)	10	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	61	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	45	Y	FACU
2. *Acer pensylvanicum* (striped maple)	25	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	12	Y	FACU
2. *Thelypteris noveboracensis* (New York fern)	20	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	32	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.33 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species.

SOIL

Sampling Point: SP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	10YR 2/1	100	None	-	-	-	Sapric	Oa
0-4	10YR 4/2	60	None	-	-	-	Flaggy SL	A
4-9	10YR 5/4	50	None	-	-	-	Stony SL	Bw
9+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 9"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 9" or less. Rocks encountered increase in size with depth.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-5

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Shoulder Local relief (concave, convex, none): None Slope (%) 4

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.44263282 Long: -77.0416893 Datum: NAD 83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Snow present at 1" (20% cover), however, herbaceous stratum still visible. Sample Point located west of existing access road in northern portion of the AOI. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-5

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	50	Y	UPL
2. *Acer saccharum* (sugar maple)	12	N	FACU
3. *Kalmia latifolia* (mountain laurel)	18	Y	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	70	Y	FACU
2. *Fagus grandifolia* (American beech)	4	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	74	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	6	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	8	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	14	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species.

SOIL

Sampling Point: SP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	10YR 2/1	100	None	-	-	-	Sapric	Oa (frozen)
0-5	7.5YR 5/2	90	None	-	-	-	Flaggy L-	EA
5-13	10YR 5/6	95	None	-	-	-	Flaggy L+	Bt
13+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 13" or less. Frozen soil in various areas nearby SP.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-6

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Shoulder Local relief (concave, convex, none): None Slope (%) 5

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43708749 Long: -77.0379595 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Snow present at 1" (15% cover), however, herbaceous stratum still visible. Sample Point located west of existing access road in the center portion of the AOI. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-6

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	60	Y	UPL
2. *Acer saccharum* (sugar maple)	8	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	68	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	50	Y	FACU
2. *Pinus strobus* (eastern white pine)	8	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	58	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	5	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	15	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	20	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species.

SOIL

Sampling Point: SP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
2-0	10YR 2/1	100	None	-	-	-	Sapric	Oa (frozen)
0-2	7.5YR 4/2	100	None	-	-	-	SL-	A
2-8	10YR 5/6	100	None	-	-	-	LS	E
8-13	10YR 6/4	97	10YR 7/2	2	D	M	SL+	Bt
			7.5YR 5/6	1	C	M		
13+	Refusal							

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 13" or less. Frozen soil in various areas nearby SP.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-7

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%) 3

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43123451 Long: -77.03818289 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Snow present at 2" (30% cover), however, herbaceous stratum still visible. Sample Point located within southeast portion of AOI. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-7

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	35	Y	UPL
2. *Acer rubrum* (red maple)	8	N	FAC
3. *Fagus grandifolia* (American beech)	10	N	FACU
4. *Pinus strobus* (eastern white pine)	12	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	65 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	80	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	10	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	8	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	8 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species.

SOIL

Sampling Point: SP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	2.5Y 2.5/1	100	None	-	-	-	Sapric	Oa
0-5	2.5Y 6/1	100	None	-	-	-	SL+	A
5-13	10YR 5/6	100	None	-	-	-	L-	Bw
13+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock and or root refusal

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock and or root refusal at 13" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-8

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Shoulder Local relief (concave, convex, none): None Slope (%) 5

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43282361 Long: -77.03745602 Datum: NAD 83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point in area with dense *Kalmia latifolia* coverage in the central-eastern portion of the AOI. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **X**	Depth (inches): -		
Water Table Present?	Yes ____	No **X**	Depth (inches): -		
Saturation Present? (includes capilary fringe)	Yes ____	No **X**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **X**

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-8

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	50	Y	UPL
2. *Acer rubrum* (red maple)	12	N	FAC
3. *Quercus velutina* (black oak)	10	N	NL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	72	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	80	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	8	Y	FACU
2. *Mitchella repens* (partridgeberry)	2	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	10	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species. NL species assumed to be UPL.

SOIL

Sampling Point: SP-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	10YR 2/1	100	None	-	-	-	Sapric	Oa
0-4	7.5YR 6/1	100	None	-	-	-	LS	E
4-5	10YR 3/4	100	None	-	-	-	SL+	Bs
5-11	7.5YR 5/6	100	None	-	-	-	SL	Bt1
11-17	7.5YR 6/6	100	None	-	-	-	SCL-	Bt2
17+	Refusal							Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock and or root refusal

Depth (inches): 17"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock and or root refusal at 17" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-9

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Backslope Local relief (concave, convex, none): None Slope (%) 12

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43383808 Long: -77.03603525 Datum: NAD 83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located on side of backslope in eastern portion of AOI. Sample point taken in areas with less *K. latifolia* and greater slopes. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-9

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	50	Y	UPL
2. *Betula populifolia* (gray birch)	8	N	FAC
3. *Quercus velutina* (black oak)	10	N	NL
4. *Hamalis virginiana* (American witchhazel)	12	N	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	80	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	40	Y	FACU
2. *Quercus prinus* (chestnut oak)	10	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	50	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	5	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	5	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU or UPL species. NL species assumed to be UPL. *Kalmia latifolia* is less dense in this location.

SOIL

Sampling Point: SP-9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	2.5Y 2.5/1	100	None	-	-	-	Mucky SL	A
4-6	7.5YR 5/2	100	None	-	-	-	SL-	E (very flaggy)
6-12	10YR 6/4	100	None	-	-	-	SL-	Bw (very flaggy)
12+	Refusal							Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock and or root refusal

Depth (inches): 12"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock and or root refusal at 12" or less. Soil was very rocky with 30% rocks of 1/2" to 1 1/2" in size present.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-10

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Sideslope Local relief (concave, convex, none): None Slope (%) 6

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.4351971 Long: -77.03908681 Datum: NAD 83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located on wooded sideslope in eastern portion of AOI and west of the existing access road. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-10

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	50	Y	UPL
2. *Pinus strobus* (eastern white pine)	15	Y	FACU
3. *Quercus velutina* (black oak)	8	N	NL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	73	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	50	Y	FACU
2. *Pinus strobus* (eastern white pine)	12	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	62	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	17	Y	FACU
2. *Gaultheria procumbens* (eastern teaberry)	3	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	20	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Unknown moss present (approximately 10 percent ground cover). A dominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species. NL species assumed to be UPL.

SOIL

Sampling Point: SP-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	10YR 2/1	100	None	-	-	-	Oa	Sapric
0-4	2.5Y 5/1	100	None	-	-	-	LS	
4+	Refusal							Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 4"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 4" or less. Soil was very rocky with 15% rocks of 1/2" to 1" in size throughout soil profile.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-11

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Summit Local relief (concave, convex, none): Concave Slope (%) 6

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.434649 Long: -77.039087 Datum: NAD 83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located west of the existing access road in western portion of AOI. Area dominated by *K. latifolia* and area very rocky. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-11

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	50	Y	UPL
2. *Acer saccharum* (sugar maple)	12	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	62	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	70	Y	FACU
2. *Hamamelis virginiana* (American witchhazel)	8	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	78	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	18	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	10	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	28	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Unknown moss present (approximately 10 percent ground cover). A dominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species.

SOIL

Sampling Point: SP-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0	10YR 3/2	100	None	-	-	-	Oa	Sapric
0-1	10YR 3/1	100	None	-	-	-	mucky SL	
1+	Refusal							Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 1"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 1" or less. Ridgetop sampling location soils were very rocky with 80% rocks of 1/2" to 2" in size throughout soil profile.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-12

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Summit Local relief (concave, convex, none): Convex Slope (%) 4

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43334435 Long: -77.04050562 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb channery loam, 3 to 12 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located in the southwest portion of AOI on a rocky summit, near the proposed well pad location. Large rocks present on ground surface (2" to 8" or more). Area dominated by *K. latifolia* and area very rocky. Vegetation naturally problematic due to the time of year (dormant, not in growing stage).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-12

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	60	Y	UPL
2. *Acer saccharum* (sugar maple)	15	N	FACU
3. *Betula lenta* (sweet birch)	10	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	85	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	45	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	45	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	18	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	8	Y	FACU
3. *Thelypteris noveboracensis* (New York fern)	3	N	FAC
4. *Gaultheria procumbens* (eastern teaberry)	1	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	30	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Area has slightly less *K. latifolia* coverage than previous sample points. A dominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species.

SOIL

Sampling Point: SP-12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0	7.5YR 3/3	100	None	-	-	-	Oe	Hemic
0-1	10YR 2/1	100	None	-	-	-	mucky SL	A
1-8	10YR 6/2	100	None	-	-	-	LS	Rocks at 20% (1/2" to 3")
8+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 8"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 8" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-13

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Summit Local relief (concave, convex, none): None Slope (%) 3

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43158841 Long: -77.04098106 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb channery loam, 3 to 12 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located in southwest portion of AOI on a rocky summit. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-13

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	60	Y	UPL
2. *Acer saccharum* (sugar maple)	10	N	FACU
3. *Betula papyrifera* (paper birch)	8	N	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	78	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	65	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	5	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	25	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	10	Y	FACU
3. *Mitchella repens* (partridgeberry)	1	N	FACU
4. *Gaultheria procumbens* (eastern teaberry)	2	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	38	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species.

SOIL

Sampling Point: SP-13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100	None	-	-	-	Mucky L	A1
2-3	2.5Y 3/1	100	None	-	-	-	Mucky LS	A2
3-10	10YR 6/2	100	None	-	-	-	LS	E
10-12	10YR 3/4	100	None	-	-	-	SL	BS
12-20	10YR 5/6	50	None	-	-	-	SL+	Bt
	10YR 6/6	50	None	-	-	-		

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: None

Depth (inches): -

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-14

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Summit Local relief (concave, convex, none): None Slope (%) 4

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43046888 Long: -77.03979683 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb channery loam, 3 to 12 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located in southern portion of AOI where a vegetation change (less *K. latifolia* and more *P. strobus*) occurs. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-14

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	40	Y	UPL
2. *Acer saccharum* (sugar maple)	10	N	FACU
3. *Pinus strobus* (eastern white pine)	30	Y	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	30	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	30	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	20	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	7	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	27	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Area has slightly less *K. latifolia* coverage than previous sample points. Adominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species.

SOIL

Sampling Point: SP-14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 3/1	100	None	-	-	-	mMucky L	
3-4	10YR 3/1	100	None	-	-	-	SL-	
4-8	2.5Y 4/1	100	None	-	-	-	LS+	
8-17	10YR 5/6	50	None	-	-	-	SCL-	
	10YR 6/6	50	None	-	-	-		
17+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 17"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 17" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-15

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Summit Local relief (concave, convex, none): None Slope (%) 3

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.431792 Long: -77.040208 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb channery loam, 3 to 12 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located in area of dense *K. latifolia* coverage. 1" snow cover present on ground (approx. 40 percent coverage), however, herbaceous stratum still visible. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-15

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	35	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	35	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	80	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	50	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	50	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

Area has slightly less *K. latifolia* coverage than previous sample points. A dominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species.

SOIL

Sampling Point: SP-15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100	None	-	-	-	Mucky SL	
4-7	10YR 5/1	100	None	-	-	-	SL	
7-12	10YR 6/6	100	None	-	-	-	SL+	
12+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 12"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 12" or less. Soils characteristic of the site. Rocks present throughout soil profile (approx. 20% rock of 1/2" to 1").

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-16

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Summit Local relief (concave, convex, none): Convex Slope (%) 6

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.433014 Long: -77.03931 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb channery loam, 3 to 12 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located in central portion of southern part of AOI in dense *K. latifolia* vegetation. Very rocky terrain at sample point. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-16

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	35	Y	UPL
2. *Acer saccharum* (sugar maple)	14	Y	FACU
3. *Quercus velutina* (black oak)	7	N	NL
4. *Betula papyrifera* (paper birch)	10	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	66	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	80	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	45	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	10	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	55	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

NL species assumed as UPL. A dominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species.

SOIL

Sampling Point: SP-16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	7.5YR 3/2	100	None	-	-	-	Mucky SL	
4-5	10YR 5/1	100	None	-	-	-	mucky LS	
5-9	2.5Y 4/2	100	None	-	-	-	LS	
9+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 9"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 9" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-17

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Summit Local relief (concave, convex, none): None Slope (%) 5

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43368251 Long: -77.03836209 Datum: NAD 83

Soil Map Unit Name: DkB - Dekalb channery loam, 3 to 12 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located adjacent to an overgrown access road in the south-central portion of the AOI. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-17

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	30	Y	UPL
2. *Acer saccharum* (sugar maple)	25	Y	FACU
3. *Pinus strobus* (eastern white pine)	15	Y	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	45	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	45 = Total Cover		

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	30	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	8	N	FACU
3. Grass sp.	4	N	
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	42 = Total Cover		

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species.

SOIL

Sampling Point: SP-17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/1	100	None	-	-	-	Mucky SL	A1
3-4	2.5Y 3/1	100	None	-	-	-	mucky LS	A2
4-6	10YR 5/3	100	None	-	-	-	LS	EB
6+							LS	Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 6"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 6" or less.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region - Version 2.0

Project/Site: Tract 100 Pad P City/County: Lewis/Lycoming County Sampling Date: 6-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-18

Investigator(s): Rachelle A Shiffler, Jocelyn L Robinson Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Shoulder Local relief (concave, convex, none): None Slope (%) 8

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43402978 Long: -77.03686834 Datum: NAD 83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site are typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation Yes , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X		
Hydric Soil Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID:	N/A

Summary Remarks:

Sample point located east of existing access road in southeast portion of AOI on a shoulder. Large rocks (2" to 5") present on ground surface. Vegetation naturally problematic due to the time of year (dormant, not in growing season).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	-	
Water Table Present?	Yes ____	No X	Depth (inches):	-	
Saturation Present? (includes capilary fringe)	Yes ____	No X	Depth (inches):	-	**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gage, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary indicators of wetland hydrology were observed during the evaluation.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-18

Tree Stratum (Plot size: 30' Radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	40	Y	UPL
2. *Acer saccharum* (sugar maple)	8	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	48	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' Radius)			
1. *Kalmia latifolia* (mountain laurel)	70	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	70	= Total Cover	

Herb Stratum (Plot size: 5' Radius)			
1. *Kalmia latifolia* (mountain laurel)	30	Y	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	10	Y	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	40	= Total Cover	

Woody Vine Stratum (Plot size: 30' Radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

A dominance of hydrophytic vegetation absent due to prevalence of FACU and UPL species.

SOIL

Sampling Point: SP-18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
4-0	7.5YR 3/2	100	None	-	-	-	Oa, Oe	Sapric/Hemic
0-1	2.5Y 2.5/1	100	None	-	-	-	Mucky SL	A
1-5	10YR 5/2	100	None	-	-	-	LS	E
5-7	10YR 4/6	100	None	-	-	-	SL	Bt
7+								Refusal

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR K, L, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat of Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock Refusal

Depth (inches): 7"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No indicators of hydric soil met due to the absence of redoximorphic features. Multiple soil profiles attempted, however all resulted in rock refusal at 7" or less.

ATTACHMENT D

PHOTO DOCUMENTATION

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad P

Project Number: 085042037

DATE:
March 6, 2012

DIRECTION:
Northeast

COMMENTS:
PHOTO 1
View of Sample Point 2 (SP-2) located in an upland area within the northern portion of the Area of Investigation (AOI).

DATE:
March 6, 2012

DIRECTION:
Northwest

COMMENTS:
PHOTO 2
View of SP-5, located within the northern portion of the AOI.

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad P

Project Number: 085042037

DATE:
March 6, 2012

DIRECTION:
North

COMMENTS:
PHOTO 3
View of SP-6 located within the central portion of the AOI.

DATE:
March 6, 2012

DIRECTION:
East-southeast

COMMENTS:
PHOTO 4
View of SP-9, located within the southeast portion of the AOI.

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad P

Project Number: 085042037

DATE:
March 7, 2012

DIRECTION:
Northeast

COMMENTS:
PHOTO 5
View of SP-11, located within the south-central portion of the AOI.

DATE:
March 7, 2012

DIRECTION:
Southwest

COMMENTS:
PHOTO 6
View of upland area at SP-13, located within the southwest portion of the AOI.

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad P

Project Number: 085042037

DATE:
March 7, 2012

DIRECTION:
Northeast

COMMENTS:
PHOTO 7
View of SP-15, located within the southern portion of the AOI.

DATE:
March 7, 2012

DIRECTION:
Southwest

COMMENTS:
PHOTO 8
View of the SP-16, located within the south-central area of the AOI.

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad P

Project Number: 085042037

DATE:
March 7, 2012

DIRECTION:
Southwest

COMMENTS:
PHOTO 9
View of overgrown access road located nearby SP-17.

DATE:
March 7, 2012

DIRECTION:
North

COMMENTS:
PHOTO 10
View of the SP-18, located within the eastern portion of the AOI.

ATTACHMENT E

PROFESSIONAL QUALIFICATIONS

Chad Lobley – Mr. Lobley is a biologist with over eight years of experience and training in field ecology, wetlands, fisheries, aquatics and wildlife. In his current role Mr. Lobley has a multitude of responsibilities, which include; management and coordination with sub-contractors and regulatory agencies, prepare and monitor permit documents to ensure compliance, and providing technical support. Mr. Lobley is efficient at field ecology and has managed numerous projects involving biological investigations of linear development (pipeline), wind farm siting, and industrial sites in Pennsylvania, Ohio, New Jersey, New York, Delaware, Maryland, West Virginia, Virginia, Illinois, Michigan, and other states. These projects included tasks such as wetlands delineation, wetland and stream restoration/mitigation/monitoring, avian and wildlife surveys/management/and studies, threatened and endangered species surveys, ecological risk assessment, stream assessments, aquatic life studies, baseline ecological evaluations, water quality/wastewater management, and other various habitat evaluations.

David J. Durofchalk – Mr. Durofchalk is a Professional Wetland Scientist (PWS) and a Project Management Professional (PMP). He holds a Bachelor's degree in Geography/Environmental Planning from Bloomsburg University of Pennsylvania, and a Master's of Science in Biology/Environmental Studies from East Stroudsburg University of Pennsylvania. Mr. Durofchalk has twenty-three years of natural resource consulting expertise garnered throughout the Mid-Atlantic and East Coast. He is experienced in all aspects of wetland field investigations, federal and state wetland regulations, Clean Water Act Section 404/401 and Pennsylvania Chapter 105 permitting, wetland function and value assessments, and habitat assessments for sensitive species. Mr. Durofchalk has directed interdisciplinary team members and coordinated with agency personnel in the preparation of a wide range of National Environmental Policy Act (NEPA) documents for a wide variety of transportation and energy infrastructure projects.

Jocelyn L. Robinson – Ms. Robinson has a bachelor degree in geography and a Bachelor of Science degree with a double major in environmental soil science and agriculture and natural resources from the University of Delaware. After receiving her degree in geography, Ms. Robinson gained experience in soil science through site evaluations for on-site wastewater treatment and disposal systems (OWTDS)/septic, stormwater management structure siting/permitting, basement investigations, and rapid and comprehensive assessments of tidal and non-tidal wetlands in Delaware. Ms. Robinson is knowledgeable with aspects of hydric soils and soil classification, wetlands delineation and wetland assessment. She has conducted many field investigations which include culvert replacements and wetland surveys for roadway improvements projects in Pennsylvania. Such projects include wetland reports and encroachment permits through PADEP's Chapter 105 regulations. Ms. Robinson has attended numerous continuing education courses pertaining to soils science and wetland delineation and is actively seeking multiple certifications.

Rachelle A. Shiffler – Ms. Shiffler has a Bachelor of Science degree in Biology from Millersville University. As an undergrad, she interned with The Stroud Water Research Center in Avondale, Pennsylvania as an Entomologist and for the Pennsylvania Department of Environmental Protection (PADEP) in the Water Quality/Vector Management division in Harrisburg, Pennsylvania. In addition, she has participated in several water quality assessments, macroinvertebrate identification, and local flora identification while attending Millersville. During Ms. Shiffler's employment with RETTEW, she has been a part of wetland delineation teams in Pennsylvania and is familiar with the *U.S. Army Corps of Engineers Wetland Delineation Manual* and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* and *Eastern Mountains and Piedmont Region*. She has authored wetland delineation reports and prepared Joint Permit and General Permit applications for PADEP and the United States Army Corps of Engineers. In addition, she has completed a wetland training course through the Wetland Training Institute (WTI) and is seeking other continuing education courses and certifications.

Amber S. Amelingmeier – Ms. Amelingmeier has a Bachelor's Degree of Science in Biology with a minor in Environmental Sciences from Messiah College. She conducted a study on the current health and development of various coral ecosystems around Bonaire, Netherlands Antilles. Ms. Amelingmeier is familiar with Geographical Informational Systems (GIS), Biotic Sampling Methods, Analysis of Population as well as Stream Assessments. She has delineated wetlands using the 1987 *Corps of Engineers Wetland Delineation Manual* and is familiar with the *Interim Regional Supplements to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* and the *Northcentral and Northeast Region.*

RETTEW SM
We answer to you.
3020 Columbia Avenue, Lancaster, PA 17603
Phone: (717) 394-3721 Fax: (717) 394-1063
E-mail: rettew@rettew.com • Web site: www.rettew.com

M E M O R A N D U M

TO: Doug Kepler, Seneca Resources Corporation

FROM: Jocelyn L. Robinson, Chad G. Lobley

DATE: April 5, 2012

PROJECT NAME: Tract 100 Pad T **PROJECT NO.:** 085042033

SUBJECT: Wetland Investigation

INTRODUCTION

On behalf of Seneca Resources Corporation (Seneca), RETTEW Associates, Inc. (RETTEW) conducted a wetland investigation of the proposed Tract 100 Pad T on March 28 and 29, 2012 by qualified wetland biologists (Jeffery C. Cole and Dennis W. Strouse). The proposed project includes the construction of a well pad which will be used to collect natural gas found within the region. The project area of the Tract 100 Pad T is located east of Hagerman Run Road, and north of Pennsylvania State Route 14. The project is located in Lewis Township, Lycoming County, Pennsylvania and appears on the Trout Run, Pennsylvania 7.5-minute United States Geological Survey (USGS) quadrangle (Tract 100 Pad T Latitude: 41.437305 and Longitude: -77.032502) as provided on the Topographic Basemap, **Figure 1**. The Area of Investigation (AOI) for the proposed Tract 100 Pad T is provided on the Aerial Basemap, **Figure 2.**

METHODS

RETTEW conducted the wetland investigation of proposed Tract 100 Pad T using the updated wetland delineation methodology outlined in the 1987 *Corps of Engineers Wetland Delineation Manual* and the 2012 *Version 2.0 Regional Supplement to the Corps of Engineers Wetland Delineation Manual*: *Northeast and Northcentral Region*. This approach recognizes the three (3) parameters of vegetation, soils, and hydrology to identify and delineate wetlands. The purpose of this investigation was to identify wetland and stream boundaries within the AOI and avoid and/or minimize impacts to these natural resources.

AGENCY COORDINATION

An online Pennsylvania Natural Diversity Inventory (PNDI) search of the Tract 100 Pad T (project search ID: **20120326346088**) was performed on March 26, 2012. The PNDI search receipt identified that the proposed project area has a potential impact to a special concern species under the jurisdiction of the Pennsylvania Fish and Boat Commission (PFBC). To date, PNDI conflict resolution has been coordinated by Seneca for the resulting special concern species of the timber rattlesnake (*Crotalus horridus*). An April 2012 rattlesnake survey is to be conducted by Wildlife Specialists, LLC. A copy of the PNDI search receipt is included in **Attachment B**.

RESULTS

Wetlands

Based upon RETTEW's investigation, the AOI was dominated by deciduous hardwood forests. No wetlands, waterbodies, or watercourses were identified within the AOI. Please refer to the Aerial Basemap, **Figure 2** for the location of the proposed Tract 100 Pad T and **Attachment C** for the datasheets with specific information for each sample point.

Uplands

Characteristic indicators of wetland hydrology, hydrophytic vegetation, and hydric soils observed at all Sample Points (SP-1, SP-2, SP-3, SP-4, SP-5, SP-6, SP-7, SP-8, SP-9, SP-10, SP-11, SP-12, SP-13, SP-14, SP-15, SP-16, and SP-17) were absent. No Sample Points met the criteria for a jurisdictional wetland. Please refer to representative field data sheets provided in **Attachment C** for additional information specific to these sample points.

The AOI consisted of 71.3 acres. 17 sample points were taken throughout the AOI. The typical dominant vegetation observed during the evaluation consisted of *Acer pensylvanicum* (striped maple, FACU)*, Acer rubrum* (red maple, FAC)*, Betula papyifera* (paper birch, FACU), *Dennstaedtia punctilobula* (eastern hay-scented fern, UPL), *Gaultheria procumbens* (eastern teaberry, FACU), *Hamamelis virginiana* (American witchhazel, FAC)*, Fraxinus americana* (white ash, FACU), *Kalmia latifolia* (mountain laurel, FACU)*, Pinus strobus* (eastern white pine, FACU)*, Quercus alba* (white oak, FACU), *Quercus prinus* (chestnut oak, UPL)*, Quercus rubra* (red oak, FACU), *Quercus velutina* (black oak, UPL), and *Vaccinium angustifolium* (lowbush blueberry, FACU). Companion species observed with the dominant vegetation consisted of *Betula lenta* (sweet birch, FACU), *Mitchella repens* (partridgeberry, FACU), *Pinus resinosa* (red pine, FACU), *Pteridium aquilinum* (western bracken fern, FACU) and *Tsuga canadensis* (eastern hemlock, FACU). The composition of the dominant species resulted in dominance tests less than 50 percent, indicating a lack of dominant hydrophytic vegetation. Hydric soils and evidence of primary and secondary wetland hydrology indicators were absent at all evaluated sample point locations. It was determined that due to an absence of wetland hydrology, hydrophytic vegetation, and hydric soils, that all observed sample points were located within upland areas.

Streams

RETTEW did not identify any waterbodies or watercourses within or immediately adjacent to the AOI.

DISCUSSION

RETTEW did not identify any wetlands, waterbodies, or watercourses within the AOI. Please refer to the site mapping figures (**Figure 1**: Topographic Basemap, **Figure 2**: Aerial Basemap) for the location and distribution of upland sample points. The PNDI, data sheets, recent color photographs, and qualifications are included in **Attachments A, B, C,** and **D** respectively.

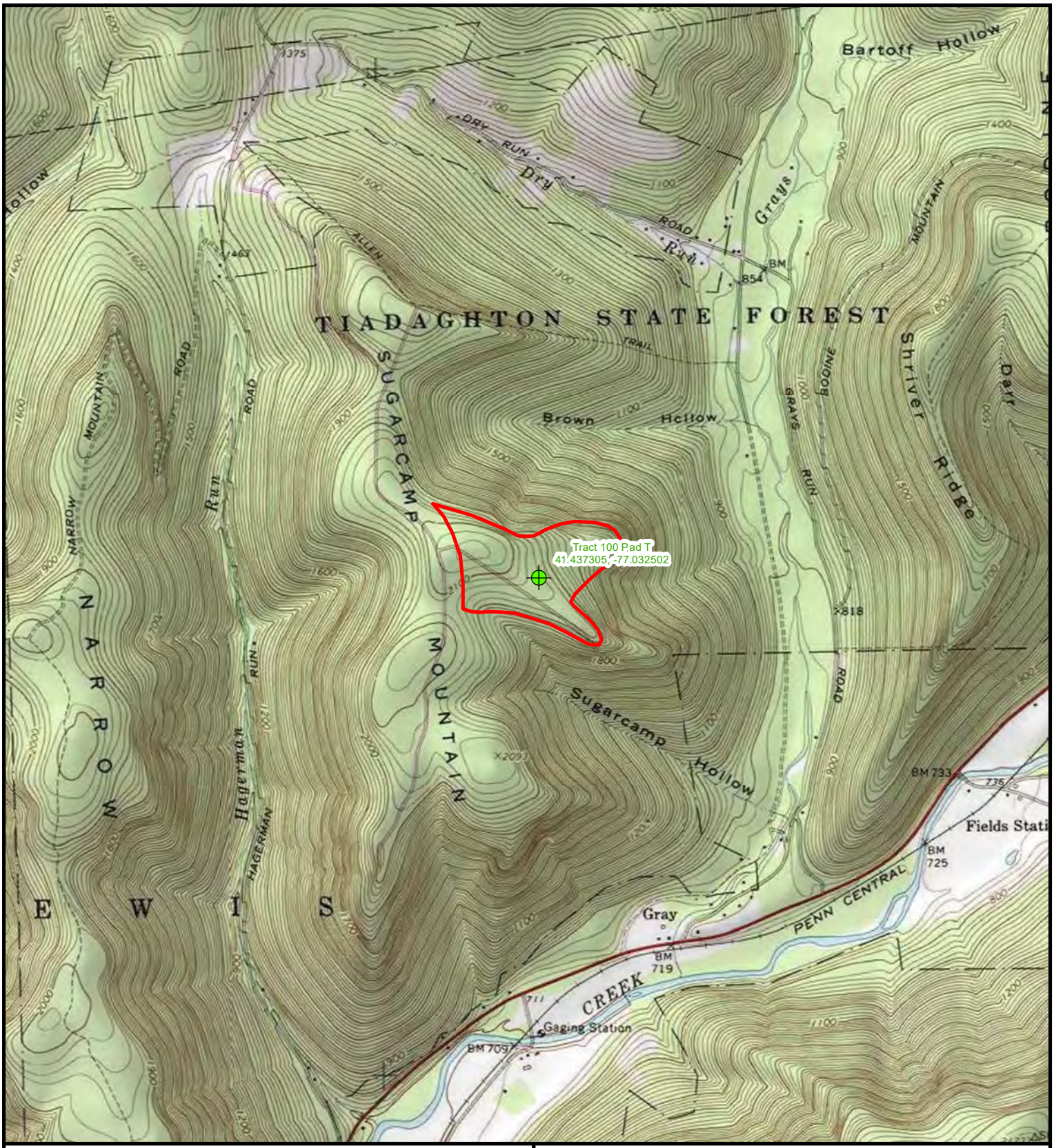
Wetlands, man-made ponds, and intermittent or perennial stream channels, are regulated by the United States Army Corps of Engineers (USACE) and the Pennsylvania Department of Environmental Protection (PADEP). Any encroachments, fills, or crossing of these areas will require appropriate State and Federal permits. Data on which this report is based are on file at RETTEW's Lancaster, Pennsylvania office.

The wetland boundary determination was made using the best available indicators at the time of the delineation. Seasonal changes in wetland indicators (such as hydrology and vegetation) may require adjustment of the boundary during the growing season. This wetland boundary should be considered preliminary and used for planning purposes only. Wetland boundary confirmation will be required during the growing season before this wetland delineation meets accepted standards for permitting purposes.

Prepared by: _____
Jocelyn L. Robinson, Environmental Scientist

Reviewed by: _____
Chad G. Lobley, Senior Biologist

H:\Projects\08504\085042033\NS\Wetland Report\WetMemo-Tract100PadT.doc



t Éäãm-Ç÷ çÅ-íáçå

^ ëÉ-~çÑfåîÉëíáÖ-íáçå
HTNR≤ ÅéÉëF

Lewis Township, Lycoming County, PA
Trout Run, PA USGS 7.5' Topographic Quadrangle

_~ëÉã ~éWr kpKd ÍçäçÖåÅ-ä÷pì ã ÉóI⁼k d p|q çéç r p| OavlHk ~íáçå~äd ÍçÖêéÜåÅ=
pçÅáÉíóI=OMMNFÜí éWëÉëíáÅÉëKêÅÖáçääå ÉKÅç ã ÍïVPIÍêÉíêáÉÉ Ç÷çå=PICOVDNMOK

Seneca Resources Corporation

Tract 100 Pad T

cáÖêÉ=N÷Íqçéç ÖêéÜåÅ_ ~ëÉã ~é
mççäÉÅí=kçK=MUNRQMIP
i Éí áë=qçï åëÜêéI=íóÅçã ãåÖ=`çìåí óI=m

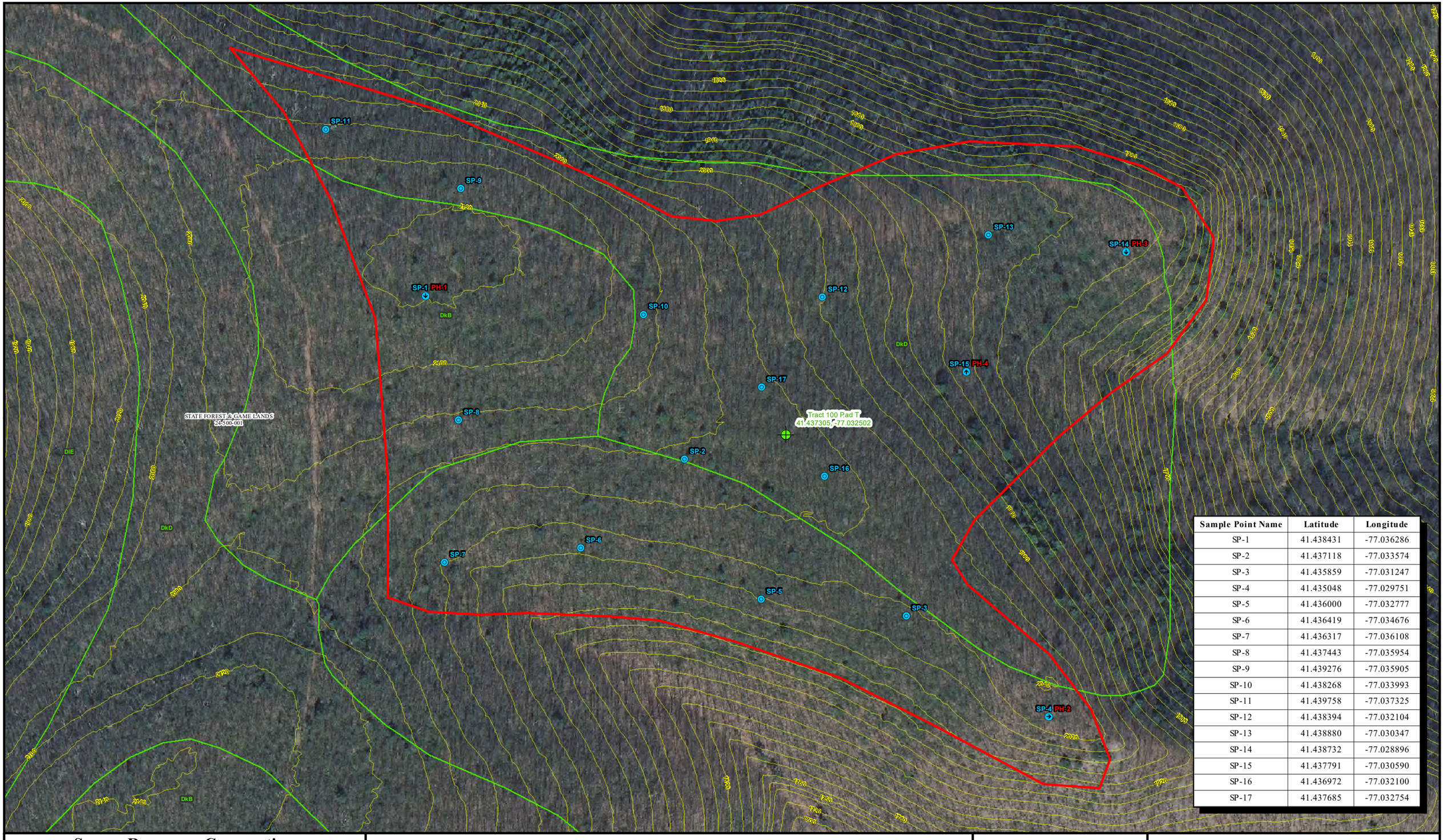
N
W E
S

M NIMMM OIMMM
cÉÉí

N=äÅÜZ=OIMMM=ÑÉ

SENECA RESOURCES RETTEW

e WnêçäÉÅëyMURMQMURMQMPPPfpybñÜÅáëy Éí÷j Éã çyqê~Å|NMMm-Ç|q|q çéç| _~ëÉã ~éKã ñÇ



Sample Point Name	Latitude	Longitude
SP-1	41.438431	-77.036286
SP-2	41.437118	-77.033574
SP-3	41.435859	-77.031247
SP-4	41.435048	-77.029751
SP-5	41.436000	-77.032777
SP-6	41.436419	-77.034676
SP-7	41.436317	-77.036108
SP-8	41.437443	-77.035954
SP-9	41.439276	-77.035905
SP-10	41.438268	-77.033993
SP-11	41.439758	-77.037325
SP-12	41.438394	-77.032104
SP-13	41.438880	-77.030347
SP-14	41.438732	-77.028896
SP-15	41.437791	-77.030590
SP-16	41.436972	-77.032100
SP-17	41.437685	-77.032754

Seneca Resources Corporation

Tract 100 Pad T

Figure 2 - Aerial Basemap
Project No. 085042033
Lewis Township, Lycoming County, PA

H:\Projects\08504\085042033\GIS\Exhibits\Wet Memo\Tract_100_Pad_T_Aerial_Basemap.mxd

4/1/2012

- Well Pad Location
- Sample Point
- Sample Point with Photo Location and Direction
- Field Delineated Stream (None Identified)
- Contour (20 ft Interval)
- Field Delineated Wetland (None Identified)
- NRCS, USDA Soil Survey
- Area of Investigation (71.3 Acres)
- Parcel Boundary

N
W E
S

0 250 Feet

1 inch = 250 feet

SENECA RESOURCES

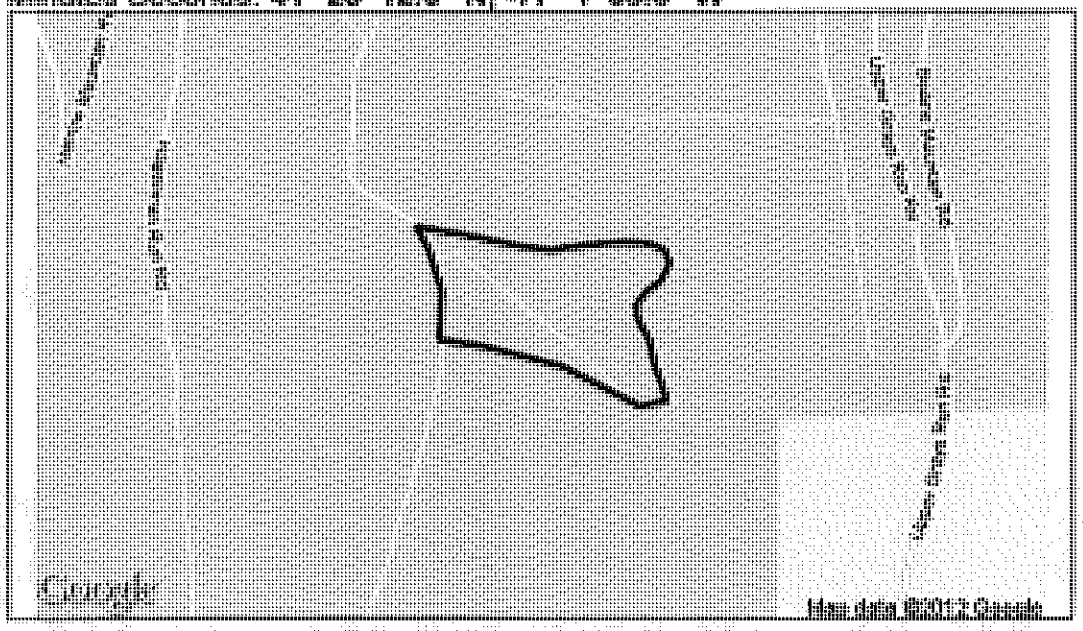
RETTEW

ATTACHMENT A

PENNSYLVANIA NATURAL DIVERSITY INVENTORY SEARCH RECEIPT

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad T**
Date of review: **3/26/2012 8:11:58 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **83.8** acres
County: **Lycoming** Township/Municipality: **Lewis**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17771**
Decimal Degrees: **41.436838 N, -77.032098 W**
Degrees Minutes Seconds: **41° 26' 12.6" N, -77° 1' 55.6" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

__X__ **SIGNED** copy of this Project Environmental Review Receipt
__X__ Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
__X__ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
__X__ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Greg Kimmel
Company/Business Name: Seneca Resources Corperation
Address: 51 Zents Blvd.
City, State, Zip: Brookville, PA 15856
Phone:(814) - 220-1523 Fax:( )
Email: kimmelg@srcx.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

FOR: GREG KIMMEL 4/3/2012

applicant/project proponent signature date

ATTACHMENT B

FIELD DATA SHEETS

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-1

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 3%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.438431 Long: -77.036286 Datum: NAD-83

Soil Map Unit Name: DkB - Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the eastern portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-1

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	21%	Yes	UPL
2. *Fraxinus americana* (white ash)	11%	No	FACU
3. *Quercus rubra* (red oak)	42%	Yes	FACU
4. *Betula papyrifera* (paper birch)	6%	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	80%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	46%	Yes	FACU
2. *Hamamelis virginiana* (American witchhazel)	2%	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	48%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	31%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	27%	Yes	FACU
3. *Gaultheria procumbens* (eastern teaberry)	4%	No	FACU
4. *Pteridium aquilinum* (western bracken fern)	2%	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	64%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+3-0								Organic layer
0-5	7.5YR 5/2	100	None	-	-	-	SL	E-horizon
5-6	7.5YR 3/3	100	None	-	-	-	SL	Bs
6-12	10YR 5/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 12"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. E-horizon present in the 0-5 layer. E horizons are common in forest landscape soil toposequences. This is an "elluvial" horizon and is not characteristic of prolonged saturation. Furthermore, redoximorphic features are required with horizons designated to be an E horizon. No redoximorphic features were present in the soil profile. Depth of excavation could not exceed 12 inches. Multiple attempts made to describe deeper horizons.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-2

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 5%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.437118 Long: -77.033574 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the center portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-2

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	26%	Yes	UPL
2. *Pinus strobus* (white pine)	22%	Yes	FACU
3. *Quercus rubra* (red oak)	42%	Yes	FACU
4. *Quercus alba* (white oak)	4%	No	FACU
5. *Acer rubrum* (red maple)	13%	No	FAC
6.			
7.			
8.			
9.			
10.			
	107%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	56%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	56%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	8%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	9%	Yes	FACU
3. *Gaultheria procumbens* (eastern teaberry)	2%	No	FACU
4. *Pteridium aquilinum* (western brackenfern)	18%	Yes	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	37%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+4-0								Organic layer
0-3	7.5YR 4/2	100	None	-	-	-	SL	E-horizon
3-4	7.5YR 4/4	100	None	-	-	-	SL	Bw1
4-13	7.5YR 5/6	100	None	-	-	-	SL	Bw2

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. E-horizon present in the 0-3 layer. E horizons are common in forest landscape soil toposequences. This is an "elluvial" horizon and is not characteristic of prolonged saturation. Furthermore, redoximorphic features are required with horizons designated to be an E horizon. No redoximorphic features were present in the soil profile. Multiple attempts made to describe below 13" excavated.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-3

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 6%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.435859 Long: -77.031247 Datum: NAD-83

Soil Map Unit Name: OxE - Oquaga and Lordstown very stony loams, 25 to 70 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the southeast portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-3

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	61%	Yes	UPL
2. *Pinus resinosa* (red pine)	10%	No	FACU
3. *Acer rubrum* (red maple)	11%	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	82%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	47%	Yes	FACU
2. *Hamamelis virginiana* (American witchhazel)	9%	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	56%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	36%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	13%	Yes	FACU
3. *Gaultheria procumbens* (eastern teaberry)	4%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	53%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+3-0								Organic layer
0-5	10YR 6/2	100	None	-	-	-	SL	E-horizon
5-6	7.5YR 4/4	100	None	-	-	-	SL	Bw1
6-11	10YR 5/6	100	None	-	-	-	SL	Bw2

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 11"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. E-horizon present in the 0-5 layer. E horizons are common in forest landscape soil toposequences. This is an "elluvial" horizon and is not characteristic of prolonged saturation. Furthermore, redoximorphic features are required with horizons designated to be an E horizon. No redoximorphic features were present in the soil profile. Soil excavated to a depth of 11 inches, deeper excavation attempted, however unsuccessful.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-4

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 5%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.435048 Long: -77.029751 Datum: NAD-83

Soil Map Unit Name: OxE - Oquaga and Lordstown very stony loams, 25 to 70 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the southeast portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-4

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus montana* (chestnut oak)	48%	Yes	UPL
2. *Pinus strobus* (eastern white pine)	12%	No	FACU
3. *Quercus velutina* (black oak)	22%	Yes	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	82%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	8%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	8%	= Total Cover	
Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	4%	No	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	58%	Yes	FACU
3. *Gaultheria procumbens* (eastern teaberry)	5%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	67%	= Total Cover	
Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+3-0								Organic layer
0-5	10YR 5/2	100	None	-	-	-	SL	E-horizon
5-6	7.5YR 4/4	100	None	-	-	-	SL	Bw1
6-11	10YR 5/8	100	None	-	-	-	SL	Bw2

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 11"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. E-horizon present in the 0-5 layer. E horizons are common in forest landscape soil toposequences. This is an "elluvial" horizon and is not characteristic of prolonged saturation. Furthermore, redoximorphic features are required with horizons designated to be an E horizon. No redoximorphic features were present in the soil profile. Excavation could not exceed 11 inches. Multiple attempts made.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-5

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 10%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.436000 Long: -77.032777 Datum: NAD-83

Soil Map Unit Name: OxE - Oquaga and Lordstown very stony loams, 25 to 70 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the southern portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-5

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus montana* (chestnut oak)	53%	Yes	UPL
2. *Acer rubrum* (red maple)	17%	Yes	FAC
3. *Betula papyrifera* (paper birch)	3%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	73% = Total Cover		

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	56%	Yes	FACU
2. *Hamamelis virginiana* (American witchhazel)	5%	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	61% = Total Cover		

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	3%	No	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	19%	Yes	FACU
3. *Gaultheria procumbens* (eastern teaberry)	6%	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	28% = Total Cover		

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+2-0								Organic layer
0-2	10YR 3/2	100	None	-	-	-	SL	A
2-2.5	10YR 4/6	100	None	-	-	-	SL	BA
2.5-14.5	10YR 6/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 14.5"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. Multiple attempts made to excavate deeper than 14.5", however unable to describe at deeper depths.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-6

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 8%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.436419 Long: -77.034676 Datum: NAD-83

Soil Map Unit Name: OxE - Oquaga and Lordstown very stony loams, 25 to 70 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the southern portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-6

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	63%	Yes	UPL
2. *Acer rubrum* (red maple)	16%	No	FAC
3. *Pinus strobus* (eastern white pine)	2%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	81%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	48%	Yes	FACU
2. *Hamamelis virginiana* (American witchhazel)	3%	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	51%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	41%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	26%	Yes	FACU
3. *Gaultheria procumbens* (eastern teaberry)	4%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	71%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+3-0								Organic layer
0-6	7.5YR 5/1	100	None	-	-	-	SL	E-horizon
6-7	7.5YR 3/4	100	None	-	-	-	SL	Bs
7-13	10YR 6/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. E-horizon present in the 0-6 layer. E horizons are common in forest landscape soil toposequences. This is an "elluvial" horizon and is not characteristic of prolonged saturation. Furthermore, redoximorphic features are required with horizons designated to be an E horizon. No redoximorphic features were present in the soil profile. Soil excavated to a depth of 13", no additional descriptions of deeper horizons available. Multiple attempts made to view deeper portions of the subsoil.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-7

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%) 12%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.436317 Long: -77.036108 Datum: NAD-83

Soil Map Unit Name: OxE - Oquaga and Lordstown very stony loams, 25 to 70 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is located in a shallow concave ravine which is the lowest topographic point in the southwestern corner of the AOI. No defined channel was present and no signs of concentrated flow were observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-7

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	23%	Yes	UPL
2. *Quercus rubra* (red oak)	8%	No	FACU
3. *Acer rubrum* (red maple)	12%	No	FAC
4. *Tsuga canadensis* (eastern hemlock)	7%	No	FACU
5. *Quercus alba* (white oak)	17%	Yes	FACU
6.			
7.			
8.			
9.			
10.			
	67%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	36%	Yes	FACU
2. *Tsuga canadensis* (eastern hemlock)	3%	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	39%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	26%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	4%	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	30%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+1-0								Organic layer
0-2.5	7.5YR 4/2	100	None	-	-	-	SL	A
2.5-3.5	7.5YR 4/4	100	None	-	-	-	SL	AB
3.5-16	10YR 6/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were observed. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chroma colors observed are not indicative of hydric soils. Soils described to a depth of 16", no deeper excavation available, multiple attempts made.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-8

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 7%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.437443 Long: -77.035954 Datum: NAD-83

Soil Map Unit Name: DkB - Dekalb very stony sandy loam, 0 to 8 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the western portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-8

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	43%	Yes	UPL
2. *Quercus rubra* (red oak)	9%	No	FACU
3. *Acer rubrum* (red maple)	7%	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	59%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	28%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	28%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	17%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	9%	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	26%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+3-0								Organic layer
0-4	7.5YR 4/3	100	None	-	-	-	SL	A
4-13	7.5YR 4/6	100	None	-	-	-	SL	AB

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were observed. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chroma colors observed are not characteristic of hydric soils. Soils described to a depth of 13", description of deeper horizons unavailable, multiple attempts made.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-9

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 5%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.439276 Long: -77.035905 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the northeast portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-9

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	46%	Yes	UPL
2. *Quercus rubra* (red oak)	11%	No	FACU
3. *Betula papyrifera* (paper birch)	4%	No	FACU
4. *Acer rubrum* (red maple)	8%	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	69%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	19%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	19%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	20%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	34%	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	54%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+2-0								Organic layer
0-3	10YR 4/4	100	None	-	-	-	SL	A
3-17	10YR 6/4	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 17"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were observed. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chroma colors observed are not characterisitic of hydric soils. Soils excavated to a depth of 17 inches, deeper excavation and description of deeper horizons unavailable, mutliple attempts made.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-10

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 7%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.438268 Long: -77.033993 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the northcentral portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-10

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus montana* (chestnut oak)	28%	Yes	UPL
2. *Quercus rubra* (red oak)	13%	No	FACU
3. *Quercus alba* (white oak)	19%	Yes	FACU
4. *Acer rubrum* (red maple)	18%	Yes	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	78%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	34%	Yes	FACU
2. *Hamamelis virginiana* (American witchhazel)	6%	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	40%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	13%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	9%	Yes	FACU
3. *Dennstaedtia punctilobula* (eastern hayscented fern)	21%	Yes	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	43%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+2-0								Organic layer
0-5	7.5YR 3/2	100	None	-	-	-	SL	A
5-16	10YR 5/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were observed. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. Subsoil high chroma colors observed were not indicative of soils commonly found in wetland areas. Soil sxcavated to a depth of 16". Deeper excavation unavailable, multiple attempts made.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-11

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 6%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.439758 Long: -77.037325 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the northwest portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-11

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	18%	Yes	UPL
2. *Quercus rubra* (red oak)	36%	Yes	FACU
3. *Betula papyrifera* (paper birch)	17%	Yes	FACU
4. *Acer rubrum* (red maple)	8%	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	79%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	33%	Yes	FACU
2. *Hamamelis virginiana* (American witchhazel)	14%	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	47%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	16%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	8%	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	24%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 14% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).

No hydrophytic vegetation indicators were met at this sampling point. Sparse herbaceous cover due to dense shrub and tree cover.

SOIL

Sampling Point: SP-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+1-0								Organic layer
0-3	7.5YR 5/2	100	None	-	-	-	SL	E-horizon
3-4	7.5YR 4/6	100	None	-	-	-	SL	Bs
4-16	10YR 5/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 16"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were observed. Soils were very rocky throughout the sampled profile. E-horizon present in the 0-3" layer. E horizons are common in forest landscape soil toposequences. This is an "elluvial" horizon and is not characteristic of prolonged saturation. Furthermore, redoximorphic features are required with horizons designated to be an E horizon. No redoximorphic features were present in the soil profile. Soil excavated to a depth of 16". Deeper excavation of subsurface horizons unavailable, multiple attempts made.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-12

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 6%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.438394 Long: -77.032104 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions found within the central portion of the AOI. No wetland indicators were met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-12

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	21%	Yes	UPL
2. *Quercus rubra* (red oak)	20%	Yes	FACU
3. *Acer rubrum* (red maple)	6%	No	FAC
4. *Quercus alba* (white oak)	17%	Yes	FACU
5. *Betula papyrifera* (paper birch)	8%	No	FACU
6.			
7.			
8.			
9.			
10.			
	72%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	32%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	32%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	18%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	17%	Yes	FACU
3. *Gaultheria procumbens* (teaberry)	3%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	38%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+3-0								Organic layer
0-2	7.5YR 3/2	100	None	-	-	-	SL	A
2-15	10YR 5/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 15"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chroma colors of subsoil horizons observed are characteristic of upland soils and not of soils commonly found within wetland areas. Soil excavated to a depth of 15". Description of deeper horizons unavailable, multiple attempts made.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-13

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Toe of slope - terrace Local relief (concave, convex, none): None Slope (%) 5%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.43888 Long: -77.030347 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

Sampling point located at the toe of slope, at the upslope edge of a ridgetop terrace. This sampling point is representative of the upland conditions the northwest portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-13

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	31%	Yes	UPL
2. *Quercus rubra* (red oak)	11%	No	FACU
3. *Acer rubrum* (red maple)	23%	Yes	FAC
4. *Betula lenta* (black birch)	7%	No	FACU
5. *Betula papyrifera* (paper birch)	9%	No	FACU
6.			
7.			
8.			
9.			
10.			
	81%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	29%	Yes	FACU
2. *Acer pensylvanicum* (striped maple)	3%	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	32%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	48%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	4%	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	52%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
+1-0								Organic layer
0-3	7.5YR 3/3	100	None	-	-	-	SL	A
3-13	7.5YR 4/4	100	None	-	-	-	SL	AB

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chroma subsurface colors observed are not characteristic of hydric soils. Soils excavated to a depth of 13". Description of deeper horizons unavailable, multiple attempts made.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-14

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%) 4%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.438732 Long: -77.028896 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions in the northeast portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-14

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	42%	Yes	UPL
2. *Pinus resinosa* (red pine)	6%	No	FACU
3. *Acer rubrum* (red maple)	15%	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	63% = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	7%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	7% = Total Cover		
Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	4%	Yes	FACU
2. *Vaccinium angustifolium* (lowbush blueberry)	9%	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	13% = Total Cover		
Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+2-0								Organic layer
0-13	10YR 5/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 13"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were observed. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chroma colors observed are not characteristic of soils commonly found within wetland areas. Soils excavated to a depth of 13". Multiple attempts made to describe deeper horizons, however unavailable.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-15

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%) 16%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.437791 Long: -77.03059 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 precent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions in the eastern portion of the AOI. Sampling point location is a very steep northeast facing slope.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-15

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	41%	Yes	UPL
2. *Tsuga canadensis* (eastern hemlock)	3%	No	FACU
3. *Acer rubrum* (red maple)	39%	Yes	FAC
4. *Betula lenta* (black birch)	4%	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	87%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	17%	Yes	FACU
2. *Acer pensylvanicum* (striped maple)	7%	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	24%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	14%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	14%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+4-0								Organic layer
0-15	10YR 5/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 15"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were observed. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chroma colors are characteristic of upland soils and not of soils commonly found within wetlands. Soils excavated to a depth of 15". Multiple attempts made to describe deeper, however unavailable.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-16

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 3%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.436972 Long: -77.032100 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions in the center portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-16

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	51%	Yes	UPL
2. *Quercus rubra* (red oak)	11%	No	FACU
3. *Acer rubrum* (red maple)	4%	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	66%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	36%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	36%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	43%	Yes	FACU
2. *Gaultheria procumbens* (teaberry)	4%	No	FACU
3. *Vaccinium angustifolium* (lowbush blueberry)	9%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	56%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

_____ 1 - Rapid Test for Hydrophytic Vegetation

_____ 2 - Dominance Test is >50%

_____ 3 - Prevalence Index is ≤3.0[1]

_____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+4-0								Organic layer
0-14	10YR 5/6	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 14"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were met. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chromas observed are not characteristic of soils commonly found within wetland areas. Soil excavated to a depth of 14". Multiple attempts made to describe deeper horizons, however unavailable.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: 085042033 Tract 100 Pad T City/County: Lycoming County Sampling Date: 28-Mar-12

Applicant/Owner: Seneca Resources Corporation State: PA Sampling Point: SP-17

Investigator(s): Dennis Strouse, Jeffrey Cole Section, Township, Range: Lewis Township

Landform (hilslope, terrace, etc.): Ridgetop Local relief (concave, convex, none): None Slope (%) 5%

Subregion (LRR or MLRA): LRR N, MLRA 140 Lat: 41.437685 Long: -77.032754 Datum: NAD-83

Soil Map Unit Name: DkD - Dekalb very stony sandy loam, 8 to 25 percent slopes NWI classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (If no, explain in Remarks)

Are Vegetation **N**, Soil **N**, or Hydrology **N** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ____

Are Vegetation **N**, Soil **N**, or Hydrology **N** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS- Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No **X**		
Hydric Soil Present?	Yes ____ No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Wetland Hydrology Present?	Yes ____ No **X**	If yes, optional Wetland Site ID:	N/A

Remarks: (Explain alterative procedures here or within a separate report.)

This sampling point is representative of the upland conditions in the center portion of the AOI.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required, check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No **x**	Depth (inches): -		
Water Table Present?	Yes ____	No **x**	Depth (inches): -		
Saturation Present? (includes capillary fringe)	Yes ____	No **x**	Depth (inches): -	**Wetland Hydrology Present?**	**Yes** ____ **No** **x**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Hydrology Remarks:

No primary or secondary wetland hydrology indicators were observed.

VEGETATION - Use scientific names of plants.

Sampling Point: SP-17

Tree Stratum (Plot size: 30 Feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus prinus* (chestnut oak)	47%	Yes	UPL
2. *Quercus rubra* (red oak)	11%	No	FACU
3. *Acer rubrum* (red maple)	12%	No	FAC
4. *Quercus alba* (white oak)	8%	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
	78%	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15 Feet)			
1. *Kalmia latifolia* (mountain laurel)	48%	Yes	FACU
2. *Hamamelis virginiana* (American witchhazel)	7%	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	55%	= Total Cover	

Herb Stratum (Plot size: 5 Feet)			
1. *Kalmia latifolia* (mountain laurel)	24%	Yes	FACU
2. *Gaultheria procumbens* (eastern teaberry)	3%	No	FACU
3. *Vaccinium angustifolium* (lowbush blueberry)	8%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
	35%	= Total Cover	

Woody Vine Stratum (Plot size: 30 Feet)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:		(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub- Woody plants,less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vines - All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No X

Vegetation Remarks: (Include photo numbers here or on a separate sheet).
No hydrophytic vegetation indicators were met at this sampling point.

SOIL

Sampling Point: SP-17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
+4-0								Organic layer
0-14	10YR 5/8	100	None	-	-	-	SL	Bw

[1]Type: C=concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) **(LRR R, MLRA 149B)**
- ___ Polyvalue Below Surface (S8) **(LRR R, MLRA 149B)**
- ___ Thin Dark Surface (S9) **(LRR R, MLRA 149B)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(LRR R, MLRA 149B)**
- ___ Coast Prairie Redox (A16) **(LRR K, L, R)**
- ___ 5 cm Mucky Peat or Peat (S3) **(LRR K, L, R)**
- ___ Dark Surface (S7) **(LRR K, L, M)**
- ___ Polyvalue Below Surface (S8) **(LRR K, L)**
- ___ Thin Dark Surface (S9) **(LRR K, L)**
- ___ Iron-Manganese Masses (F12) **(LRR K, L, R)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 149B)**
- ___ Mesic Spodic (TA6) **(MLRA 144A, 145, 149B)**
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock/Pan

Depth (inches): 14"

Hydric Soil Present? **Yes** ___ **No** X

Soil Description Remarks:

No hydric soil indicators were observed. Soils were very rocky throughout the sampled profile. No redoximorphic features were present in the soil profile. High chroma colors observed are characteristic of upland soils and not of soils commonly found within wetland areas. Soils excavated to a depth of 14". Multiple attempts made to describe deeper horizons, however unavailable.

ATTACHMENT C

PHOTO DOCUMENTATION

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad T

Project Number: 085042033

DATE:
March 28, 2012

DIRECTION:
south

COMMENTS:
PHOTO 1
View of SP-1 located within the western portion of the AOI.

DATE:
March 28, 2012

DIRECTION:
east

COMMENTS:
PHOTO 2
View of SP-4, located within the southeast portion of the AOI.

RETTEW Associates, Inc.
Photo documentation

Client: Seneca Resources Corporation

Site Location: Lewis Township, Lycoming County, Pennsylvania

Site Name: Tract 100 Pad T

Project Number: 085042033

DATE:
March 29, 2012

DIRECTION:
south

COMMENTS:
PHOTO 3
View of SP-14 located within the northeast portion of the AOI.

DATE:
March 29, 2012

DIRECTION:
north

COMMENTS:
PHOTO 4
View of SP-15, located within the eastern portion of the AOI.

ATTACHMENT D

PROFESSIONAL QUALIFICATIONS

Chad Lobley – Mr. Lobley is a biologist with over eight years of experience and training in field ecology, wetlands, fisheries, aquatics and wildlife. In his current role Mr. Lobley has a multitude of responsibilities, which include; management and coordination with sub-contractors and regulatory agencies, prepare and monitor permit documents to ensure compliance, and providing technical support. Mr. Lobley is efficient at field ecology and has managed numerous projects involving biological investigations of linear development (pipeline), wind farm siting, and industrial sites in Pennsylvania, Ohio, New Jersey, New York, Delaware, Maryland, West Virginia, Virginia, Illinois, Michigan, and other states. These projects included tasks such as wetlands delineation, wetland and stream restoration/mitigation/monitoring, avian and wildlife surveys/management/and studies, threatened and endangered species surveys, ecological risk assessment, stream assessments, aquatic life studies, baseline ecological evaluations, water quality/wastewater management, and other various habitat evaluations.

David J. Durofchalk – Mr. Durofchalk is a Professional Wetland Scientist (PWS) and a Project Management Professional (PMP). He holds a Bachelor's degree in Geography/Environmental Planning from Bloomsburg University of Pennsylvania, and a Master's of Science in Biology/Environmental Studies from East Stroudsburg University of Pennsylvania. Mr. Durofchalk has 23 years of natural resource consulting expertise garnered throughout the Mid-Atlantic and East Coast. He is experienced in all aspects of wetland field investigations, federal and state wetland regulations, Clean Water Act Section 404/401 and Pennsylvania Chapter 105 permitting, wetland function and value assessments, and habitat assessments for sensitive species. Mr. Durofchalk has directed interdisciplinary team members and coordinated with agency personnel in the preparation of a wide range of National Environmental Policy Act (NEPA) documents for a wide variety of transportation and energy infrastructure projects.

Jocelyn L. Robinson – Ms. Robinson has a bachelor degree in geography and a Bachelor of Science degree with a double major in environmental soil science and agriculture and natural resources from the University of Delaware. After receiving her degree in geography, Ms. Robinson gained experience in soil science through site evaluations for on-site wastewater treatment and disposal systems (OWTDS)/septic, stormwater management structure siting/permitting, basement investigations, and rapid and comprehensive assessments of tidal and non-tidal wetlands in Delaware. Ms. Robinson is knowledgeable with aspects of hydric soils and soil classification, wetlands delineation and wetland assessment. She has conducted many field investigations which include culvert replacements and wetland surveys for roadway improvements projects in Pennsylvania. Such projects include wetland reports and encroachment permits through PADEP's Chapter 105 regulations. Ms. Robinson has attended numerous continuing education courses pertaining to soils science and wetland delineation and is actively seeking multiple certifications.

Jeffrey C. Cole – Mr. Cole has a bachelor's degree in biology and environmental science from Westminster College and a master's degree in applied ecology and conservation biology from Frostburg State University. He has conducted research related to freshwater mussel reproductive behavior, propagation, and population ecology, and investigated the habitat requirements for other aquatic species throughout the last 11 years. He was a member and crew leader of a USGS survey crew who discovered new populations of *Alasmidonta heterodon* in the Delaware River mainstem and the Big and Little Flat Brook, New Jersey. Mr. Cole's master's thesis "Predicting flow and temperature regimes at three *A. heterodon* locations in the Delaware River" was directly related to physical habitat requirements of the *A. heterodon* in the Delaware River mainstem. He also has extensive experience related to bridge construction surveys for threatened and endangered freshwater mussel species, which often included developing mitigation and monitoring programs for species found within the project area. He has performed biological surveys for aquatic species, including various fish species in the Delaware and Susquehanna River watershed. Mr. Cole has also been trained to conduct wetland delineations using the *1987 U.S. Army Corps of Engineers Wetland Delineation Manual*.

Dennis W. Strouse – Mr. Strouse has a bachelor's degree in fisheries management from Mansfield University. Mr. Strouse has worked with the Northumberland and Montour County Conservation Districts for ten years where he was responsible for permitting and inspections on projects regulated under Pennsylvania's stream and wetland encroachment and erosion control programs. He was also responsible for construction oversight on numerous nutrient management related projects and streambank stabilization and rehabilitation projects. Mr. Strouse facilitated procurement of Pennsylvania Growing Greener funding and oversaw permitting for the rehabilitation and construction of wetlands on several sites throughout Montour County. Mr. Strouse has received training in wetland delineation techniques using the *U.S. Army Corps of Engineers Wetland Delineation Manual* and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*.

APPENDIX K
DEP Permits, Waivers and Soil Remediation Approval

5500-FM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID: 48277	Auth ID: NC-843970
Watershed Name: SPRUCE RUN	Quality: HQ

MARCELLUS

Permittee	OGO.#	Permit Number	Date Issued
EXCO RESOURCES (PA), INC.	OGO-45345	37-027-21641-00	08/31/2010

Address	Farm Name & Well Number	Well Serial #
3000 ERICSSON DR STE 200	COP TRACT 706 UNIT PAD 10 59H	
WARRENDALE, PA 15086-6501	Municipality: Burnside	County: Centre
	7½ ' Quadrangle Name: Snow Shoe NW	Map Section #: 8

Phone	Project #	Latitude	Longitude
(724) 720-2500		41-7-49.6800	-77-56-58.0600

Surf Elev at Site	Anticipated Total Depth	Well Type	Offset distances referenced to NE corner of map section.
2060 feet	8462 feet	GS	South 13188 feet West 9033 feet

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.
This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.
Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.
The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.
This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

Prior to setting casing/tubing in or producing from the Marcellus shale lateral, the vertical portion of the hole, if it extends below the Kick-Off Point (KOP), must be plugged back to the KOP according to the requirements of §§ 78.91 through 78.95. The procedure used to plug this section of the well will be submitted with or as part of the Well Record and Completion Report.

The Operator shall run a complete angular deviation and directional survey of this intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after completion of well drilling together with other regularly required reports.

WATER PLAN CONDITIONS ATTACHED.

RECEIVED
SEP 07 2010
OIL & GAS
NCRO

This permit expires **08/31/2011** unless drilling is commenced on or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

TRAVIS WALKER
Oil & Gas Inspector

186 ENTERPRISE DRIVE
PHILLIPSBURG, PA 16866
Address

(814) 342-8130
Phone Number

Total Application Fee $ 3850

Marcellus

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
2. Will the well penetrate a **workable coal seam**? If "No," include justification and supporting documentation.	☐	☒
3. If the well will penetrate a **workable coal seam**, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells).	☐	☐
a. If "No," is the required exception request attached? (Check here if re-working an existing well: ☐ N/A)	☐	☐
4. Will the well be drilled at a location where the **coal** has been removed?	☐	☒
5. Will the well be drilled through an **active (operating or projected) coalmine**, or within 1,000 feet of the boundary?	☐	☒
a. If "Yes," print the names of: Mine: Operator:		
6. Will the well penetrate or be within 2,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
7. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
8. Will the well site be within 100 feet (measured horizontally) of a **stream, spring or body of water** identified on the most current 7½' topographic map?	☐	☒
a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached?	☐	☐
9. Will the well site be within 100 feet of a **wetland** or in a **wetland**?	☐	☒
a. Is the well site within 100 feet of a wetland greater than one acre in size?	☐	☐
If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached?	☐	☐
10. Will the well be drilled within 200 feet (horizontally) from any existing **building** or an existing **water supply**?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached?	☐	☐

	Yes	No
11. Will the well be located where it may impact a public resource as outlined in the "**Coordination of a Well Location with Public Resources**" form 5500-PM-OG0076? If yes, attach a competed copy of the form.	☒	☐
12. Is the well site in a **Special Protection** High Quality (HQ) or Exceptional Value (EV) watershed?	☒	☐
13. Is this well part of a development where you need an **Earth Disturbance Permit** for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. 14-08-802	☒	☐

DEP USE ONLY

Date Stamps/Notes

Auth 843970

Site 737540

Clnt 48277

APS 726490

Acct 683165

JUL 30 2010

DEP, SOUTHWEST REGION OIL & GAS

Signature of Applicant The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.

Signature of Person Authorized to Submit Application: Ross A Simpson

(Print or Type) Name of Signer: ROSS SIMPSON

Title: Regulatory Specialist

Date: 7/29/2010

Application Preparer/Contact: Ross Simpson

Phone: 724-720-2574

45 DAYS = 9-12-10

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
EXCO Resources (PA), Inc.	48277	COP Tract 706 Unit Pad 10	59H
Address		**Project Number (if previously assigned)**	
3000 Ericsson Drive, Suite 200			
City	**State / Zip Code**	**County**	**Municipality**
Warrendale	PA 15086	Centre	Burnside Township
Phone	**Fax**	**Latitude**	**Longitude**
724-720-2500	724-720-2505	N 41 ° 07 ′ 49.68 ″	W 77 ° 56 ′ 58.06 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Sproul State Forest

   List the name, address and phone number of the person responsible for management of the public resource.

   PADCNR-Rachel Carson Office Building, PO Box 8767 400 Market Street, Harrisburg, PA 17105-8767

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☐ Yes ☒ No

   If yes, provide PNDI Search Number_____ or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   JUL 30 2010

   DEP, SOUTHWEST REGION OIL & GAS

   Has the potential conflict been resolved? ☐ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   The operator will use the designed E&S Control Plan and best management practices as described by DEP. Cooperation with the PADCNR personnel will be established and maintained during operations.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP USE ONLY
AUTH # NC-843170
Check # 181192 Amount $ 3850

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

DEP USE ONLY

Notes			
	OGO # 45345	Objection Date - Do not issue before: 5-5-10	Well Permit # 027-21641-00
	Bond # 5746		Special Cond. A B C D E F
	C: RP PA	Date Approved: 8-26-10	Watershed Name: Spruce Run
	INV:		Designation: HQ EV

Please read instructions before you begin filling in this form.

Applicant (Operator) Name	DEP Client ID#	Phone	FAX	Check if new address. ☐
EXCO Resources (PA), Inc.	48277	724-720-2500	724-720-2505	
Mailing Address (Street or PO Box)	**City**	**State**	**Zip +4**	**Country** (if not USA)
3000 Ericsson Drive, Suite 200	Warrendale	PA	15086	

(Well) Farm Name	Well #	Serial #
Cop Tract 706 Unit Pad 10	59H	

County	Municipality	Project # (from DEP)
CENTRE	BURNSIDE TOWNSHIP	

If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, ***or for a well site that was previously permitted but not drilled,*** check this box ☐ and enter the permit or registration number here:

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any "hit" must include accepted mitigation plan from applicable agency.

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Deepen a well
☐ Redrill a well
☐ Alter a well
☐ E&S Control Module
☐ Other (specify)

TYPE OF WELL Check one.
☒ Gas
☐ Oil
☐ Comb. (gas & oil)
☐ Injection, recovery
☐ Injection, disposal
☐ Coalbed Methane
☐ Gas Storage
☐ Other (specify)

APPLICATION FEE Check applicable.
☒ Marcellus Well: Non-Vertical
☐ Marcellus Well: Vertical
☐ Non-Marcellus Well: Non-Vertical
☐ Non-Marcellus Well: Vertical
☐ $200 (Home Use Well)
☐ $500 E&S Fee
☐ $ 0 (Rehab orphan)
☐ Vertical: Length ____ ft.
☒ Marcellus: Length 14520 ft.
☐ Non-Vertical: Length ____ ft.
Total Application Fee $ 3850

Marcellus

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
2. Will the well penetrate a **workable coal seam**? If "No," include justification and supporting documentation.	☐	☒
3. If the well will penetrate a **workable coal seam**, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells).	☐	☐
a. If "No," is the required exception request attached? (Check here if re-working an existing well: ☐ N/A)	☐	☐
4. Will the well be drilled at a location where the **coal** has been removed?	☐	☒
5. Will the well be drilled through an **active (operating or projected) coalmine**, or within 1,000 feet of the boundary?	☐	☒
a. If "Yes," print the names of: Mine: Operator:		
6. Will the well penetrate or be within 2,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
7. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
8. Will the well site be within 100 feet (measured horizontally) of a **stream, spring or body of water** identified on the most current 7½' topographic map?	☐	☒
a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached?	☐	☐
9. Will the well site be within 100 feet of a **wetland** or in a **wetland**?	☐	☒
a. Is the well site within 100 feet of a wetland greater than one acre in size?	☐	☐
If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached?	☐	☐
10. Will the well be drilled within 200 feet (horizontally) from any existing **building** or an existing **water supply**?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached?	☐	☐

DEP USE ONLY
Date Stamps/Notes
Auth 843170
Site 737540
Clnt 48277
APS 726490
Acct 683165

JUL 30 2010
DEP, SOUTHWEST REGION
OIL & GAS

	Yes	No
11. Will the well be located where it may impact a public resource as outlined in the "**Coordination of a Well Location with Public Resources**" form 5500-PM-OG0076? If yes, attach a competed copy of the form.	☒	☐
12. Is the well site in a **Special Protection** High Quality (HQ) or Exceptional Value (EV) watershed?	☒	☐
13. Is this well part of a development where you need an **Earth Disturbance Permit** for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. 14-08-802	☒	☐

Signature of Applicant The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.

Signature of Person Authorized to Submit Application	*(Print or Type)*	Name of Signer: ROSS SIMPSON Title: Regulatory Specialist	Date
Ross A Simpson			7/29/2010

Application Preparer/Contact: Ross Simpson Phone: 724-720-2574

45 DAYS = 9-12-10

WELL LOCATION MAP

made for

EXCO - NORTH COAST ENERGY, INC.

"PAD 10 WELLS"

SNOW SHOE NW QUADRANGLE

BURNSIDE TOWNSHIP, CENTRE COUNTY

Scale:1" = 2000' Date: 07-01-10 Drawn by: MW.S.

PREPARED BY: BOTSFORD SURVEYING, INC.
301 High Street, Marion Center, PA 15759
Phone: 724-397-8888, Fax: 724-397-8886

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

JUL 30 2010

DEP, SOUTHWEST REGION
OIL & GAS

PNDI Project

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in [illegible] species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Ross Simpson
Company/Business Name: EXCO Resources, (PA), Inc.
Address: 3000 Ericsson Drive, Suite 200
City, State, Zip: Warrendale, PA 15086
Phone:(724) 720-2574 Fax:(724) 720-2500
Email: rsimpson@excoresources.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Ross A Simpson — applicant/project proponent signature

7/20/10 — date

JUL 3 0 201

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

OIL & GAS MANAGEMENT

August 31, 2010

COPY

EXCO Resources (PA), Inc.
3000 Ericsson Drive, Suite 200
Warrendale, PA 15086

Special Protection Watershed
Spruce Run Watershed
Farm Name: Cop Tract 706 Unit Pad 10 59H
Township: Burnside
County: Centre
Permit No.: 37-027-21641-00

Dear Well Operator:

This is to inform you that the location of the well on the enclosed well permit is in a Special Protection Watershed. Special Protection Watersheds are drainage areas to streams which are classified by the Environmental Quality Board as either High Quality or Exceptional Value due to their unique characteristics or sensitive use. Special Protection Watersheds are high priority areas for the Department's water pollution control activities.

The above information is being provided to remind you of the necessity to adequately control and dispose of waste fluids generated from your activities at this location. It is expected that you will conduct your activities with these concerns in mind.

Sincerely,

Alan J. Eichler
Regional Manager
Oil & Gas Management

Enclosure

cc: File
AJE:rp

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes $4050 SNC
Check No. 001965G9 - $26350
DMO1 - 12/20/12

OGO # 63815
Client Id 237104
Bond # 10012
C: 3/19/13 MS: 3/25/13 AM
INV: 4-3-13
APS # 804840 Auth Id 768012

Objection Date - Do not issue before: 3/12/13
Date Approved: 4/5/13 BM
Special Cond. E Vert Plugback
Site Id 760180

API #'s37- 117-21624
and -
Watershed Name:
Designation: ☐ HQ ☐ EV
PF Id 762404
SF Id V - 1101186 H - 1101187

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator: Talisman Energy USA Inc.	DEP ID#: 237104	Well API # (if available): 37- - - -	Well Farm Name: DCNR 594		Well #: 02-203-01
Address: 50 Pennwood Place		LAT: 41°37' 34.59" / LONG: 77°07' 31.95"	NAD 83	Project Number	Serial #
City: Warrendale	State: PA	Zip: 15086	Municipality Name/ City, Borough, Township: Liberty Township	County: Tioga	
Phone: 724-814-5300	Fax: 724-814-5301	Email: lmontes@talismanusa.com		USGS 7.5 min. quadrangle map: Cherry Flats	Section: 9

☐ Check if this is a new address

24/7 Emergency Phone contact number: 607-857-6807

911 address of well site (if available): To Be Determined

Freshwater Impoundment Name/ Identification: Unknown

Centralized Impoundment Name/ Identification: Unknown

Well Pad (cluster) Name/Identification: Unknown

Borrow Area Name/Identification: Unknown

Surface Elev: 2246

Deepest Formation to be penetrated: ~~Marcellus~~ Onondaga

Anticipated TVD: 7866

Target Formation(s) proposed for production: Marcellus

Anticipated Target Top/Bottom TVD: 7536 7716

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 15794 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☐ Other (specify)

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☒ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☒ Unconventional
Total Application Fee
$ 4,050.00

Bond Agreement Id 10012

RECEIVED
MAR 12 2013
Environmental Protection
Northwest Regional Office

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☒	
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☒	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

APO 4/4/13

5/2/13

LIBERTY TWP

a. If Yes, print the names of: Storage Field: Operator:

4. Is the proposed well location within the permitted area of a **landfill**? ☐ ☒

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes	OGO #	Objection Date - Do not issue before:	API #s37-__-_____-__-__;
	Client Id	Date Approved:	and -__-__; -__-__; -__-__; -__-__; -__-__
	Bond #		Watershed Name: Designation: ☐ HQ ☐ EV
	C: G:	Special Cond.	
	INV: APS # / Auth Id	Site Id / PF Id / SF Id	

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator	DEP ID#	Well API # (if available)	Well Farm Name	Well #
Talisman Energy USA Inc.	237104	37- - - -	DCNR 594	02-203-01

Address	LAT / LONG	NAD	Project Number	Serial #
50 Pennwood Place	LAT 41°37' 34.59" / LONG - 77°07' 31.95"	83		

City	State	Zip	Municipality Name/ City, Borough, Township	County	Section
Warrendale	PA	15086	Liberty Township	Tioga	9

Phone	Fax	Email	USGS 7.5 min. quadrangle map
724-814-5300	724-814-5301	lmontes@talismanusa.com	Cherry Flats

☐ Check if this is a new address

24/7 Emergency Phone contact number: 607-857-6807

911 address of well site (if available): To Be Determined

Freshwater Impoundment Name/ Identification	Centralized Impoundment Name/ Identification	Well Pad (cluster) Name/Identification	Borrow Area Name/Identification
Unknown	Unknown	Unknown	Unknown

Surface Elev	Deepest Formation to be penetrated:	Anticipated TVD
2246	Onondaga	7866

Target Formation(s) proposed for production: Marcellus

Anticipated Target Top/Bottom TVD: 7536 7716

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 15794 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____(see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☐ Other (specify)

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☒ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☒ Unconventional
Total Application Fee
$ 4,050.00

Bond Agreement Id
10012

RECEIVED
APR 04 2013
Environmental Protection
Northwest Regional Office

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☒	☐
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☒	☐
b. Does the location fall within an area covered by a spacing order?	☐	☒
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☐ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed _____.	☐	☒
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX12-117-0040 - April 18, 2012	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership & Control form 8000-FM-OOGM0118		

Signature of Applicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
Signature of Person Authorized to Submit Application	*(Print or Type)*	Name of Signer: JASON DE WOLFE Title: Team Lead, Water Mgmt & Surface Land	Date 2-20-13
			Phone: 724-814-5442

Application Preparer/Contact: LIANA MONTES

LIBERTY TWP 59

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

Page 2 Notifications

DEP ONLY | Project #:

DEP Statewide toll-free phone number for reporting cases of water contamination which may be associated with

8000-PM-OOGM0002 4/2012

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

Page 1 Surface Location

DEP USE ONLY		
Auth ID #:		ACO
Permit #:	11721624	C: 4/4/13
Project #:		

Surface hole is located on topo map 14717 feet south of latitude 41° 40' 00" (NAD 83)

Surface hole is located on topo map 147 feet west of longitude 77° 07' 30" (NAD 83)

Denotes location of well on topo map.

Denotes surface location of well on plat

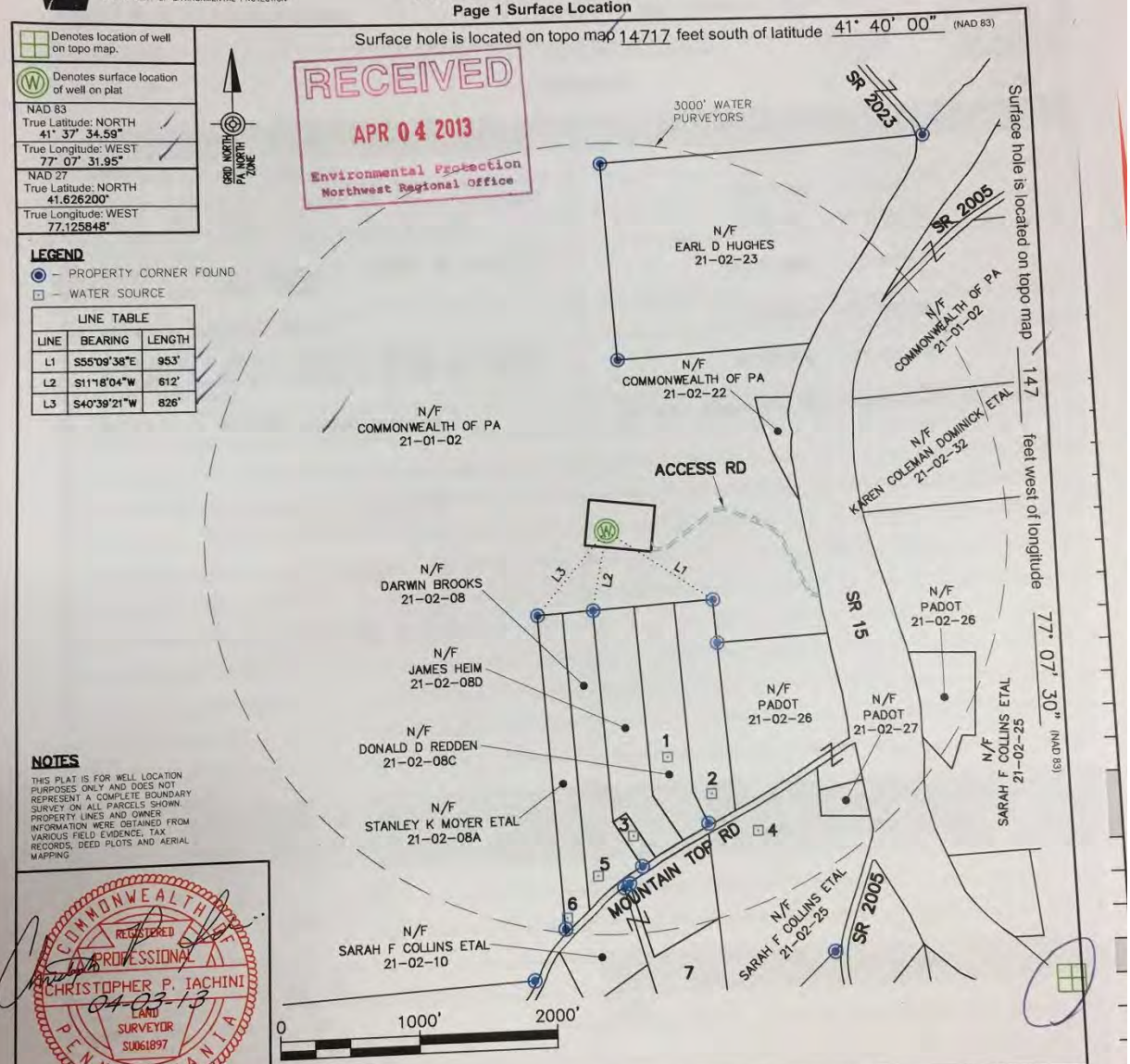
NAD 83 True Latitude: NORTH	41° 37' 34.59"
True Longitude: WEST	77° 07' 31.95"
NAD 27 True Latitude: NORTH	41.626200°
True Longitude: WEST	77.125848°

GRID NORTH PA NORTH ZONE

RECEIVED
APR 04 2013
Environmental Protection
Northwest Regional Office

LEGEND
- ◉ – PROPERTY CORNER FOUND
- ⊡ – WATER SOURCE

LINE TABLE		
LINE	BEARING	LENGTH
L1	S55°09'38"E	953'
L2	S11°18'04"W	612'
L3	S40°39'21"W	826'



NOTES

THIS PLAT IS FOR WELL LOCATION PURPOSES ONLY AND DOES NOT REPRESENT A COMPLETE BOUNDARY SURVEY ON ALL PARCELS SHOWN. PROPERTY LINES AND OWNER INFORMATION WERE OBTAINED FROM VARIOUS FIELD EVIDENCE, TAX RECORDS, DEED PLOTS AND AERIAL MAPPING

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
CHRISTOPHER P. IACHINI
04-03-13
LAND SURVEYOR
SU061897

Drawn By: BAS

Applicant / Well Operator Name: TALISMAN ENERGY USA INC.	DEP ID #:	Well (Farm) Name: DCNR 594		Well #: 02-203-01	Serial #:
Address: 50 PENNWOOD PLACE, WARRENDALE, PA. 15086		County: TIOGA	Municipality (Host): LIBERTY TWP.		Well Type: GAS
911 address of well site: TBD		USGS 7½' Quadrangle Map Name: CHERRY FLATS		Map Section: 9	Surface Elevation: 2246 ft.
Surveyor or CHRISTOPHER P. IACHINI	Phone #: 570-323-6603	Dwg #: 6436-006-035	Date: ~~FEB. 08, 2013~~	Revised: APR. 03, 2013	Scale: 1" = 1000'	Tract Acreage: 19782±
Engineer: LARSON DESIGN GROUP						Survey Date: DEC. 26, 2012
Lat. & Long. Metadata Method: TRIMBLE MAPPING GPS	Accuracy: 3'±(PPS) ft.	Datum: NAD 83	Elevation Metadata Method: PAMAP LIDAR	Accuracy: 2'± ft.	Datum: NAVD 88	

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit #	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
Talisman Energy USA Inc.	237104	DCNR 594	02-203-01
Address		Project Number (if previously assigned)	
50 Pennwood Place			
City / State / Zip Code		County	Municipality
Warrendale / PA / 15086		Tioga	Liberty
Phone	Fax	Latitude	Longitude
7248145300	7248145301	N 41 ° 37 ′ 34.59 ″	W 77 ° 07 ′ 31.95 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   State Forest Tract 594

   List the name, address and phone number of the person responsible for management of the public resource.

   Justin L. Shafer, Assistant Forester, Tioga State Forest, One Nessmuk Lane, Wellsboro, PA 16901, 570-724-8127

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☐ Yes ☒ No

   If yes, provide PNDI Search Number_____ or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   Has the potential conflict been resolved? ☐ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   Talisman Energy USA Inc. will be implementing the best management practices per DEP's Chapter 102 and Chapter 105 Manuals and following Talisman's Preparedness Prevention and Contingency Plan.

RECEIVED
MAR 12 2013
Environmental Protection
Northwest Regional Office

DCNR GAS LEASE WAIVER REQUEST

TIOGA STATE FOREST DCNR TRACT 594
BLOSS TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA
TEUSA TRACT 594 WELL PAD 3 (02-203)

A. WAIVER REQUEST SPECIFIC CONDITIONS

Talisman Energy USA Inc. (TUESA) is requesting a waiver to utilize Fisher Trail as the entrance point to their proposed gas Well Pad #3 located within the Tioga State Forest Tract 594, Bloss Township, Tioga County. The proposed access road is to utilize a portion of Fisher Trail for the access road to minimize steep slopes and further impacts to State Forest Ground. It should be noted the Assistant District Forester has reviewed this location with members of LDG staff on several occasions and this was determined to be the most suitable entrance into the proposed location.

B. PROPOSED DEVIATION

The proposed deviation would be to relocate Fisher Trail and utilize the existing trail as the access road. The trail would be widened and stoned for access into the pad site. The trail will then be relocated just below the proposed access, maintaining a vegetative buffer between the proposed access and the proposed trail. This will route foot traffic around the access road and maintain safety for the hikers. Only a small portion of the trail will be utilized for the access road totaling a length of approximately 450 feet.

C. NEED TO DEVIATE AND HARDSHIP

The need to utilize Fisher Trail rather than any other location is due to the location of the trail in not only relation to the well pad, but as well as Lower Arnot Road. Fisher trail is the most direct route to Well Pad #3 which would minimize disturbances to the state forest. Sight distance at the entrance to Fisher Trail was the only place that meets PennDOT requirements that was close to the proposed site. If the entrance road was relocated it would have to be positioned several hundred feet away increasing further impacts to state forest ground. Fisher Trail also lies adjacent to the proposed well pad location. It is the safest and most convenient way into the proposed well pad location.

D. ALTERNATIVE ANALYSIS

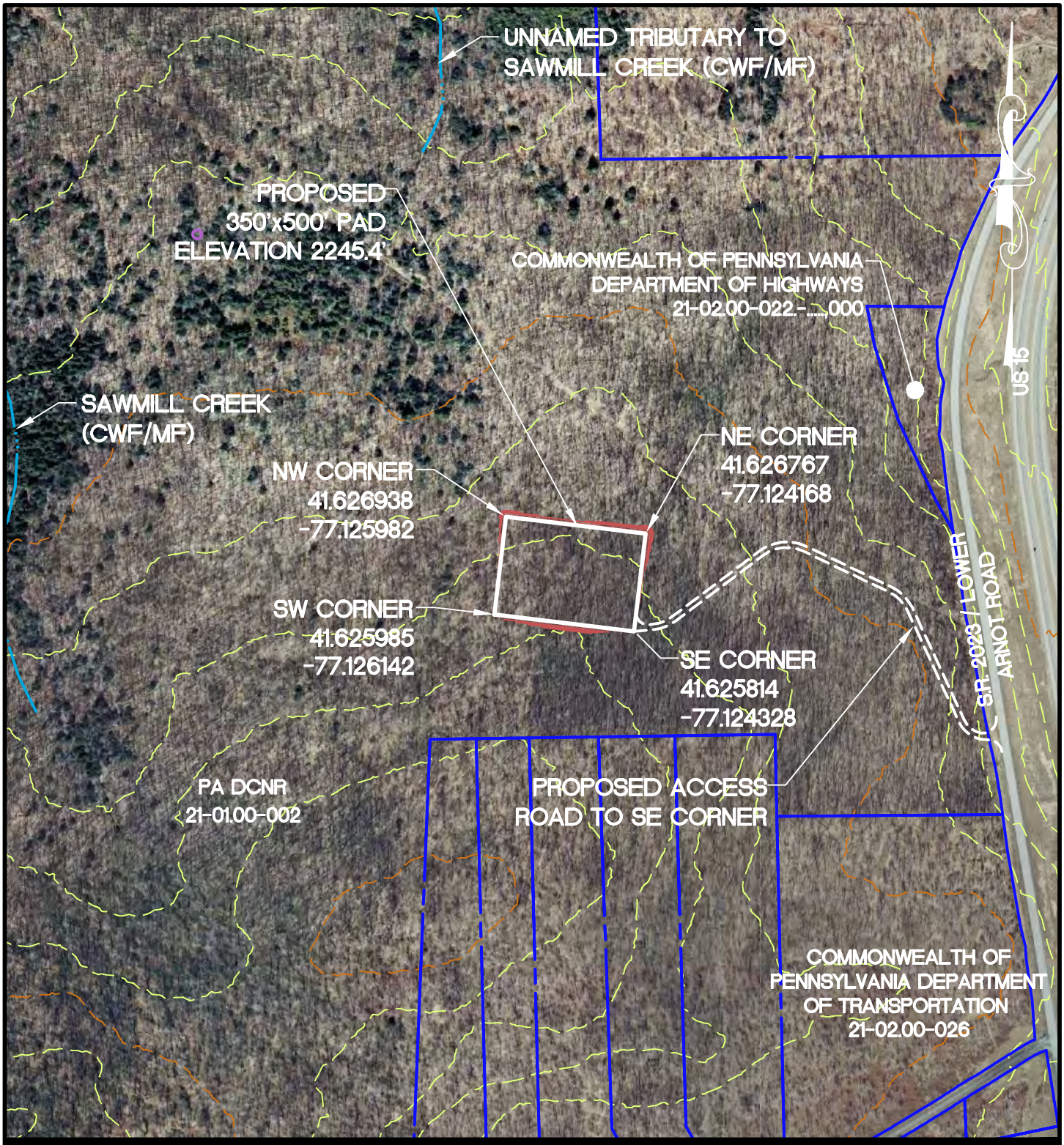
The only alternative to this location is to shift the access point further to the north that would meet PADOT requirements for sight distance. This in return would cause a longer access road and would also cause further impacts to state forest ground as the grades are steeper in this area and the road would have to switch back to get into the pad. This alternative would also need to cross Fisher Trail and would probably also need the trail to be relocated at some point. The pad cannot be shifted as it is in the most suitable area to cover the 594 tract with proposed bore legs with the fewest amount of proposed well pads.

E. NO DETRIMENTAL IMPACT FROM PROPOSED DEVIATION

The proposed deviation will have the least amount of impact to State Forest ground than any other possibility into the pad. The trail is already cleared and will need to be doubled in size to handle the truck traffic going into the well pad site. If any other option or possibility is utilized, greater impact will be needed.

It should be noted that when the pipeline is constructed to this pad, it is to be installed along with this road, and the trail will then be re-located in the pipeline right of way allowing the trail to be relocated almost exactly where it was originally

F. MAPPING AND APPENDIX
    a. Aerial Location Map
    b. USGS Location Map
    c. PNDI Environmental Review
    d. Well Site E&S Plans (Trail Relocation on sheet ES-3)



NOTE: ALL COORDINATES IN NAD 83. CONTOURS ARE AT 20' INTERVALS.

500 0 500 1000 FEET

SCALE

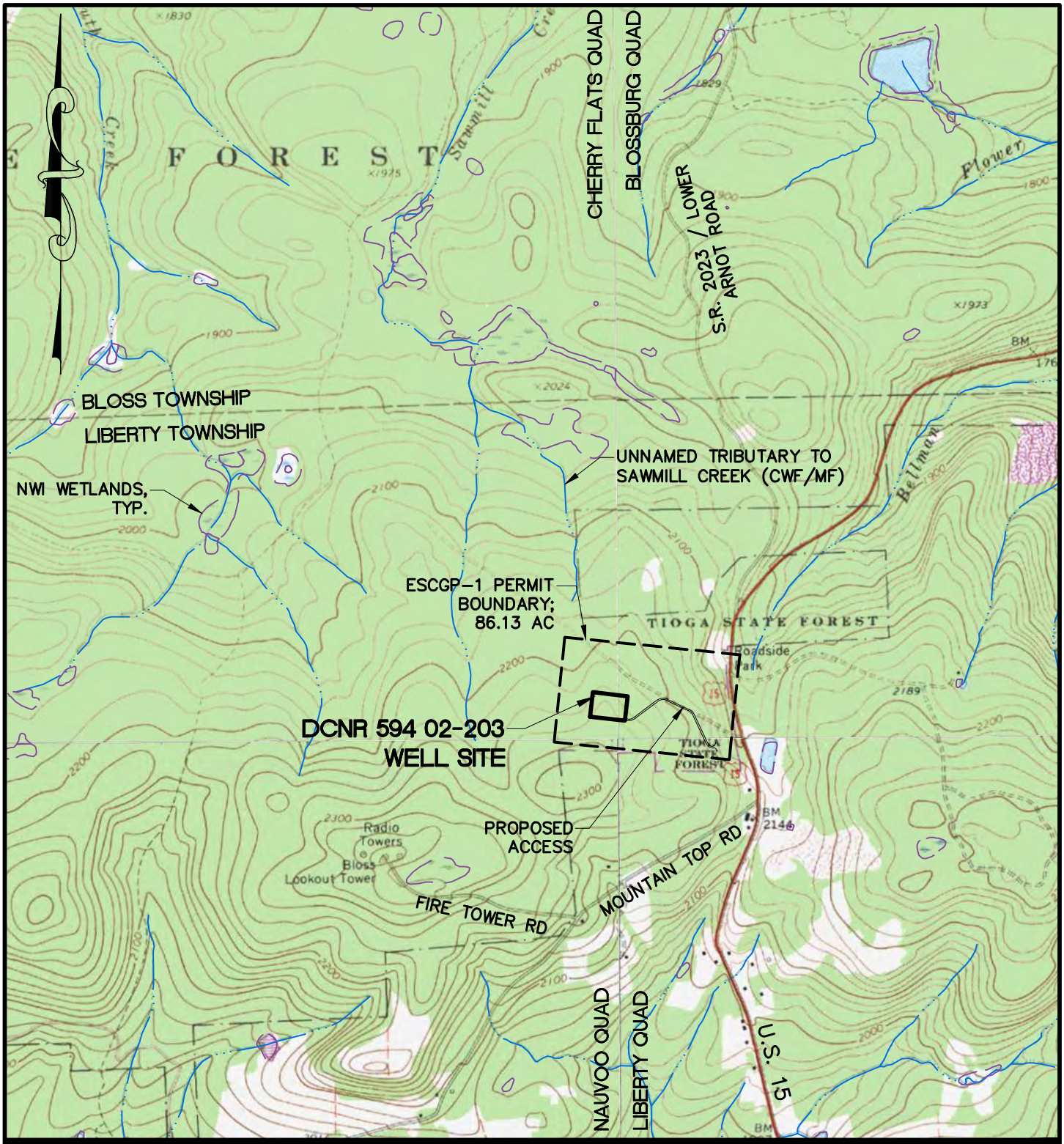
PAD DETAILS:
350' X 500'
20,400 CY CUT
1,730 LF ROAD

Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603
TOLL FREE 877.323.6603
FAX 570.323.9902
www.larsondesigngroup.com
Larson Design Group

DCNR 594 (02-203)
FOUR CORNERS MAP

LIBERTY TOWNSHIP, TIOGA COUNTY
FOR
TALISMAN ENERGY USA INC.

DATE: 2/10/12
SHEET NO.: FC 02-203
PROJECT NO.: 6436-015
SCALE: AS NOTED



2000 0 2000 4000 FEET

SCALE

Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603
TOLL FREE 877.323.6603
FAX 570.323.9902
www.larsondesigngroup.com
Larson Design Group

DCNR 594 (02-203) WELL SITE
CHERRY FLATS + BLOSSBURG QUADS
LOCATION MAP

LIBERTY TOWNSHIP, TIOGA COUNTY

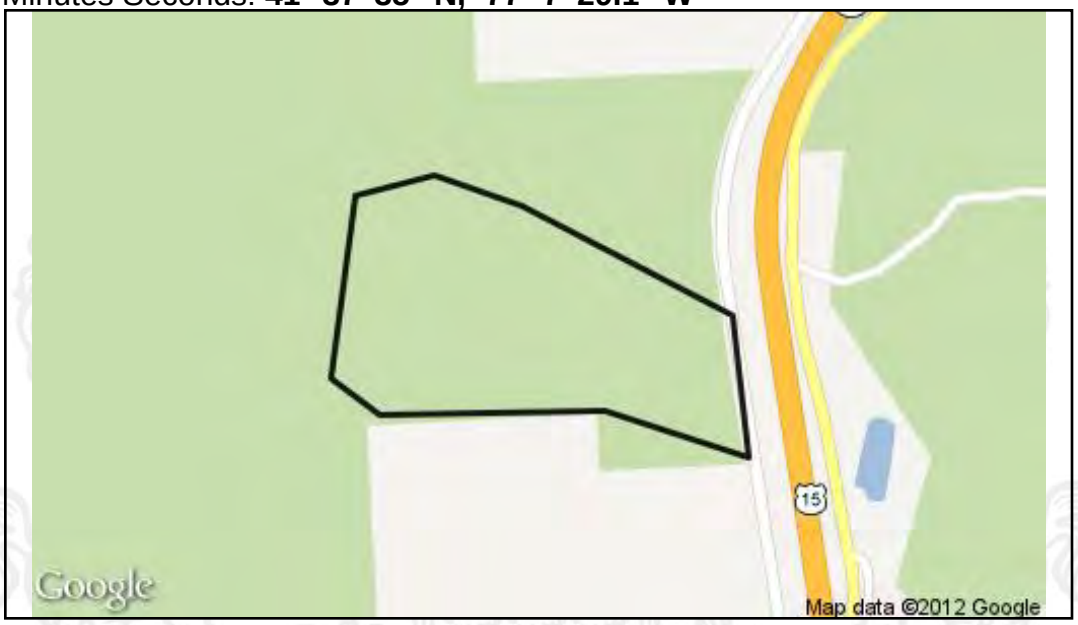
FOR

TALISMAN ENERGY USA INC.

DATE: 2/10/12
SHEET NO.: LM 02-203
PROJECT NO.: 6436-006-35
SCALE: AS SHOWN

1. PROJECT INFORMATION

Project Name: **DCNR 594 (02-203)**
Date of review: **3/8/2012 10:48:10 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **57.6** acres
County: **Tioga** Township/Municipality: **Liberty Twp**
Quadrangle Name: **CHERRY FLATS** ~ ZIP Code: **16912**
Decimal Degrees: **41.626382 N, -77.124752 W**
Degrees Minutes Seconds: **41° 37' 35" N, -77° 7' 29.1" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources

Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service

Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission

Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission

Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

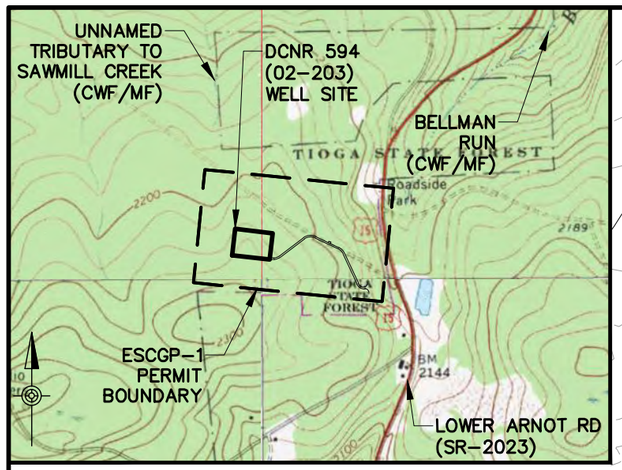
Name: Brent S. Herman
Company/Business Name: Larson Design Group
Address: 1000 Commerce Park Drive, Suite 201
City, State, Zip: Williamsport, PA 17701
Phone:(570) 323-6603 ext. 321 Fax:( )
Email: bsh@larsondesigngroup.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Brent S. Herman *3/8/12*

applicant/project proponent signature date



NOTE: EROSION CONTROL MATTING IS REQUIRED ON ALL 3:1 AND STEEPER SLOPES.

NOTE: TOPSOIL STOCKPILES OVER 10' HIGH WITH 2:1 SIDE SLOPES MUST PROVIDE 18" COMPOST SOCKS OR ADEQUATELY SIZED COMPOST SOCK AS PER THE SLOPE LENGTH TABLE ON THE DETAIL SHEET.

NOTE: ALL PROPOSED ELEVATIONS ARE APPROXIMATE

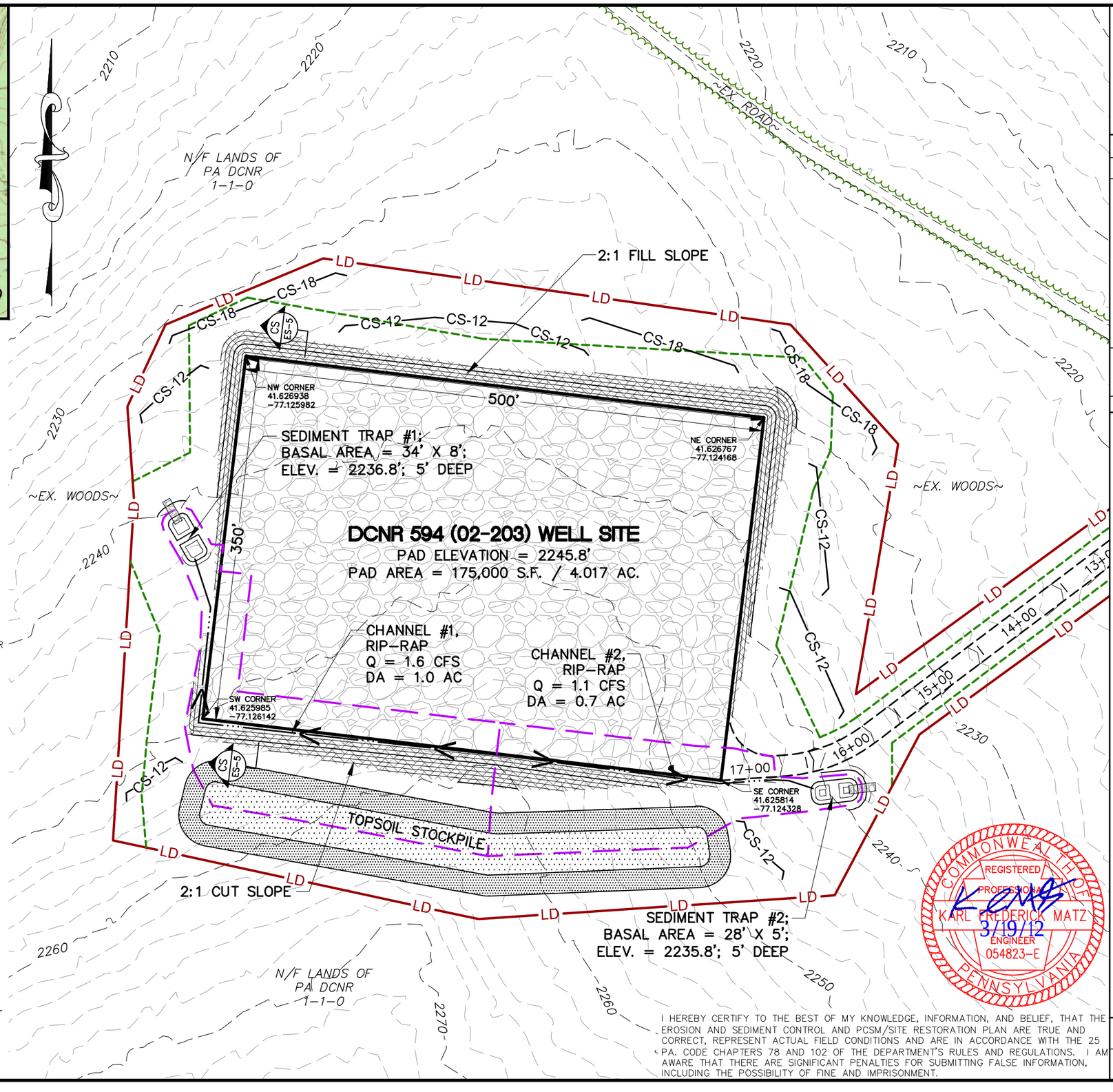
TOTAL LIMITS OF DISTURBANCE = 12.4 AC
(INCLUDING ACCESS ROAD)

PAD EARTHWORK VOLUMES:
19,800 CY TOTAL CUT MATERIAL
9,700 CY STONE FOR PAD (ASSUMED 18" THICKNESS)
ASSUMING 12" TOPSOIL, 7,700 CY TO BE STRIPPED

LEGEND

- COMPOST FILTER SOCK — CS-18 (SOCK DIAMETER (INCHES))
- PROPOSED ACCESS ROAD
- ROCK-LINED ROADSIDE DITCH
- PROPOSED CHANNEL
- BMP DRAINAGE AREA
- LIMIT OF DISTURBANCE — LD
- EXISTING PROPERTY LINE
- EXISTING TREE LINE
- CLEARING LIMIT
- ROCK CONSTRUCTION ENTRANCE
- EROSION CONTROL MATTING NA GREEN S75 OR EQUIVALENT
- 18" CULVERT AND ROCK APRON SUMP
- ROCK FILTER

100 0 100 200 FEET
SCALE



COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823-E
3/19/12

I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THAT THE EROSION AND SEDIMENT CONTROL AND PCSM/SITE RESTORATION PLAN ARE TRUE AND CORRECT, REPRESENT ACTUAL FIELD CONDITIONS AND ARE IN ACCORDANCE WITH THE 25 PA. CODE CHAPTERS 78 AND 102 OF THE DEPARTMENT'S RULES AND REGULATIONS. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT.

LDG
Larson Design Group

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	KEH	KFM

ISSUE / REVISIONS

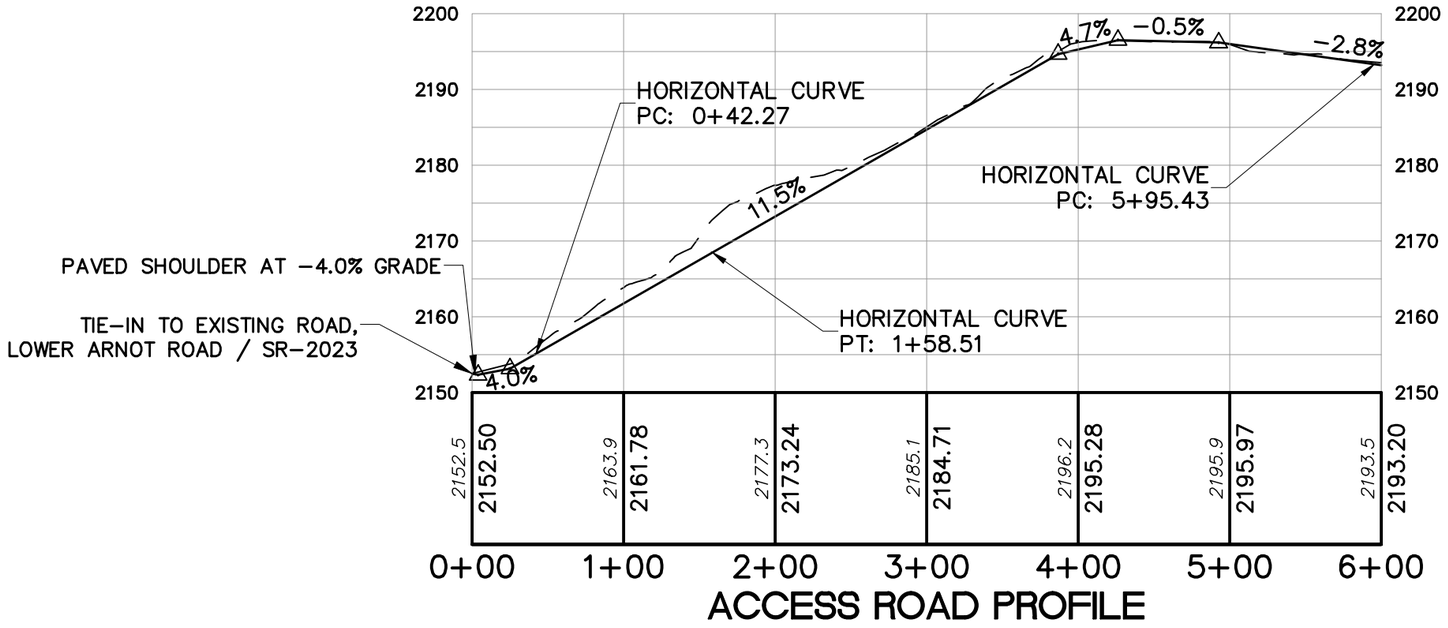
EROSION CONTROL PLAN
DCNR 594 (02-203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

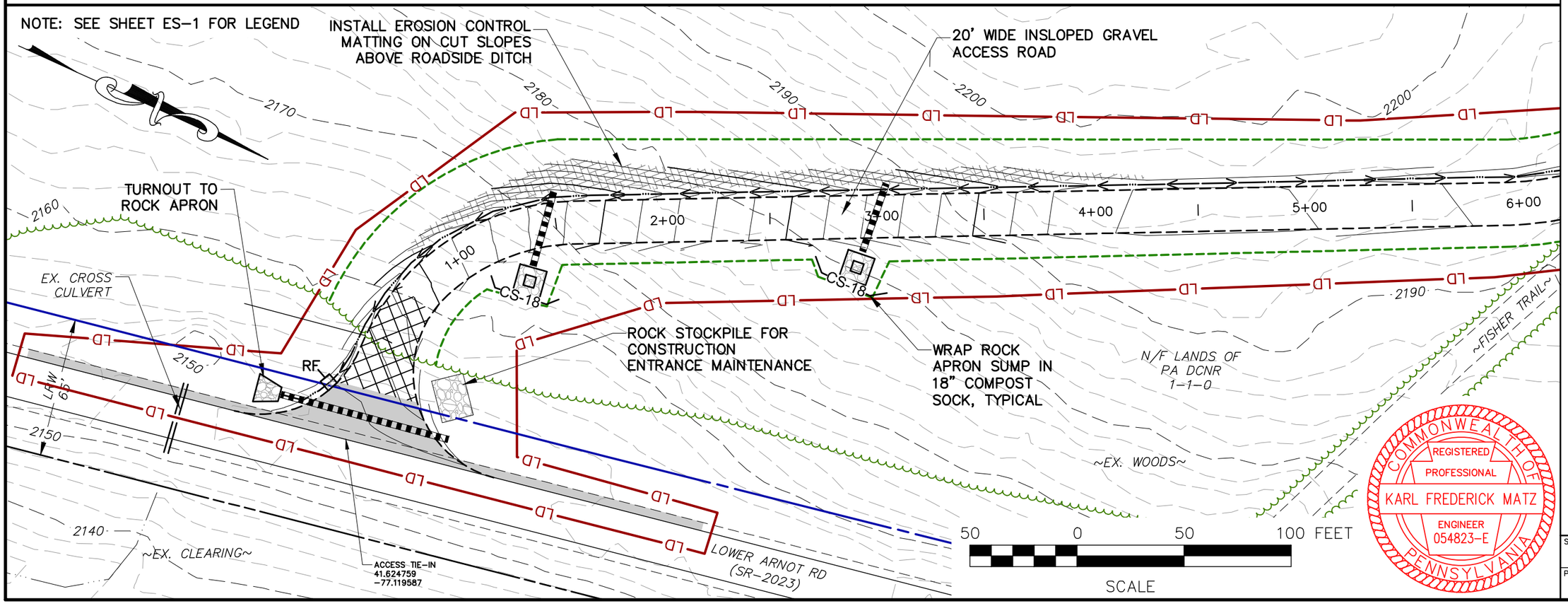
SHEET NO.: ES-1

PROJECT NO.: 6436-006-35



ACCESS ROAD PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'



NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP−1 SUBMISSION	KEH	KFM

ISSUE / REVISIONS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823−E

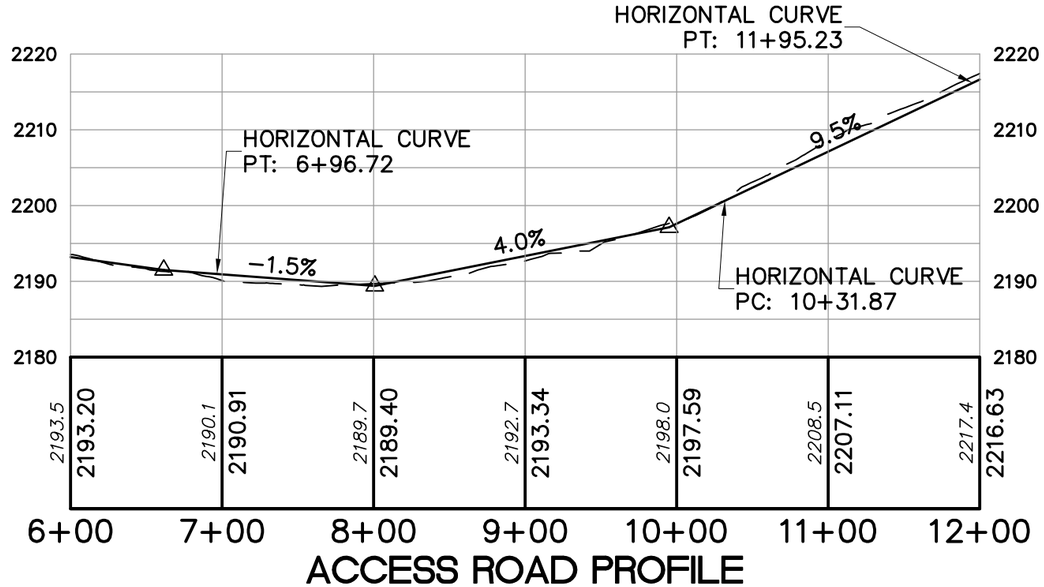
Larson Design Group
Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

ACCESS ROAD PLAN AND PROFILE
DCNR 594 (02−203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562−4000

SHEET NO.: ES−2

PROJECT NO.: 6436−006−35



ACCESS ROAD PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823-E

NOTE: SEE SHEET ES-1 FOR LEGEND

50 0 50 100 FEET
SCALE

~EX. WOODS~
20' WIDE CROWNED GRAVEL ACCESS ROAD
20' WIDE INSLOPED GRAVEL ACCESS ROAD
PROPOSED GATE
CS-18
FISHER TRAIL RE-ROUTE; CLEAR 8' WIDE CORRIDOR FOR GRASS FOOT PATH
30' X 20' GRAVEL PAD FOR SECURITY SHACK
N/F LANDS OF PA DCNR 1-1-0
CLEAR 8' WIDE CORRIDOR FOR GRASS FOOT PATH; MAINTAIN TREES BETWEEN ACCESS ROAD AND PROPOSED GRASS PATH
~FISHER TRAIL~
CONNECT BACK INTO EXISTING FISHER TRAIL
2220
2210
2200
2190
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00

Larson Design Group

ISSUE / REVISIONS

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	KEH	KFM

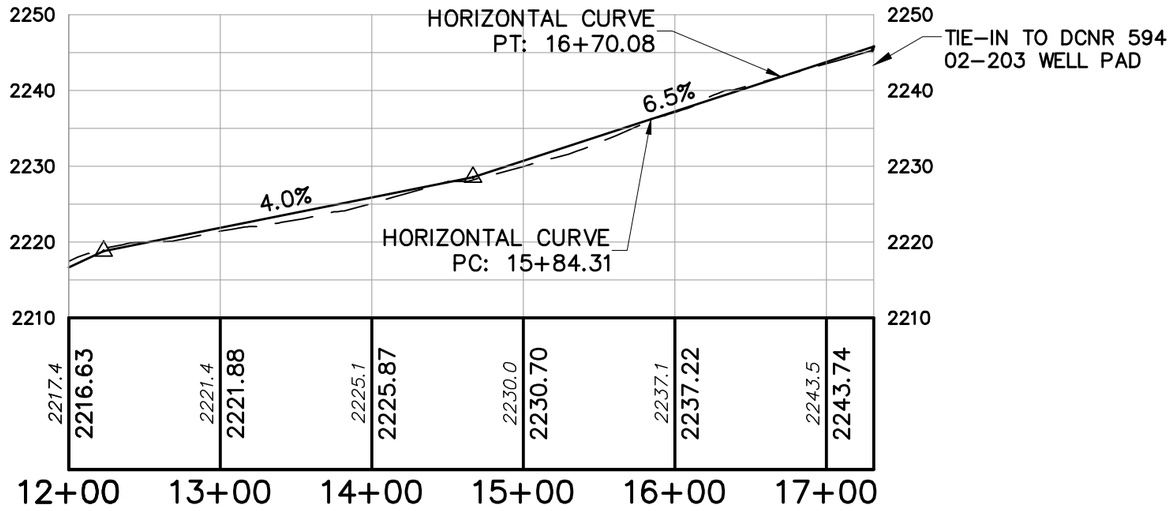
ACCESS ROAD PLAN AND PROFILE
DCNR 594 (02-203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

SHEET NO.: ES-3

PROJECT NO.: 6436-006-35



ACCESS ROAD PROFILE

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'

NOTE: SEE SHEET ES-1 FOR LEGEND

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823-E

50 0 50 100 FEET
SCALE

20' WIDE CROWNED GRAVEL ACCESS ROAD

~EX. WOODS~

N/F LANDS OF PA DCNR 1-1-0

~FISHER TRAIL~

DCNR 594 (02-203) WELL SITE

CS-12

Larson Design Group

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	KEH	KFM

ISSUE / REVISIONS

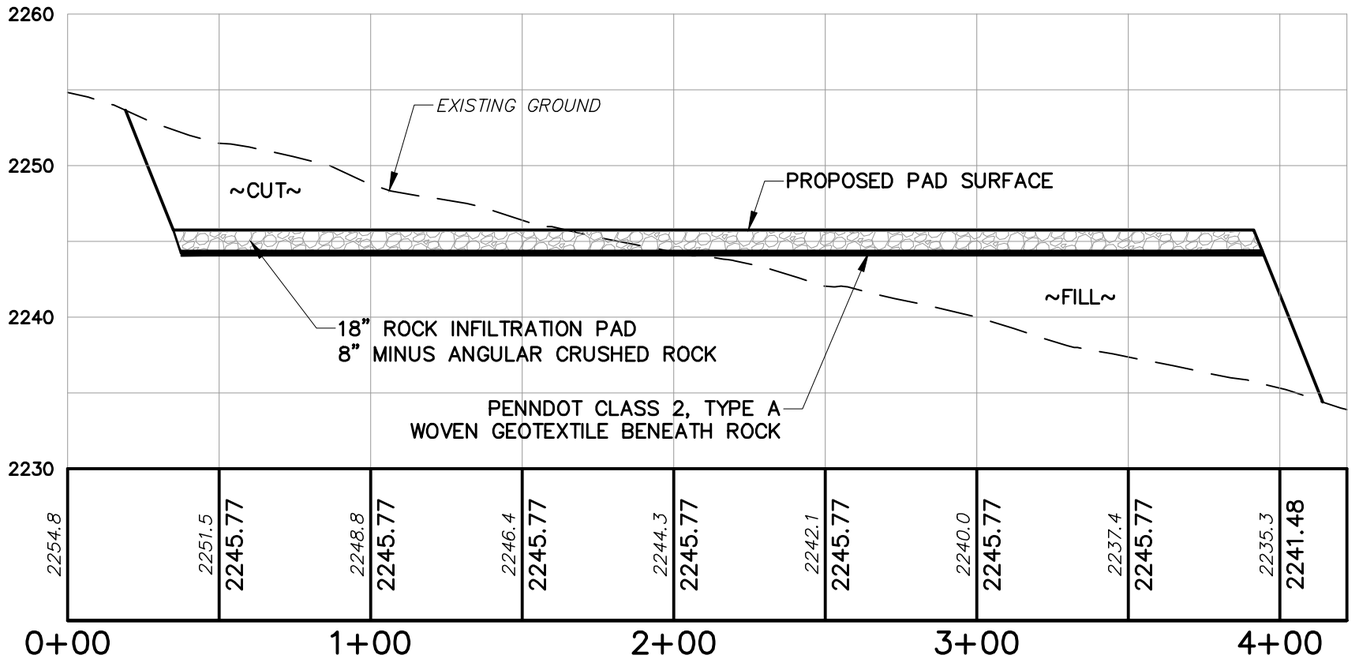
ACCESS ROAD PLAN AND PROFILE
DCNR 594 (02-203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

SHEET NO.: ES-4

PROJECT NO.: 6436-006-35



WELL PAD CROSS SECTION

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823-E

Larson Design Group

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	KEH	KFM

ISSUE / REVISIONS

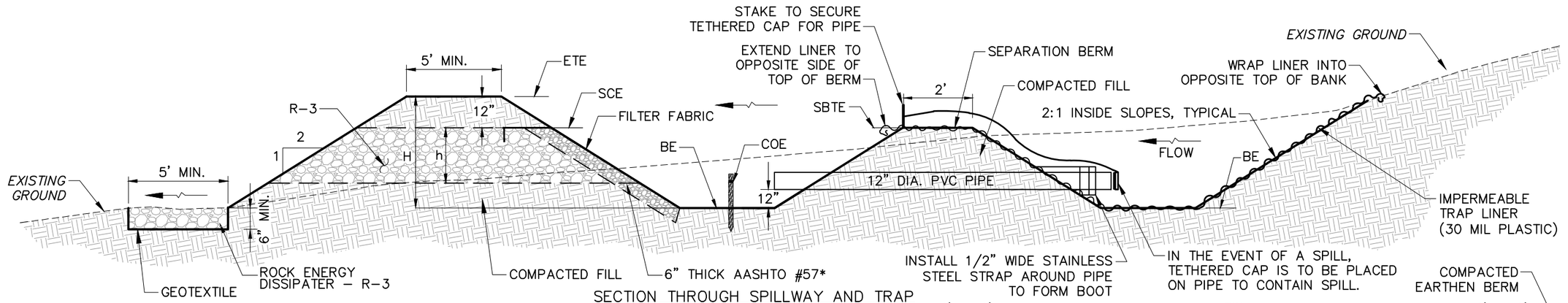
WELL PAD CROSS SECTION
DCNR 594 (02-203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

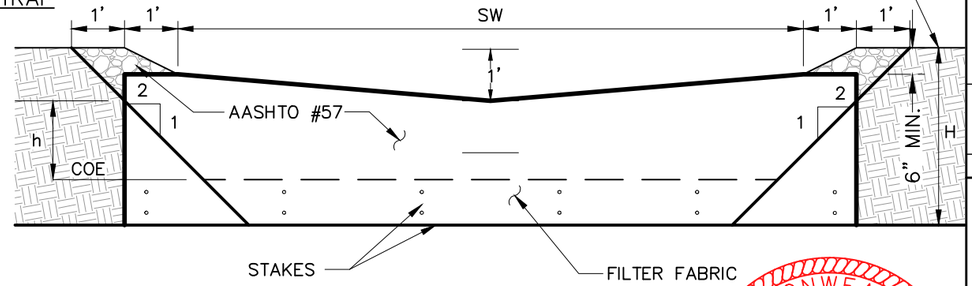
SHEET NO.: ES-5

PROJECT NO.: 6436-006-35



SECTION THROUGH SPILLWAY AND TRAP

TRAP NO.	TOTAL TRIBUTARY ACRES	REQ. CAPACITY (2000 CF/AC.)	PROVIDED CAPACITY AT OVERFLOW (2000 CF/AC.)	BOTTOM AREA L (FT)	BOTTOM AREA W (FT)	L:W RATIO	INSIDE AND OUTSIDE SLOPES	H (FT)	h (FT)	EMBANK. TOP ELEV. ETE (FT)	SEPARATION BERM TOP ELEV. SBTE (FT)	SPILLWAY CREST ELEV. SCE (FT)	CLEAN OUT ELEV. COE (FT)	BOTTOM ELEV. BE (FT)	SPILL-WAY WIDTH SW (FT)
1	1.0	2,000	2,218	34	8	4.3:1	2:1	5	2.3	2241.8	2240.8	2240.8	2238.5	2236.8	8
2	0.7	1,400	1,522	28	5	5.6:1		5	2.2	2240.6	2239.8	2239.8	2237.6	2235.8	8



INSIDE FACE

INSTALLATION

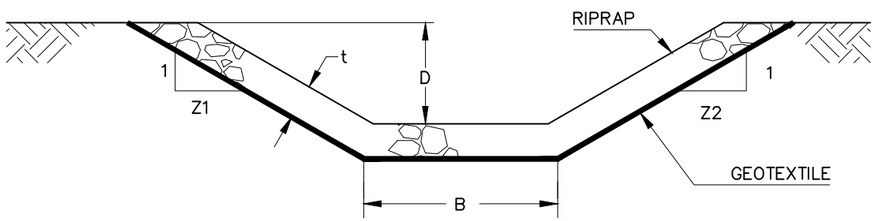
1. EMBANKMENT OUTLET COMPOSED ENTIRELY OF ROCK; MAIN BODY R-3 OR LARGER, INSIDE FACE AASHTO #57 STONE OR SMALLER.

MAINTENANCE

1. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES THE CLEAN OUT ELEVATION MARKED ON THE STAKE.

SEDIMENT TRAP / CONTAINMENT DETAIL

NO SCALE



CHANNEL CROSS-SECTION

CHANNEL NO.	STATIONS	BOTTOM WIDTH B (FT)	DEPTH D (FT)	Z1 (FT)	Z2 (FT)	CHANNEL SLOPE	RIPRAP SIZE (R-_)	RIPRAP THICK. t (IN)	DRAINAGE AREA (ACRES)	Q* (CFS)
1	ALL	2	2.2	2	2	0.5%	R-3	12	1.0	1.6
2	ALL	2	1.1	2	2	0.5%	R-3	12	0.7	1.1

* AS ALL PROPOSED CHANNELS ARE TEMPORARY, FLOW IS CALCULATED AT 1.60 CFS/ACRE AS PER STANDARD WORKSHEET #18 OF PA DEP E&S MANUAL

RIPRAP CHANNELS

SCALE: NOT TO SCALE

CONSTRUCTION SEQUENCE

THE BMPS SHALL BE IMPLEMENTED, MAINTAINED AND OPERATED IN THE FOLLOWING GENERAL SEQUENCE OF CONSTRUCTION TO MITIGATE THE HAZARD OF ACCELERATED EROSION AND SEDIMENTATION TO THE ACCEPTABLE LEVELS. MINOR DEVIATIONS FROM THIS SEQUENCE SHALL BE EXECUTED BY THE PROJECT'S FOREMAN AS NEEDED TO ELIMINATE ANY POTENTIAL EROSIVE CONDITION THAT MAY ARISE DURING THE DURATION OF THE PROJECT. ANY MINOR BMP DEVIATIONS FROM THE APPROVED PLANS SHALL BE MARKED UP ON THE SITE'S PLAN DRAWINGS. MARKED UP PLANS SHOULD BE PRESENTED FOR DEP INSPECTOR'S ACKNOWLEDGEMENT.

1. INSTALL THE ROCK CONSTRUCTION ENTRANCE AS SHOWN ON THE PLANS.
2. INSTALL ALL COMPOST FILTER SOCKS AND/OR FILTER FABRIC FENCING AS SHOWN ON THE PLANS AND DETAILS.
3. CLEAR AND GRUB THE ACCESS ROAD AND PAD AREA.
4. STRIP TOPSOIL AND STOCKPILE IN AREAS DESIGNATED ON THE PLAN DRAWINGS. ENSURE THAT ENTIRE AREA DOWNSLOPE OF THE TOPSOIL STOCKPILE IS DRAINING TO AN E&S BMP SUCH AS A COMPOST SOCK. SEED AND MULCH TOPSOIL STOCKPILES.
5. CONVEY UPSLOPE DRAINAGE AROUND THE WELL SITE BY CONSTRUCTING THE DIVERSION BERM(S) AS SHOWN ON THE PLANS AND DETAILS. IF APPLICABLE, CONSTRUCT LEVEL SPREADER(S) AS SHOWN ON THE PLANS AND DETAILS. SEED AND MULCH ANY DISTURBED AREAS.
5. BEGIN OVERLOT GRADING OF ACCESS ROAD AND WELL PAD.
6. CONSTRUCT CHANNELS AS SHOWN ON THE PLAN DRAWINGS AND DETAILS AND STABILIZE WITH STONE.
7. INSTALL SEDIMENT TRAPS AS SHOWN ON THE PLANS AND DRAWINGS.
8. CONSTRUCT ACCESS ROAD. INSTALL ROCK LINED ROADSIDE DITCH AND CROSS CULVERTS, IF APPLICABLE. STABILIZE ROADWAY AND ROADSIDE DITCH IMMEDIATELY WITH GRAVEL. STOCK PILE AND STABILIZE TOPSOIL ALONG THE ACCESS ROAD AS NEEDED.
9. FINE GRADE THE WELL SITE TO FINISHED GRADE. IMMEDIATELY STABILIZE THE PAD WITH STONE. STABILIZE SIDE SLOPES WITH EROSION CONTROL MATTING, IF NECESSARY, AND SEED AND MULCH.
10. SEED AND MULCH ALL DISTURBED AREAS USING THE RECOMMENDED SEED MIXTURES ON THE DETAIL SHEET. IN NON-GERMINATION PERIODS (WINTER) APPLY TEMPORARY SEEDING AND MULCHING WITHIN 14 DAYS CONSISTING OF 40 LBS/ACRE ANNUAL RYE GRASS AND 3 TONS PER ACRE HAY OR STRAW MULCH.
11. PREVIOUSLY DISTURBED AREAS AND IMMEDIATE DOWN SLOPE AREAS SHALL BE INSPECTED AFTER EACH STORMWATER EVENT AND MONITORED WEEKLY FOR SIGNS OF ACCELERATED EROSION. IMPLEMENT ADDITIONAL BMP'S AS DEEMED NECESSARY. THESE INSPECTIONS SHALL CONTINUE DURING THE DURATION OF THE PROJECT AND FOLLOWING SITE RECLAMATION.
12. COMMENCE THE DRILLING ACTIVITY.
13. AFTER STABILIZATION WITH UNIFORM 70% VEGETATIVE COVER OF EROSION RESISTANT PERENNIAL SPECIES HAS BEEN ACHIEVED OVER A PREVIOUSLY DISTURBED AREA, THE TEMPORARY BMPs FOR THAT AREA MAY BE REMOVED. CONTINUE TO MONITOR THESE AREAS TO ENSURE A UNIFORM 70% VEGETATIVE COVERAGE IS MAINTAINED. ANY AREAS FOUND TO BE DEFICIENT SHALL BE RE-SEEDED AND MULCHED.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823-E

Larson Design Group

ISSUE / REVISIONS

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	RNH	KFM

EROSION CONTROL DETAILS

DCNR 594 (02-203) WELL SITE

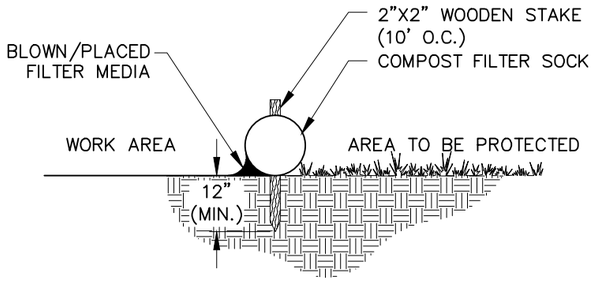
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

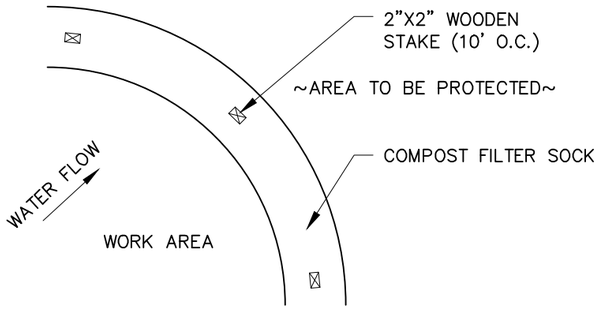
TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

SHEET NO.: DET-1

PROJECT NO.: 6436-006-35





SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1. COMPOST SHALL MEET THE FOLLOWING STANDARDS:	
ORGANIC MATTER CONTENT	80% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5 – 8.0
MOISTURE CONTENT	35% – 55%
PARTICLE SIZE	98% PASS THROUGH 1" SCREEN
SOLUBLE SALT CONCENTRATION	5.0 dS MAXIMUM

NOTES:
1. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT.
2. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
3. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES ½ THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN AN APPROVED MANNER.
4. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
5. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
6. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

COMPOST FILTER SOCK
SCALE: NOT TO SCALE

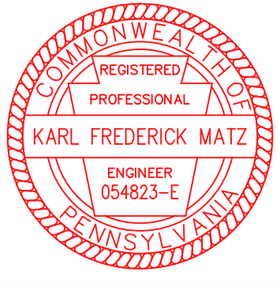
MAXIMUM SLOPE LENGTH ABOVE COMPOST FILTER SOCKS *					
SLOPE PERCENT	COMPOST FILTER SOCK DIAMETER				
	8"	12"	18"	24"	32"
2	400	520	690	1000	1300
5	200	250	350	500	650
10	100	150	250	300	400
20	25	70	150	200	250
33	20	40	65	90	105
40	15	35	55	75	90
50	10	25	40	50	65

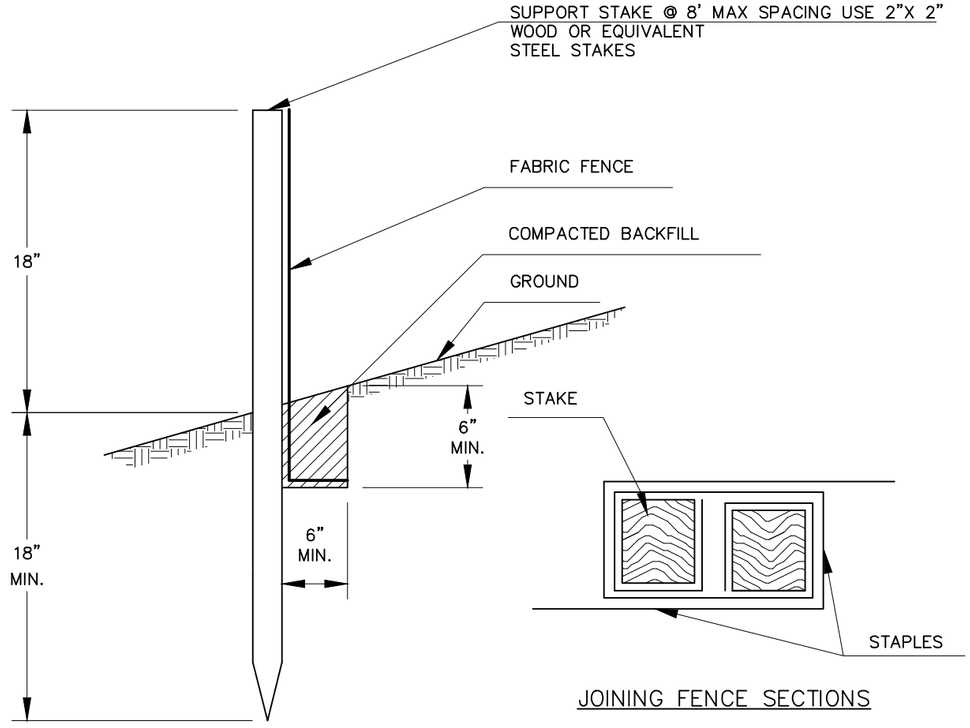
* TABLE DERIVED FROM FIGURE 4.2, PA DEP EROSION CONTROL MANUAL DRAFT, 363-2134-008 / DRAFT OCTOBER 17, 2009 / PAGE 54

NOTE: COMPOST FILTER SOCKS SHOWN IN THIS E&S PLAN WERE SIZED ACCORDING TO THE ABOVE TABLE. IN THE EVENT THAT COMPOST FILTER SOCKS ARE NOT AVAILABLE, AND THE PROJECT SITE IS NOT IN A SPECIAL PROTECTION WATERSHED, FILTER FENCE MAY BE SUBSTITUTED. FILTER FENCE MUST BE SIZED AND PLACED IN ACCORDANCE WITH THE ATTACHED DETAIL AND SLOPE LENGTH TABLE.

MAXIMUM SLOPE LENGTH ABOVE FILTER FABRIC FENCE *			
SLOPE PERCENT	FILTER FABRIC FENCE SIZE		
	18"	30" REINF.	SUPER
2	150	500	1000
5	100	250	550
10	50	150	325
20	25	70	175
33	15	42	91
40	15	35	75
50	10	25	50

* TABLE DERIVED FROM TABLE 4.3, PA DEP EROSION CONTROL MANUAL DRAFT, 363-2134-008 / DRAFT OCTOBER 17, 2009 / PAGE 63





JOINING FENCE SECTIONS

INSTALLATION
1. FILTER FABRIC FENCE MUST BE INSTALLED AT LEVEL GRADE. BOTH ENDS OF EACH FENCE SECTION SHOULD BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT.
2. A 6" DEEP TRENCH SHOULD BE EXCAVATED, MINIMIZING THE DISTURBANCE ON THE DOWNSLOPE SIDE. THE BOTTOM OF THE TRENCH SHOULD BE AT LEVEL GRADE. MAXIMUM DEVIATION FROM LEVEL GRADE SHOULD BE 1%, AND NOT EXTEND FOR MORE THAN 25 FT.
3. SUPPORT STAKES SHOULD BE DRIVEN A MINIMUM OF 18" BELOW THE EXISTING GROUND SURFACE AT 8 FOOT (MAX.) INTERVALS.
4. FILTER FABRIC SHOULD BE STRETCHED AND FASTENED TO THE UPSLOPE SIDE OF THE SUPPORT STAKES. WHEREVER REINFORCED FABRIC FENCE IS INSTALLED, THE REINFORCEMENT MESH SHOULD BE FASTENED TO THE STAKES PRIOR TO THE FABRIC.
5. AT FABRIC ENDS, BOTH ENDS SHOULD BE WRAPPED AROUND THE SUPPORT STAKES AND STAPLED. IF THE FABRIC COMES ALREADY ATTACHED TO THE STAKES, THE END STAKES SHOULD BE HELD TOGETHER WHILE THE FABRIC IS WRAPPED AROUND THE STAKES AT LEAST ONE REVOLUTION PRIOR TO DRIVING THE STAKES.
6. THE BOTTOM OF THE FENCE SHOULD BE ANCHORED BY PLACING THE FABRIC IN THE BOTTOM OF THE TRENCH, AND BACKFILLING AND COMPACTING THE FILL MATERIAL IN THE TRENCH.
7. FILTER FABRIC FENCE ALIGNMENT SHOULD BE AT LEAST 8 FEET FROM THE TOE OF SLOPE.

MAINTENANCE
1. THE FENCE INSTALLATION SHOULD BE INSPECTED WEEKLY AND AFTER EVERY PRECIPITATION EVENT. ANY NECESSARY REPAIRS WILL BE MADE IMMEDIATELY AFTER THE INSPECTION.
2. ACCUMULATED SEDIMENTS WILL BE REMOVED AS REQUIRED TO KEEP THE FENCE FUNCTIONAL. IN ALL CASES, REMOVE DEPOSITS WHERE ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.
3. ALL UNDERCUTTING OR EROSION OF THE TOE ANCHOR WILL BE PREPARED IMMEDIATELY WITH COMPACTED BACKFILL MATERIALS.
4. ADHERE TO ANY MANUFACTURER'S RECOMMENDATIONS FOR REPLACING FABRIC FENCE DUE TO WEATHERING.
5. ANY SECTION OF FILTER FENCE WHICH HAS BEEN UNDERMINED OR TOPPED MUST BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET.

STANDARD FILTER FABRIC FENCE (18" HIGH)
SCALE: NOT TO SCALE

Larson Design Group

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	RNH	KFM

ISSUE / REVISIONS

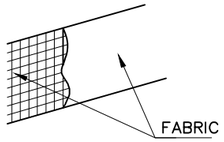
EROSION CONTROL DETAILS
DCNR 594 (02-203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

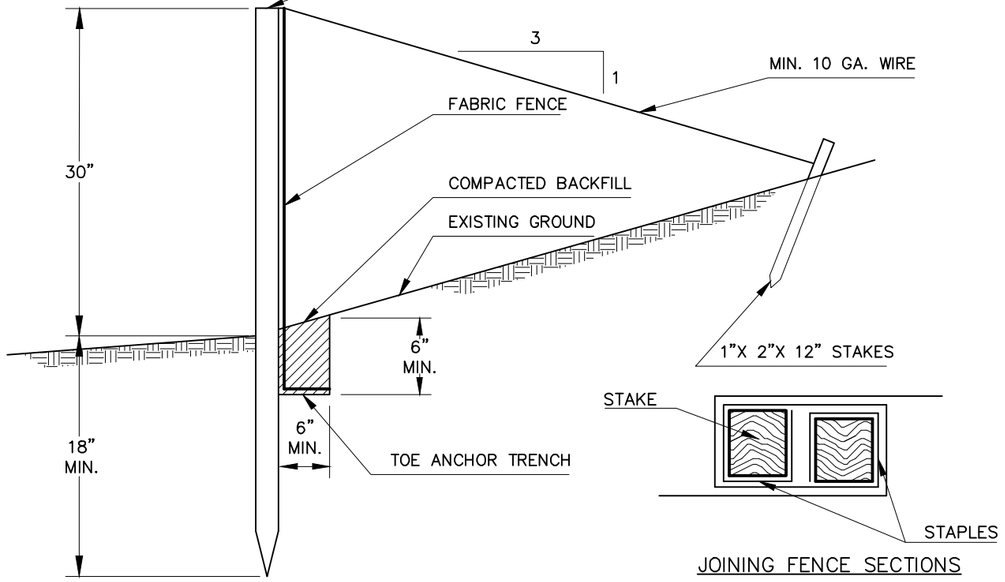
SHEET NO.: DET-2

PROJECT NO.: 6436-006-35



CUTAWAY VIEW

NOTE:
SUPPORT STAKE @ 8' MAX SPACING
USE 2"X 2" WOOD OR EQUIVALENT
STEEL STAKES



JOINING FENCE SECTIONS

INSTALLATION

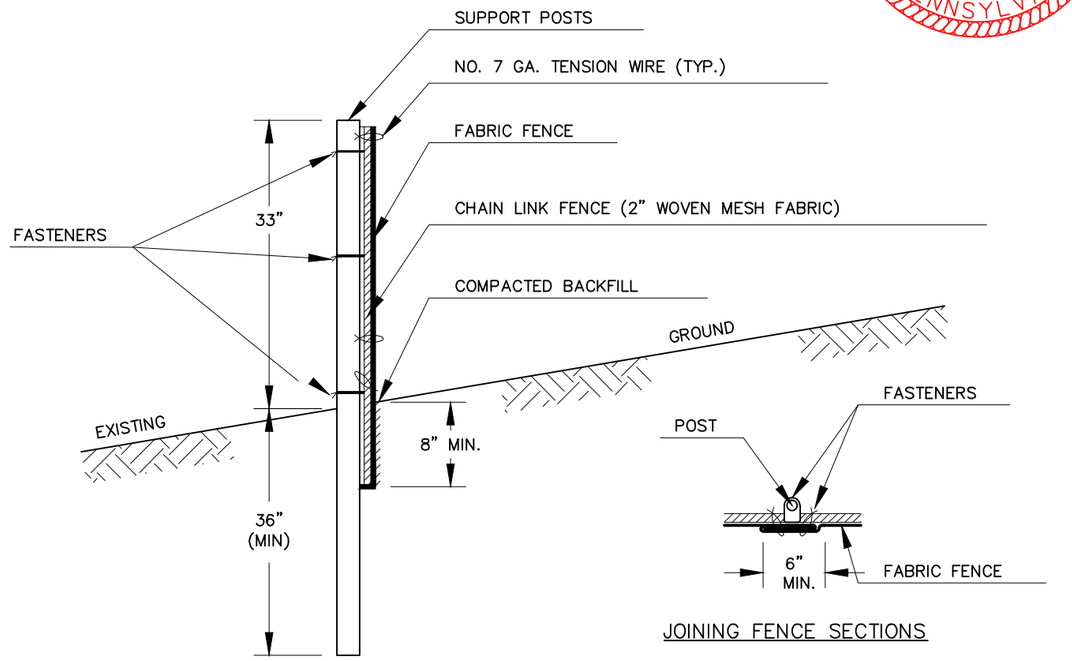
1. FILTER FABRIC FENCE MUST BE INSTALLED AT LEVEL GRADE. BOTH ENDS OF EACH FENCE SECTION SHOULD BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT.
2. A 6" DEEP TRENCH SHOULD BE EXCAVATED, MINIMIZING THE DISTURBANCE ON THE DOWNSLOPE SIDE. THE BOTTOM OF THE TRENCH SHOULD BE AT LEVEL GRADE. MAXIMUM DEVIATION FROM LEVEL GRADE SHOULD BE 1%, AND NOT EXTEND FOR MORE THAN 25 FT.
3. SUPPORT STAKES SHOULD BE DRIVEN A MINIMUM OF 18" BELOW THE EXISTING GROUND SURFACE AT 8 FOOT (MAX.) INTERVALS.
4. FILTER FABRIC SHOULD BE STRETCHED AND FASTENED TO THE UPSLOPE SIDE OF THE SUPPORT STAKES. WHEREVER REINFORCED FABRIC FENCE IS INSTALLED, THE REINFORCEMENT MESH SHOULD BE FASTENED TO THE STAKES PRIOR TO THE FABRIC.
5. AT FABRIC ENDS, BOTH ENDS SHOULD BE WRAPPED AROUND THE SUPPORT STAKES AND STAPLED. IF THE FABRIC COMES ALREADY ATTACHED TO THE STAKES, THE END STAKES SHOULD BE HELD TOGETHER WHILE THE FABRIC IS WRAPPED AROUND THE STAKES AT LEAST ONE REVOLUTION PRIOR TO DRIVING THE STAKES.
6. THE BOTTOM OF THE FENCE SHOULD BE ANCHORED BY PLACING THE FABRIC IN THE BOTTOM OF THE TRENCH, AND BACKFILLING AND COMPACTING THE FILL MATERIAL IN THE TRENCH.
7. FILTER FABRIC FENCE ALIGNMENT SHOULD BE AT LEAST 8 FEET FROM THE TOE OF SLOPE.
8. GUY WIRES SHOULD BE ATTACHED TO REINFORCED FABRIC FENCE.

MAINTENANCE

1. THE FENCE INSTALLATION SHOULD BE INSPECTED AFTER EVERY PRECIPITATION EVENT. ANY NECESSARY REPAIRS WILL BE MADE IMMEDIATELY AFTER THE INSPECTION.
2. ACCUMULATED SEDIMENTS WILL BE REMOVED AS REQUIRED TO KEEP THE FENCE FUNCTIONAL. IN ALL CASES, REMOVE DEPOSITS WHERE ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.
3. ALL UNDERCUTTING OR EROSION OF THE TOE ANCHOR WILL BE REPAIRED IMMEDIATELY WITH COMPACTED BACKFILL MATERIALS.
4. ADHERE TO ANY MANUFACTURER'S RECOMMENDATIONS FOR REPLACING FABRIC FENCE DUE TO WEATHERING.
5. ANY SECTION OF FILTER FENCE WHICH HAS BEEN UNDERMINED OR TOPPED MUST BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET.

REINFORCED FILTER FABRIC FENCE (30" HIGH)

SCALE: NOT TO SCALE



JOINING FENCE SECTIONS

INSTALLATION

1. POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. GALVANIZED OR ALUMINUM POSTS.
2. CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 6 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE-FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 10 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX. C TO C.
3. NO. 7 GA. TENSION WIRE INSTALLED HORIZONTALLY AT TOP AND BOTTOM OF CHAIN-LINK FENCE.
4. FILTER FABRIC FENCE MUST BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER MUST BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT.
5. FILTER FABRIC FENCE ALIGNMENT SHOULD BE AT LEAST 8 FEET FROM THE TOE OF SLOPE.

MAINTENANCE

1. THE FENCE INSTALLATION SHOULD BE INSPECTED WEEKLY AND AFTER EVERY PRECIPITATION EVENT. ANY NECESSARY REPAIRS WILL BE MADE IMMEDIATELY AFTER THE INSPECTION.
2. ACCUMULATED SEDIMENTS WILL BE REMOVED AS REQUIRED TO KEEP THE FENCE FUNCTIONAL. IN ALL CASES, REMOVE DEPOSITS WHERE ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.
3. ALL UNDERCUTTING OR EROSION OF THE TOE ANCHOR WILL BE PREPARED IMMEDIATELY WITH COMPACTED BACKFILL MATERIALS.
4. ADHERE TO ANY MANUFACTURER'S RECOMMENDATIONS FOR REPLACING FABRIC FENCE DUE TO WEATHERING.
5. ANY SECTION OF FILTER FENCE WHICH HAS BEEN UNDERMINED OR TOPPED MUST BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET.

SUPER FILTER FABRIC FENCE

SCALE: NOT TO SCALE

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823-E

Larson Design Group

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	RNH	KFM

ISSUE / REVISIONS

EROSION CONTROL DETAILS
DCNR 594 (02-203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

SHEET NO.: DET-3

PROJECT NO.: 6436-006-35

SOIL EROSION AND SEDIMENTATION CONTROL NOTES

1. A CURRENT PPC PLAN MUST BE KEPT ON SITE AT ALL TIMES.
2. TOPSOIL STOCKPILE HEIGHTS SHALL NOT EXCEED 35 FEET. STOCKPILE SIDE SLOPES MUST BE 2:1 OR FLATTER.
3. A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN AND A PPC PLAN MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES. THE OPERATOR SHALL ASSURE THAT THE APPROVED EROSION AND SEDIMENT CONTROL PLAN IS PROPERLY AND COMPLETELY IMPLEMENTED.
4. AT LEAST 3 DAYS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY THE PENNSYLVANIA ONE CALL SYSTEM INCORPORATED AT 1-800-242-1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
5. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO ELIMINATE THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION.
6. ALL PUMPING OF SEDIMENT LADEN WATER SHALL BE THROUGH A SEDIMENT CONTROL BMP, SUCH AS A PUMPED WATER FILTER BAG OR EQUIVALENT SEDIMENT REMOVAL FACILITY, OVER UNDISTURBED VEGETATED AREAS.
7. ALL CHANNELS MUST BE KEPT FREE OF OBSTRUCTIONS SUCH AS FILL GROUND, FALLEN LEAVES & WOODY DEBRIS, ACCUMULATED SEDIMENT, AND CONSTRUCTION MATERIALS/WASTES. CHANNELS SHOULD BE KEPT MOWED AND/OR FREE OF ALL WEEDY, BRUSHY OR WOODY GROWTH. ANY UNDERGROUND UTILITIES RUNNING ACROSS/ THROUGH THE CHANNEL(S) SHALL BE IMMEDIATELY BACKFILLED AND THE CHANNEL(S) REPAIRED AND STABILIZED PER THE CHANNEL CROSS-SECTION DETAIL.
8. SEDIMENT BASINS/TRAPS SHALL BE KEPT FREE OF ALL TRASH, CONCRETE WASH WATER AND OTHER DEBRIS THAT POSE THE POTENTIAL FOR CLOGGING THE BASIN/TRAP OUTLET STRUCTURES AND/OR POSE THE POTENTIAL FOR POLLUTION TO WATERS OF THE COMMONWEALTH.
9. WHEN SEDIMENT HAS ACCUMULATED TO THE CLEAN OUT ELEVATION ON ANY STAKE, ALL ACCUMULATED SEDIMENT SHALL BE REMOVED FROM THE ENTIRE TRAP/BASIN BOTTOM.
10. FILL MATERIAL FOR THE EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES AND OTHER OBJECTIONABLE MATERIALS. THE EMBANKMENT SHALL BE COMPACTED IN MAXIMUM 8" LAYERED LIFTS AT 95% STANDARD PROCTOR.
11. PERMANENT STABILIZATION IS DEFINED AS A MINIMUM UNIFORM 70% PERENNIAL VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED SURFACE EROSION AND SUBSURFACE CHARACTERISTICS SUFFICIENT TO RESIST SLIDING AND OTHER MOVEMENTS.
12. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE, THE OPERATOR SHALL STABILIZE THE DISTURBED AREAS. DURING NON-GERMINATING PERIODS, MULCH MUST BE APPLIED AT 1200 LBS PER 1000 SY. DISTURBED AREAS WHICH ARE NOT AT FINISHED GRADE AND WHICH WILL BE RE-DISTURBED WITHIN 1 YEAR MUST BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY VEGETATIVE STABILIZATION SPECIFICATIONS. DISTURBED AREAS WHICH ARE AT FINAL GRADE OR WHICH WILL NOT BE RE-DISTURBED WITHIN 1 YEAR MUST BE STABILIZED IN ACCORDANCE WITH THE PERMANENT VEGETATIVE STABILIZATION SPECIFICATIONS.
13. AN EROSION CONTROL BLANKET WILL BE INSTALLED ON ALL DISTURBED SLOPES 3:1 AND STEEPER, ALL AREAS OF CONCENTRATED FLOWS, AND DISTURBED AREAS WITHIN 50' OF WATERS OF THE COMMONWEALTH.
14. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT CONTROL BMPS MUST BE MAINTAINED PROPERLY. MAINTENANCE MUST INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT CONTROL BMPS AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEANOUT, REPAIR, REPLACEMENT, RE-GRADING, RESEEDING, RE-MULCHING AND RE-NETTING MUST BE PERFORMED IMMEDIATELY. IF EROSION AND SEDIMENT CONTROL BMPS FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPS OR MODIFICATIONS OF THOSE INSTALLED WILL BE REQUIRED.
15. SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN LANDSCAPED AREAS OUTSIDE OF STEEP SLOPES, WETLANDS, FLOOD PLAINS OR DRAINAGE CHANNELS AND IMMEDIATELY STABILIZED, OR PLACED IN TOPSOIL STOCKPILES.
16. ALL BUILDING MATERIALS AND WASTES MUST BE REMOVED FROM THE SITE AND RECYCLED OR DISPOSED OF IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 260.1 ET SEQ., 271.1., AND 287.1 ET SEQ. NO BUILDING MATERIALS OR WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURNED, BURIED, DUMPED, OR DISCHARGED AT THE SITE.

MAINTENANCE PROGRAM WHICH PROVIDES FOR INSPECTION OF BMPS ON A WEEKLY BASIS AND AFTER EACH MEASURABLE RAINFALL EVENT, INCLUDING THE REPAIR OF THE BMPS TO ENSURE EFFECTIVE AND EFFICIENT OPERATION [SECTION 102.4(B)(5)(X)]

IT SHALL BE THE RESPONSIBILITY OF THE OWNER'S CONTRACTOR TO MAINTAIN THE TEMPORARY CONTROL DEVICES. THE DEVICES SHALL BE REGULARLY INSPECTED ON A WEEKLY BASIS AND AFTER EVERY STORM EVENT. THE FOLLOWING ARE SOME TYPICAL MAINTENANCE ITEMS:

PUMPED FILTER BAG
- A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED.
- FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME HALF FULL.
- SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED.
- FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.

ROCK CONSTRUCTION ENTRANCE
- THE STRUCTURE'S THICKNESS WILL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSION BY ADDING ROCK. A STOCKPILE OF ROCK MATERIAL SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. AT THE END OF EACH CONSTRUCTION DAY, ALL SEDIMENT DEPOSITED ON PUBLIC ROADWAYS WILL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE. WASHING OF THE ROADWAY WITH WATER IS NOT PERMITTED.

COMPOST FILTER SOCKS
- COMPOST FILTER SOCKS SHOULD BE INSPECTED ON A WEEKLY BASIS AND WITHIN 24 HOURS AFTER EACH RUNOFF EVENT
- IF PONDING BECOMES EXCESSIVE, ADDITIONAL FILTER SOCKS MAY BE REQUIRED TO REDUCE THE EFFECTIVE SLOPE LENGTH OR SEDIMENT REMOVAL MAY BE NECESSARY.
- SEDIMENT ACCUMULATED AT 1/2 OF THE EFFECTIVE HEIGHT SHALL BE REMOVED OR A NEW SILT FILTER SOCKS CAN BE PLACED ON TOP OF AND SLIGHTLY BEHIND THE EXISTING SILT FILTER SOCKS WITHOUT CREATING ANY ADDITIONAL DISTURBANCE.
- DAMAGED SILT FILTER SOCKS SHALL BE REPLACED.
- NEEDED REPAIRS SHOULD BE INITIATED IMMEDIATELY AFTER THE INSPECTION.

GENERAL MAINTENANCE
- REPAIR, RESEED, AND REMULCH ANY AREAS THAT ERODE PRIOR TO FINAL STABILIZATION. FINAL STABILIZATION WILL BE ACHIEVED WHEN THERE IS A UNIFORM VEGETATIVE COVER OR DENSITY OF 70% ACROSS THE DISTURBED AREA.
- THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE MEASURES TO INSURE THAT SEDIMENT IS NOT DEPOSITED ON PUBLIC WALKS OR ROADWAYS. IF ANY SEDIMENT IS DEPOSITED ON PUBLIC WALKS OR ROADWAYS, IT SHALL BE REMOVED AND RETURNED TO THE SITE DAILY, DISPOSED OF IN LOW AREAS AND IMMEDIATELY SEEDED AND MULCHED.

SITE STABILIZATION

RECOMMENDED PERMANENT SEED MIXTURES SEASONAL GRASS PLANTING GUIDANCE			
MIXTURE NUMBER	SEASON	SPECIES	SEEDING RATE (LB./ACRE)
2	COOL	BIRDSFOOT TREFOIL, TALL FESCUE	8 40
4	WARM	FLATPEA, PLUS TALL FESCUE*, OR PERENNIAL RYEGRASS	27 26 25
6	WARM	SWITCHGRASS, OR BIG BLUESTEM, PLUS BIRDSFOOT TREFOIL	15 15 8

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823-E

PROCEDURES WHICH ENSURE THAT THE PROPER MEASURES FOR THE RECYCLING OR DISPOSAL OF MATERIALS ASSOCIATED WITH OR FROM THE PROJECT SITE WILL BE UNDERTAKEN IN ACCORDANCE WITH THIS TITLE [SECTION 102.4(B)(5)(XI)]

THE RECYCLING AND DISPOSAL OF MATERIALS SHALL BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS. COMPLY WITH AIR QUALITY, WATER QUALITY, SOLID WASTE MANAGEMENT POLICIES, ETC.

CONSTRUCTION WASTES MAY INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
- EXCESS SOIL MATERIALS(1)
- TREES, SHRUBS AND BRUSH REMOVED DURING CLEARING AND GRUBBING(2)
- SANITARY WASTES(3)
- CONCRETE WASH WATER(3)
- PACKAGING MATERIALS (WOOD, PAPER, PLASTIC, STYROFOAM, ETC.)(3)
- SCRAP OR SURPLUS BUILDING MATERIALS (METALS, RUBBER, PLASTIC, GLASS, MASONRY PRODUCTS, AND OTHER SOLID WASTE MATERIALS)(3)
- PETROLEUM PRODUCTS, PAINT AND THINNERS, CLEANING SOLVENTS, CURING COMPOUNDS AND SIMILAR MATERIALS(3)
- DEMOLITION DEBRIS(3)

1. UNLESS OTHERWISE DIRECTED, EXCESS SOIL AND EXCAVATED MATERIAL MAY BE USED FOR FILL MATERIAL ON SITE OR OFF SITE. COORDINATE WITH OWNER AND AGENCIES HAVING JURISDICTION.
2. TREES, SHRUBS AND BRUSH SHALL BE CHIPPED WHEN POSSIBLE AND REUSED AS MULCH. DO NOT BURN WITHOUT PERMISSION.
3. WHERE POSSIBLE WASTES SHALL BE RECYCLED. WHERE NOT PRACTICAL, WASTES SHALL BE PROPERLY DISPOSED OF AT A PERMITTED LANDFILL FACILITY. THE CONTRACTOR IS ENCOURAGED TO CONSULT THE RECYCLING HOTLINE OR LOCAL SOLID WASTE MANAGEMENT AGENCY.

CONTRACTOR SHALL PRACTICE GOOD HOUSEKEEPING, INCLUDING BUT LIMITED TO THE FOLLOWING:
- NEAT, ORDERLY AND CENTRALIZED STORAGE OF MATERIALS AND WASTES
- CONTROL OF LITTER PROVIDING CONTAINERS WITH LIDS IF NEEDED
- REGULAR DISPOSAL
- PROMPT CLEANUP OF ANY SPILLS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS OR IN ACCORDANCE WITH REGULATORY REQUIREMENTS. UTILIZE A SPECIALTY FIRM IF REQUIRED.
- PROMPT CLEANUP OF SEDIMENTS WITHIN THE SITE AND ONTO ADJACENT ROADWAYS
- KEEP DUST WITHIN TOLERABLE LIMITS BY USING WATER OR OTHER APPROVED DUST SUPPRESSERS

RECOMMENDED SEED MIXTURES AND AMENITIES FOR STABILIZATION	
LIME *	12,000 LBS PER ACRE
FERTILIZER *	1,000 LBS PER ACRE
MULCH	1,200 LBS PER 1,000 SY
SITE CONDITION	SEED MIXTURE (SELECT 1 MIXTURE)
CUT SLOPES AND FILLS (NOT MOWED)	2, 4, OR 6
WELL-DRAINED	2
VARIABLE DRAINAGE	2
CUT SLOPES AND FILLS (GRAZED/HAY)	2
GULLIES AND ERODED AREAS	2 OR 6
EROSION CONTROL BMPs	2
CHANNELS, DRAINAGE DITCHES, TRAP EMBANKMENTS, ETC.	2
RIGHT-OF-WAY	4 OR 6
WELL DRAINED	2
VARIABLE DRAINAGE	2
WELL-DRAINAGE AREAS FOR GRAZING/HAY	2
STRIP MINED AREAS	2 OR 4
SPOILS, WASTE AREAS, FLY ASH, SLAG, ETC.	2 OR 6

* CONTRACTOR MAY FOLLOW SITE SPECIFIC SOILS TESTING RECOMMENDATIONS IN LIEU OF LISTED LIME AND FERTILIZER RATES

LDG
Larson Design Group

ISSUE / REVISIONS

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	RNH	KFM

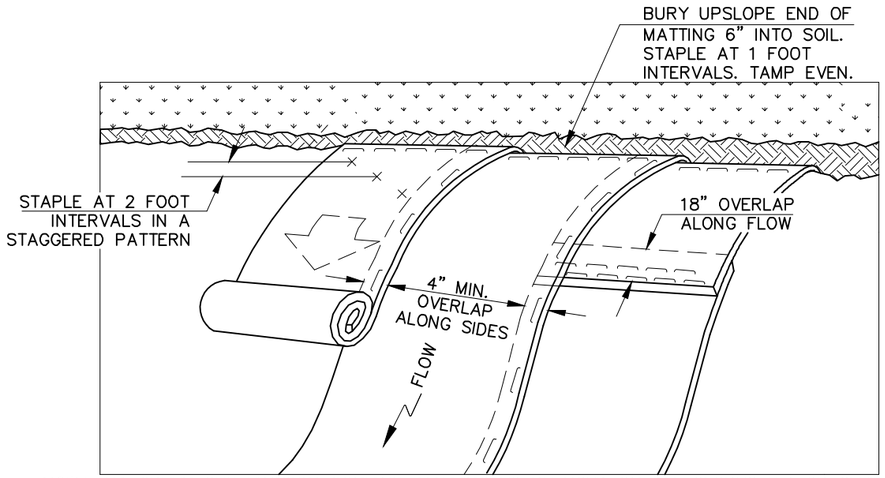
EROSION CONTROL DETAILS
DCNR 594 (02-203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

SHEET NO.: DET-4

PROJECT NO.: 6436-006-35



NOTE: NA GREEN S75 EROSION CONTROL MATTING TO BE USED ON ALL SLOPES 3:1 OR STEEPER

EROSION CONTROL MATTING FOR SLOPES

SCALE: NOT TO SCALE

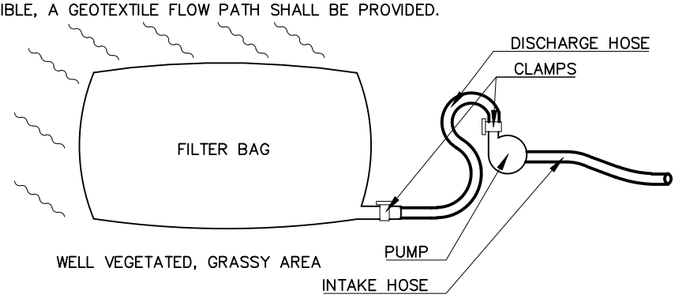
EROSION CONTROL MATTING INSTALLATION

1. INSTALL ACCORDING TO PENNDOT SPECIFICATIONS, 806.3(a) AND AS RECOMMENDED BY MANUFACTURER.
2. PLACE EROSION CONTROL MATERIALS AFTER THE SLOPE OR SWALE HAS BEEN DRESSED TO DEFINE THE FLOW AND THE DESIGNATED SEEDING, SOIL SUPPLEMENTS, AND MULCH HAVE BEEN APPLIED. PLACE EROSION CONTROL MATERIALS TO CONFORM TO THE SHAPE OF THE SOIL SURFACE.
3. SPREAD THE MAT EVENLY AND SMOOTHLY, WITHOUT STRETCHING, AND ENSURE CONTACT WITH MULCH AT ALL POINTS. UNROLL FABRIC PARALLEL TO THE FLOW DIRECTION. DRIVE ALL STAPLES FLUSH WITH THE SOIL SURFACE.
4. INSTALL THE UPSLOPE MAT END BY BURYING IN A VERTICAL, 6–INCH DEEP SLOT. STAPLE MAT ALONG THE BOTTOM OF THE SLOT AT 1–FOOT INTERVALS. BACKFILL THE SLOT AND TAMP.
5. STAPLE UNLAPPED EDGES AT 6–FOOT INTERVALS. WHERE TWO OR MORE WIDTHS ARE PLACED SIDE BY SIDE, OVERLAP EDGES BY NOT LESS THAN 4 INCHES. STAPLE ALONG THE OVERLAP AREA AT 3–FOOT INTERVALS.
6. OVERLAP ROLL ENDS BY 18 INCHES, WITH THE UPSLOPE END ON TOP. STAPLE OVERLAP AREA AT 1–FOOT INTERVALS. STAPLE FABRIC AT 2–FOOT INTERVALS IN A STAGGERED PATTERN THROUGHOUT THE MAT.
7. TERMINATE MAT INSTALLATION BY TURNING UNDER AT LEAST 6 INCHES OF FABRIC AND STAPLING SECURELY ALONG THE FOLD AT 1–FOOT INTERVALS.

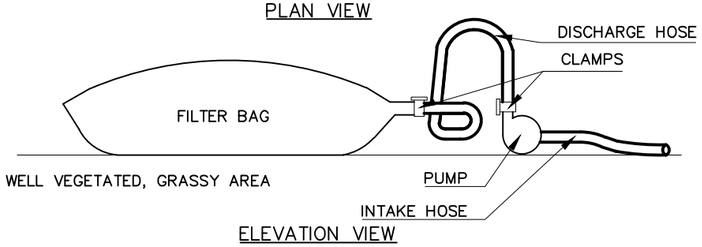
EROSION CONTROL MATTING MAINTENANCE

1. INSPECT ON A WEEKLY BASIS AND AFTER EACH PRECIPITATION EVENT. REPAIRS SHOULD BE MADE IMMEDIATELY AFTER INSPECTION.
2. RE–ANCHOR ANY LOOSE PORTIONS OF THE MATTING.
3. REPLACE DAMAGED MATTING AND RESEED AS REQUIRED.

DISCHARGE ONTO STABLE, EROSION RESISTANT AREA. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE FLOW PATH SHALL BE PROVIDED.



PLAN VIEW



ELEVATION VIEW

INSTALLATION

1. THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED.
2. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%.
3. THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR 1/2 THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHOULD BE FLOATED AND SCREENED.
4. FILTER BAGS SHALL BE MADE FROM NON–WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED "J" TYPE SEAMS. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS.

MAINTENANCE

1. A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED.
2. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME 1/2 FULL. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED.
3. FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.

PUMPED WATER FILTER BAG

SCALE: NOT TO SCALE

CLEAN FILL NOTE:

CLEAN FILL IS UNCONTAMINATED, NONWATER–SOLUBLE, NONDECOMPOSABLE INERT SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREDGED MATERIAL, USED ASPHALT AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND RECOGNIZABLE AS SUCH. (25 PA. CODE 271.101 AND 287.101) THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED.

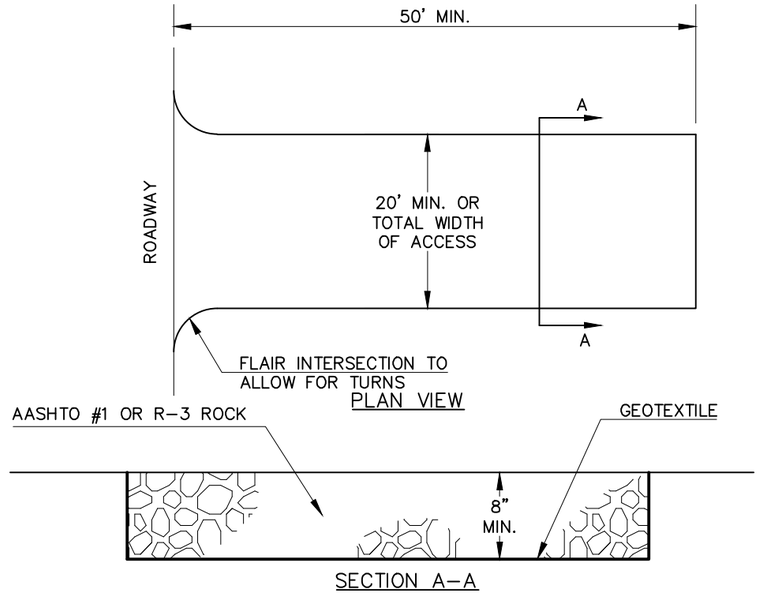
TO DETERMINE WHETHER A FILL IS CLEAN OR REGULATED, A PERSON MUST PERFORM ENVIRONMENTAL DUE DILIGENCE. ANALYTICAL ASSESSMENT, TESTING OR SAMPLING IS ONLY REQUIRED IF VISUAL INSPECTION OR REVIEWS OF HISTORIC PROPERTY USE INDICATES EVIDENCE OF THE RELEASE OF A REGULATED SUBSTANCE.

THE USE OF CLEAN FILL IS REGULATED UNDER ENVIRONMENTAL LAWS AND REGULATIONS. THE USE OF MATERIALS AS CLEAN FILL UNDER DEP'S CLEAN FILL POLICY, MUST COMPLY WITH ALL APPLICABLE REQUIREMENTS GOVERNING PLACEMENT, SUCH AS CHAPTER 102 (EROSION AND SEDIMENT CONTROL) AND CHAPTER 105 (DAM SAFETY AND WATERWAY MANAGEMENT).

ANY PERSON PLACING CLEAN FILL WHICH HAS BEEN AFFECTED BY A RELEASE OF A REGULATED SUBSTANCE ON A PROPERTY MUST CERTIFY THE ORIGIN OF THE FILL MATERIAL AND THE RESULTS OF ANALYTICAL TESTING TO QUALIFY THE MATERIAL AS CLEAN FILL ON FORM FP–001. FORM FP–001 MUST BE RETAINED BY THE OWNER OF THE PROPERTY RECEIVING THE FILL.

BEST MANAGEMENT PRACTICES (BMP) MUST BE FOLLOWED PRIOR TO DEMOLITION ACTIVITIES TO REMOVE MATERIALS LIKE LEAD BASED PAINT SURFACE, FRIABLE ASBESTOS AND HAZARDOUS MATERIALS SUCH AS MERCURY SWITCHES, PCB BALLASTS AND FLORESCENT LIGHT BULBS FROM A BUILDING IF THE BRICK, BLOCK OR CONCRETE IS USED AS CLEAN FILL.

CLEAN FILL MAY NOT CONTAIN ANY FREE LIQUIDS BASED ON VISUAL INSPECTION, AND SHALL NOT CREATE NUISANCES (FOR EXAMPLE OBJECTIONABLE ODORS) TO USERS OF RECEIVING PROPERTY OR ADJACENT PROPERTY OWNERS.



SECTION A–A

INSTALLATION

1. CONSTRUCTION WILL BE TO THE DIMENSIONS SHOWN ABOVE ON THE DETAIL.
2. LOCATE AT POINTS WHERE TRAFFIC WILL ENTER OR EXIT A CONSTRUCTION SITE.
3. A WASH RACK MAY BE NECESSARY IF EXCESSIVE TRACKING OF SEDIMENT ONTO HIGHWAYS OCCURS.

MAINTENANCE

1. INSPECT ON A WEEKLY BASIS AND AFTER EACH PRECIPITATION EVENT. REPAIRS SHOULD BE MADE IMMEDIATELY AFTER INSPECTION.
2. THE STRUCTURE'S THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK.
3. A STOCKPILE OF ROCK MATERIAL WILL BE MAINTAINED ON THE SITE FOR THIS PURPOSE.
4. AT THE END OF EACH CONSTRUCTION DAY, ALL SEDIMENT DEPOSITS ON PUBLIC ROADWAYS WILL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE.
5. WASHING OF THE ROADWAY WITH WATER OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS OR OTHER DRAINAGEWAYS IS NOT ACCEPTABLE.

ROCK CONSTRUCTION ENTRANCE

SCALE: NOT TO SCALE

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823–E

LDG
Larson Design Group

ISSUE / REVISIONS

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP–1 SUBMISSION	RNH	KFM

EROSION CONTROL DETAILS
DCNR 594 (02–203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562–4000

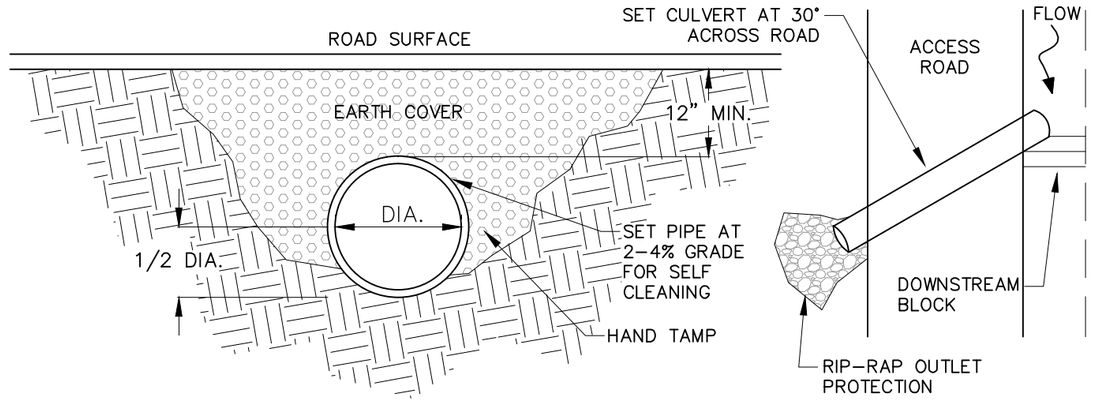
Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

SHEET NO.: DET–5

PROJECT NO.: 6436–006–35

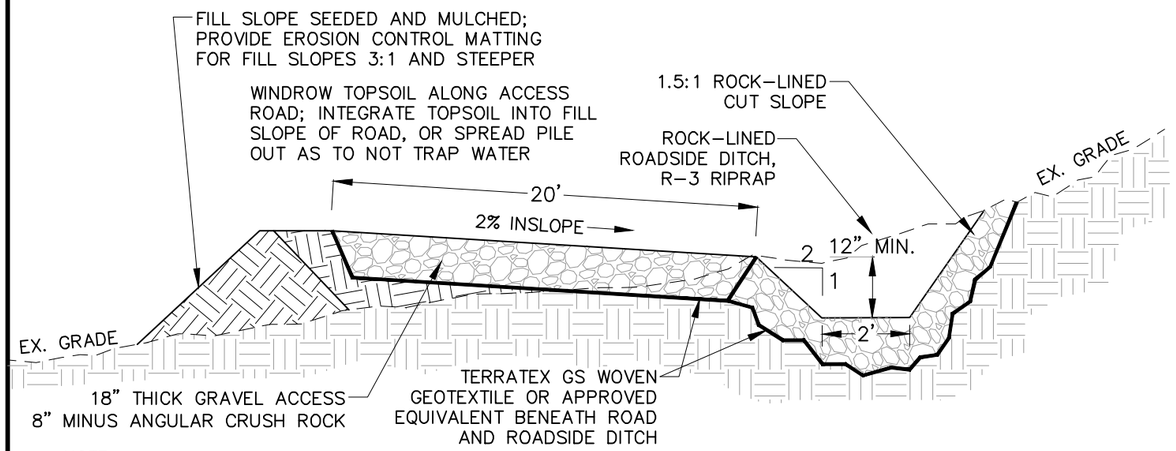
MAXIMUM SPACING* OF CROSS DRAIN CULVERTS (18" DIA. CMP) FOR PERMANENT ACCESS ROADS					
ROAD GRADE (%)	SOIL TYPE IN DITCH				
	GRAVELS, SANDY GRAVELS, AGGREGATE SURFACING	SILTY GRAVELS, CLAYEY GRAVELS	PLASTIC AND NONPLASTIC INORGANIC CLAYS	INORGANIC SILTS, SILTY OR CLAYEY SANDS	SANDS, SILTY SANDS, AND GRAVELLY SANDS
2	390	315	245	170	95
4	335	275	210	145	85
6	285	230	180	125	75
8	240	195	150	105	65
10	200	160	125	90	55
12	160	130	105	75	45
14	135	110	85	60	35

- * SPACING MAY BE ADJUSTED SLIGHTLY TO TAKE ADVANTAGE OF NATURAL DRAINAGE–WAYS.
- R–4 (MIN.) RIP–RAP PROTECTION WILL BE PROVIDED AT ALL OUTFALLS.
- AT ALL STREAM CROSSING LOCATIONS, RUNOFF MUST BE DIRECTED TO A SEDIMENT REMOVAL AREA, I.E. FILTER STRIPS, STRAW BALE, SILT FENCE, SUMP, OR TRAP FOR TREATMENT. WATER BARS AND/OR BROAD BASED DIPS SHOULD BE INSTALLED AND MAINTAINED AS REQUIRED ON THE APPROACHES TO THE STREAM CROSSING.



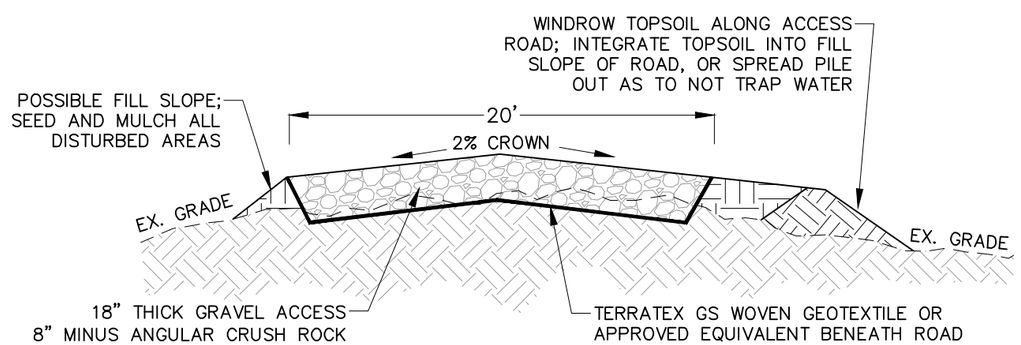
NOTE:
- MINIMUM DIAMETER FOR ANY CULVERT IS 12", OTHERWISE CULVERT SHOULD BE SIZED FOR ANTICIPATED PEAK FLOW.
- PLACE CULVERT SO BOTTOM IS AT SAME LEVEL AS BOTTOM OF DITCH OR ADJOINING SLOPE.
- CULVERTS SHALL BE PLACED WITH A SLOPE OF 2 TO 4%.
- LOWER END SHALL BE AT LEAST 2" BELOW UPPER END.
- EXTEND CULVERT 12" BEYOND BASE OF ROAD FILL ON BOTH SIDES.
- FIRMLY PACK FILL AROUND CULVERT, ESPECIALLY THE BOTTOM HALF.
- PROVIDE SUITABLE OUTLET PROTECTION* AND, WHERE APPROPRIATE, INLET PROTECTION.
- INSPECT CULVERT WEEKLY: REMOVE ANY FLOW OBSTRUCTIONS AND MAKE NECESSARY REPAIRS IMMEDIATELY.
- THIS DETAIL MAY BE USED FOR DITCH RELIEF CULVERTS AND FOR CROSSINGS OF ROADSIDE DITCHES. IT IS NOT APPROPRIATE FOR STREAM CROSSINGS.
- * FOR STEEP SLOPE (> 2H:1V) OUTFALLS, A MINIMUM 20 FOOT LONG R–5 APRON IS RECOMMENDED FOR TEMPORARY ACCESS ROADS WHERE THE RECOMMENDED CULVERT SPACING IS USED. FOR PERMANENT ACCESS ROADS, A MINIMUM R–6 ROCK SIZE IS RECOMMENDED.

CROSS DRAIN CULVERT
NOT TO SCALE



NOTE:
- CUT AND FILL SLOPES SHALL BE STABILIZED IMMEDIATELY UPON COMPLETION OF ROADWAY GRADING. THESE AREAS SHALL BE BLANKETED WHEREVER THEY ARE LOCATED WITHIN 50 FEET OF A SURFACE WATER OR WITHIN 100 FEET OF A SURFACE WATER WHERE A SUITABLE VEGETATIVE FILTER STRIP DOES NOT EXIST.
- A DURABLE TOP DRESSING SHALL BE PROVIDED FOR SOILS HAVING LOW STRENGTH.
- ROADSIDE DITCHES SHALL BE PROVIDED WITH ADEQUATE PROTECTIVE LINING.
- ADEQUATELY SIZED CULVERTS OR OTHER SUITABLE CROSS DRAINS SHALL BE PROVIDED AT ALL SEEPS, SPRINGS, AND DRAINAGE WAYS.
- ROADWAY SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED ROADWAYS, DITCHES, OR CROSS DRAINS SHALL BE REPAIRED IMMEDIATELY.

INSLOPED ACCESS ROAD TYPICAL SECTION
NOT TO SCALE



NOTE:
- CUT AND FILL SLOPES SHALL BE STABILIZED IMMEDIATELY UPON COMPLETION OF ROADWAY GRADING. THESE AREAS SHALL BE BLANKETED WHEREVER THEY ARE LOCATED WITHIN 50 FEET OF A SURFACE WATER OR WITHIN 100 FEET OF A SURFACE WATER WHERE A SUITABLE VEGETATIVE FILTER STRIP DOES NOT EXIST.
- A DURABLE TOP DRESSING SHALL BE PROVIDED FOR SOILS HAVING LOW STRENGTH.
- ROADWAY SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED ROADWAYS, DITCHES, OR CROSS DRAINS SHALL BE REPAIRED IMMEDIATELY.

CROWNED ACCESS ROAD TYPICAL SECTION
NOT TO SCALE

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823–E

Larson Design Group

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP–1 SUBMISSION	RNH	KFM

ISSUE / REVISIONS

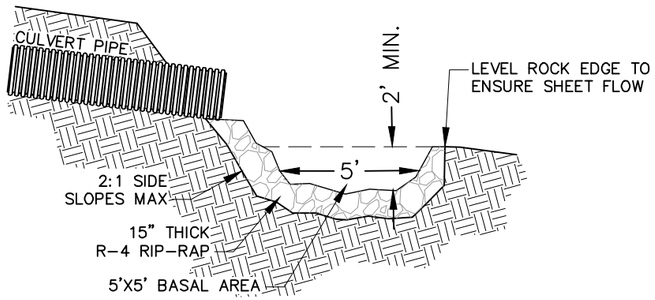
EROSION CONTROL DETAILS
DCNR 594 (02–203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562–4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

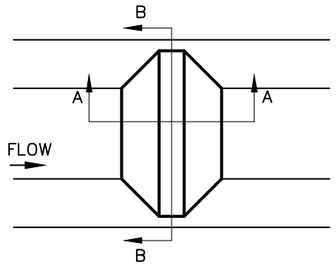
SHEET NO.: DET–6

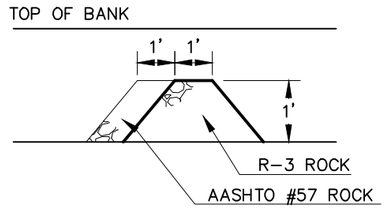
PROJECT NO.: 6436–006–35



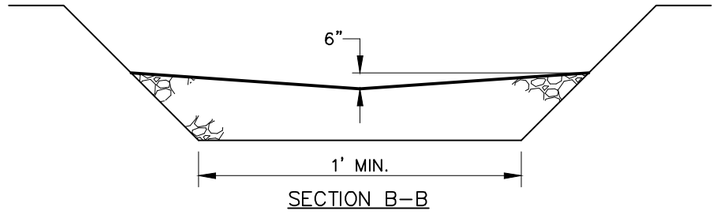
ROCK APRON SUMP

NOT TO SCALE





SECTION A-A



SECTION B-B

INSTALLATION

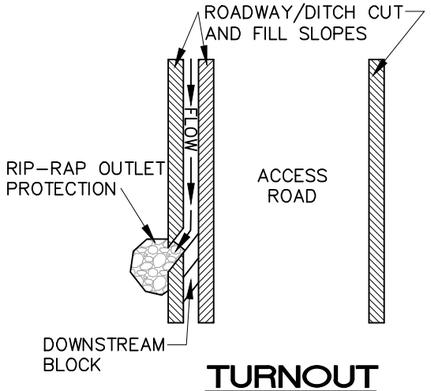
1. A ONE FOOT THICK LAYER OF AASHTO #57 STONE SHOULD BE PLACED ON THE UPSTREAM SIDE OF THE FILTER WITH R-3 RIPRAP ON THE DOWNSTREAM SIDE.

MAINTENANCE

1. INSPECT ON A WEEKLY BASIS AND AFTER EACH PRECIPITATION EVENT. REPAIRS SHOULD BE MADE IMMEDIATELY AFTER INSPECTION.
2. SEDIMENT MUST BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE HEIGHT OF THE FILTERS.
3. CLOGGED FILTER STONE (AASHTO #57) SHOULD BE REPLACED.

ROCK FILTER

SCALE: NOT TO SCALE



TURNOUT

NOT TO SCALE

Larson Design Group

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	RNH	KFM

ISSUE / REVISIONS

EROSION CONTROL DETAILS

DCNR 594 (02-203) WELL SITE

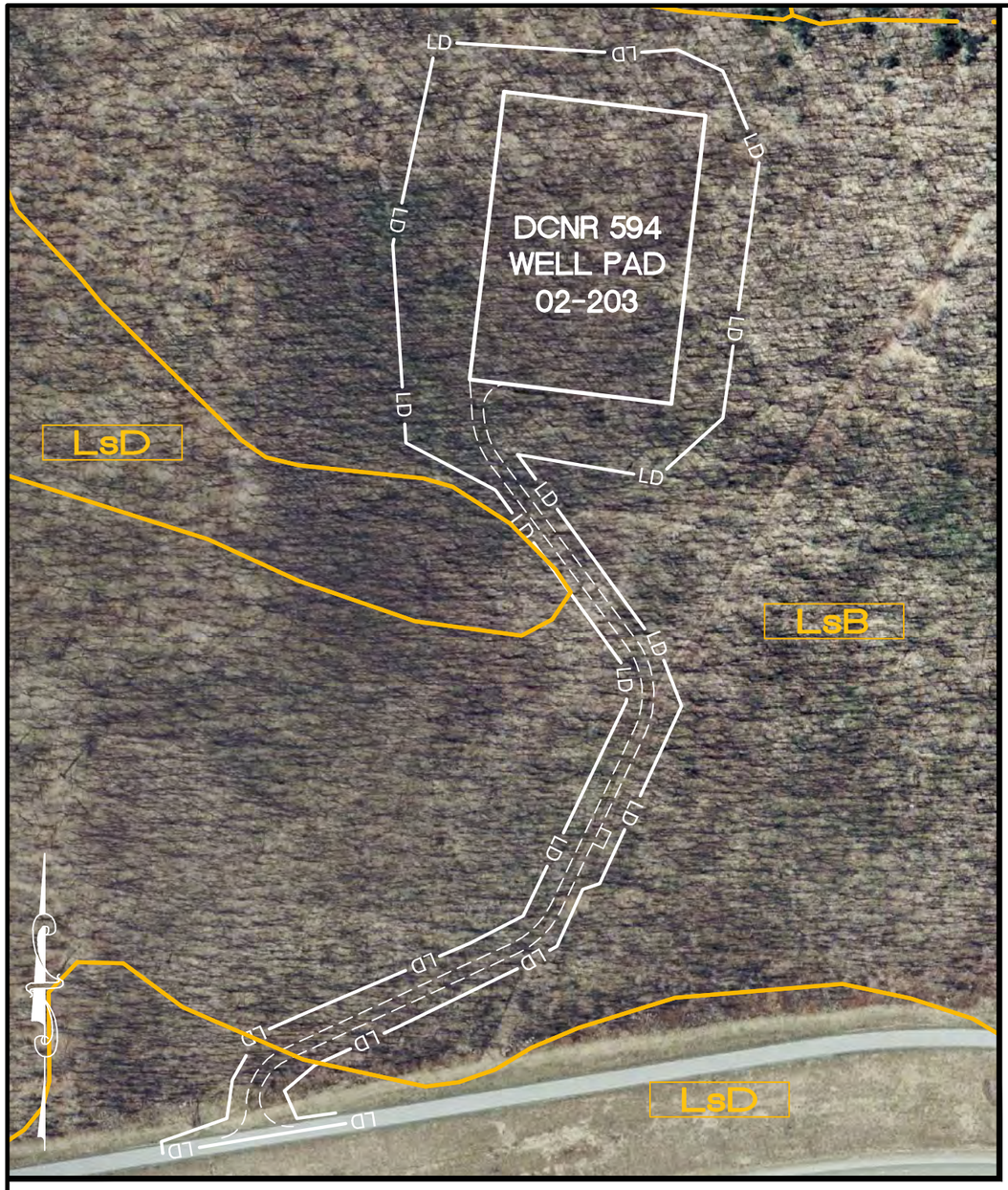
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

SHEET NO.: DET-7

PROJECT NO.: 6436-006-35



WORKSHEET 1

LIMITING SOIL CHARACTERISTICS

MAP SYMBOL	SOIL NAME	ERODIBLE	CUT BANKS CAVE	CORROSIVE TO CONCRETE OR STEEL	HIGH WATER TABLE	LOW STRENGTH	PIPING	POOR TOPSOIL	POTENTIALLY HYDRIC
LsB,D	LORDSTOWN	X	X	C		X	X		

SOILS NARRATIVE

THE FOLLOWING INFORMATION IS A GENERAL SUMMARIZATION OF THE PROPOSED PROJECT SITE AND THE SOILS THAT MAY BE ENCOUNTERED. HOWEVER, SOIL CONDITIONS COULD VARY FROM THE DATA CONTAINED HEREIN. THEREFORE, THE CONTRACTOR SHALL OBSERVE SOIL CONDITIONS CAREFULLY AND TAKE APPROPRIATE CORRECTIVE MEASURES AS NECESSARY TO ADDRESS ANY LIMITATIONS THAT MAY BE ENCOUNTERED.

THE FOLLOWING CONDITIONS ARE KNOWN POSSIBLE LIMITATIONS TO THE SOIL TYPES FOUND WITHIN THE DISTURBED AREA.

ERODIBLE SOILS:
AREAS WITH ERODIBLE SOILS MUST BE STABILIZED IMMEDIATELY WITH SEED AND MULCH, EROSION CONTROL MATTING, OR ROCK LINING. EXTRA CARE MUST BE TAKEN TO AVOID UNNECESSARY CONCENTRATED FLOWS OVER ERODIBLE SOILS.

CUT BANKS TO CAVE:
CUT SLOPES SHALL BE NO STEEPER THAN 2:1. EROSION CONTROL MATTING SHALL BE PROVIDED ON ALL SLOPES 3:1 OR STEEPER. EROSION CONTROL MATTING IS ALSO REQUIRED ON ANY SLOPES 3:1 OR STEEPER WITHIN 50' OF WATERS OF THE COMMONWEALTH. PROVIDE UPSLOPE DIVERSIONS WHERE POSSIBLE TO AVOID EXCESSIVE DRAINAGE OF STORMWATER OVER PAD CUT SLOPES.

CORROSIVE TO STEEL AND CONCRETE:
SOILS THAT ARE KNOWN TO BE CORROSIVE TO STEEL AND/OR CONCRETE SHALL USE HDPE PIPING WHERE POSSIBLE.

HIGH WATER TABLE:
RIP-RAP CHANNELS AT THE BASE OF THE CUT SLOPES ROUTED INTO A SEDIMENT TRAP OR OTHER APPROVED BMP IS SUFFICIENT TO ROUTE POTENTIAL HIGH GROUNDWATER FROM THE PAD AREA. IN ADDITION, THE 18" STONE PAD BASE PROVIDES ADDITIONAL CONDUIT FOR A HIGH WATER TABLE OCCURRENCE. ISOLATED GROUNDWATER SEEPS MAY BE PIPED OUT OF THE PAD AREA BEYOND THE TOE OF THE FILL SLOPE.

LOW STRENGTH:
ROAD FILL SHALL MEET THE PA DEP REQUIREMENTS FOR CLEAN FILL AND BE FREE OF ROOTS, OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES AND OTHER OBJECTIONABLE MATERIALS. THE FILL MATERIAL SHALL BE COMPACTED IN MAXIMUM 8" LAYERED LIFTS AT 95% STANDARD PROCTOR. IF LOW STRENGTH SOILS ARE THE ONLY AVAILABLE SOILS ON SITE, CONTRACTOR SHALL BE AWARE OF THE POTENTIAL FOR INCREASED SETTLING AND SUFFICIENT AGGREGATE SURFACING SHOULD BE PROVIDED TO PROVIDE A SUITABLE TOP STRUCTURE. ADDITIONAL FILL MATERIAL MAY BE NECESSARY TO ACHIEVE COMPACTED FINISHED GRADE.

PIPING:
NO SIGNIFICANT WATER IMPOUNDMENT EMBANKMENTS ARE BEING PROPOSED ON THIS SITE.

POOR TOPSOIL:
IMPORTING SUITABLE TOPSOIL MAY BE REQUIRED FOR AREAS WHERE SUFFICIENT TOPSOIL MIXTURE IS NOT AVAILABLE TO PROVIDE A SOIL BED FOR ESTABLISHING VEGETATION. SOIL TESTING IS RECOMMENDED. IF TESTING IS NOT FEASIBLE, CARE SHOULD BE TAKEN TO FOLLOW RECOMMENDED LIME AND FERTILIZER RATES SPECIFIED IN THE EROSION, SEDIMENT AND STORMWATER CONTROL PLAN.

POTENTIALLY HYDRIC:
NO WETLANDS HAVE BEEN FOUND ON THE SITE.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KARL FREDERICK MATZ
ENGINEER
054823-E

SOILS MAP

TIOGA COUNTY PENNSYLVANIA SOIL SURVEY
(Data Overlaid On Recent Aerial Photography)

Soil Survey data obtained from the Natural Resources Conservation Service, USDA. County Soil Surveys of Pennsylvania--(http://soildatamart.nrcs.usda.gov)

Aerial photography obtained from the Pennsylvania Spatial Data Access State GIS Clearinghouse website (http://pasda.psu.edu)

500 0 500 1000 FEET

SCALE

Larson Design Group

NO.	DATE	COMMENTS	BY	CHK
0	3/19/12	ESCGP-1 SUBMISSION	KEH	KFM

ISSUE / REVISIONS

SOILS MAP AND NARRATIVE
DCNR 594 (02-203) WELL SITE
LIBERTY TOWNSHIP, TIOGA COUNTY, PENNSYLVANIA

TALISMAN ENERGY USA INC.
337 DANIEL ZENKER DRIVE
HORSEHEADS, NY 14845
PHONE (607) 562-4000

Larson Design Group ▪ Architects Engineers Surveyors
1000 Commerce Park Drive ▪ Suite 201
Williamsport, PA 17701
PHONE 570.323.6603 TOLL FREE 877.323.6603
FAX 570.323.9902 ▪ www.larsondesigngroup.com

SHEET NO.: 2.B SOILS

PROJECT NO.: 6436-006-35

ESX11-081-0106

NOTICE OF INTENT FOR COVERAGE UNDER THE EROSION & SEDIMENT CONTROL GENERAL PERMIT (ESCGP-1)

DCNR TRACT 100 NARROW HAGERMAN COMPRESSOR PAD GAS EXPLORATION, PRODUCTION, PROCESSING, OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES

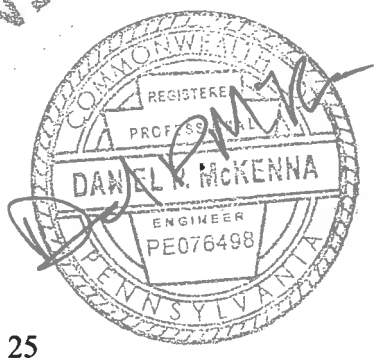
SENECA RESOURCES COMPRESSOR PAD PROJECT

LEWIS/MCINTYRE TOWNSHIP, LYCOMING COUNTY

RECEIVED
SEP 06 2011
OIL & GAS

PREPARED FOR:
SENECA RESOURCES
51 ZENTS BOULEVARD
BROOKVILLE, PA 15825

DATE: August 29, 2011



PREPARED BY:
DANIEL P. MCKENNA, P.E.
WILKINSON & ASSOCIATES
THE COMMONS @ VALLEY FORGE, UNIT 25
1220 VALLEY FORGE ROAD
VALLEY FORGE, PA 19482

5500-PM-OG0005 Rev. 2/2011
Checklist

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF OIL AND GAS MANAGEMENT

NOTICE OF INTENT (NOI) ADMINISTRATIVE COMPLETENESS CHECKLIST EROSION AND SEDIMENT CONTROL GENERAL PERMIT FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION, PRODUCTION, PROCESSING, OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES (ESCGP-1)

Please check the following list to make sure that you have included all the required information. Place a check mark in the column provided for all items completed and/or provided. Failure to provide all of the requested information will delay the processing of the application, may preclude the use of the expedited review, and may result in the application being placed ON HOLD with NO ACTION, or being considered withdrawn and the application file closed.

THIS CHECKLIST MUST BE COMPLETED AND ENCLOSED WITH YOUR GENERAL PERMIT NOI

✓CHECKLIST FOR EROSION AND SEDIMENT CONTROL GENERAL PERMIT NOI

☒ NEW NOI ☐ RENEWAL ☐ SUBSEQUENT PHASE ☐ Major Revision ☐ Minor Revision

If a Renewal, Subsequent Phase or Revision, identify ESCGP-1 Permit Authorization # _____

Minor revisions are not required to be submitted to the regional office for review.

	APPLICANT Seneca Resources PROJECT and PHASE NAME DCNR TR 100 Hagerman Compressor Pad			Applicant Check ✓ if Included	Official Use Only
1.	Fully completed, properly signed and notarized Notice of Intent form (1 original and 2 copies). (Not required for subsequent phases)			☒	☐
2.	Complete Erosion and Sediment Control (E&S) Plans. (3 copies) NOTE: Identify Location as Drawings (D), Narrative (N). (Identify Not Applicable as "N/A".)			☒	☐
	a. Topographic features	Location: D	Page: 1-3 of 4	☒	☐
	b. Soils information	Location: D/N	Page: 1-4/Figure 2	☒	☐
	c. Proposed alteration	Location: D	Page: 2	☒	☐
	d. Amount of runoff	Location: N	Page: Calcs 1-3	☒	☐
	e. Location of water which may receive runoff and receiving water classification, pursuant to Chapter 93 and the "statewide existing use listing".	Location: D	Page: 4 of 4	☒	☐
	f. Supporting calculations	Location: N	Page: Calcs 1-3	☒	☐
	g. BMPs used before, during, and after earth disturbance, including special protection BMPs.	Location: D	Page: 1-4	☒	☐
	h. Maintenance program	Location: D	Page: 4 of 4	☒	☐
	i. Plan drawings and narratives	Location: D	Page: 1-4	☒	☐
	j. Sequence of BMP installation and removal	Location: D	Page: 4 of4	☒	☐
	k. Recycling and disposal methods	Location: D	Page: 4 of 4	☒	☐
3.	Permit filing fee of $500 plus $100/Acre of earth disturbance payable to the appropriate Clean Water Fund. (Not required for subsequent phases)	Location: w/ trans letter	Page: _____	☒	☐
4.	Location map: USGS of scale 1:24,000 indicating project location and boundaries. (3 copies) (Not required for subsequent phases)	Location: N	Page: Figure 1	☒	☐

	✓CHECKLIST FOR ESCGP-1			Applicant Check ✓ if Included	Official Use Only
5.	Act 14 Municipal Notifications to the local municipality and county governments that specify that the application is for a Erosion and Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Activities. (3 copies) A "sample" notification letter is provided as Appendix A of the instructions. (Not required for subsequent phases)	Location: N	Page: After NOI	☒	☐
6.	Proof of receipt of municipal notifications; copies of certified mail receipts or acknowledgment letters from the local municipality and county government. (3 copies) (Not required for subsequent phases)	Location: N	Page: After NOI	☒	☐
7.	The PNHP Review receipt for the project area. Include impact clearance letters if proof of agency coordination is required. (3 copies) (Not required for subsequent phases if review receipt or impact clearance letters are still valid)	Location: N	Page: After Act 14 letters	☒	☐
8.	Complete Post Construction Stormwater Management (PCSM)/Site Restoration Plan. (3 copies) NOTE: Identify Location(s) by Drawing (D), Narrative (N) and page number(s). Plans must address the following: (Identify Not Applicable as "N/A".)			☒	☐
	a. Written Narrative	Location: D	Page: 4 of 4	☒	☐
	b. Location of BMPs showing final contours	Location: D	Page: 3-4	☒	☐
	c. Plan drawings of permanent stabilization	Location: D	Page: 3-4	☒	☐
	d. Plan drawings of BMPs	Location: D	Page: 3-4	☒	☐
	e. Operation and maintenance procedure	Location: D	Page: 4 of 4	☒	☐
	f. Supporting calculations or measurements	Location: N	Page: Calcs 1 - 3	☒	☐
	g. Design frequency storm rainfall amount	Location: N	Page: Calcs 1	☒	☐
	h. Area of impervious surface	Location: N	Page: Calcs 1	☒	☐
	i. Curve Number or Runoff Coefficient	Location: N	Page: Calcs 1	☒	☐
	j. Runoff from the design frequency storm	Location: N	Page: Calcs 1	☒	☐
	k. Volume of water infiltrated through BMPs	Location: N	Page: Calcs 1	☒	☐
	l. Peak discharge rate from the design frequency storm	Location: N	Page: Calcs 1	☒	☐
9.	**Expedited Review** Is the expedited review being requested? Yes ☒ No ☐ If yes all of the following items must be completed:				
	a. E&S and PCSM/Restoration Plan drawings and narrative sealed by licensed professional			☒	☐
	b. Licensed professional prepared, sealed, and certified application/NOI			☒	☐
	c. Licensed professional listed location and date of DEP training attended in application/NOI			☒	☐

	✓CHECKLIST FOR ESCGP-1	Applicant Check ✓ if Included	Official Use Only
10.	**Phased Projects** Is the activity being conducted as a phased project? Yes ☐ No ☒ If yes all of the following must be completed:	☐	☐
a.	Initial Phase - Is the master plan included? Yes ☐ No ☐		
b.	Subsequent Phase – Is the subsequent phase identified on the master plan? Yes ☐ No ☐		
11.	**Certification for Subsequent Phase Expedited Reviews** Is the activity being conducted as a phased project and is an expedited review being requested? Yes ☐ No ☐ If yes all of the following must be completed:	☐	☐

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

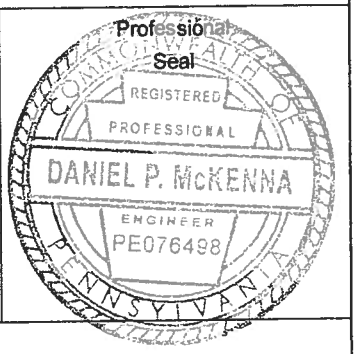
Signature Daniel P. McKenna

Company **Wilkinson & Associates, Inc.**

Address **1220 Valley Forge Road, Unit 25, PO Box 987, Valley Forge, PA 19482**

Phone **610-415-1220**

Most Recent DEP Training Attended Location Harrisburg Date March 2011



EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and PCSM/Site Restoration Plan developed and sealed by a licensed professional engineer, surveyor or professional geologist. The plans shall contain the following certification:

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan and Post Construction BMPs are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

12.	**Permit Renewals** Is a permit renewal being requested? Yes ☐ No ☒ If yes all of the following must be completed:	☐	☐
a.	Administratively complete, signed, and notarized Notice of Intent Form, including Items 1-8. (1 signed original and 2 copies of the NOI/application)	☐	☐
b.	Permit filing fee of $500 plus $100/Acre of earth disturbance payable to the appropriate Clean Water Fund.	☐	☐

5500-PM-OG0005 Rev. 12/2009
Application

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF OIL AND GAS MANAGEMENT

OFFICIAL USE ONLY
ID # ESX11-081-0106
Date Received _____

NOTICE OF INTENT FOR COVERAGE UNDER THE EROSION AND SEDIMENT CONTROL GENERAL PERMIT (ESCGP-1) FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION, PRODUCTION, PROCESSING OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES

READ THE STEP-BY-STEP INSTRUCTIONS PROVIDED IN THIS PERMIT APPLICATION PACKAGE BEFORE COMPLETING THIS FORM.

PLEASE PRINT OR TYPE INFORMATION IN BLACK OR BLUE INK.

APPLICATION TYPE NEW ☒ RENEWAL ☐ REVISED ☐ EXPEDITED ☒

SECTION A. E&S PLANNING REQUIREMENTS

1. Total Project Area (Acres): 14.57 Ac. Total Disturbed Area (Acres): 14.57 Ac.

2. Project Name

DCNR Tr100 Hagerman Compressor Pad

3. Project Type

☐ Oil/Gas Well ☒ Pipeline/Transmission Facility ☐ Processing Facility ☐ Treatment Facility

Project Description

Construction of a proposed Oil & Gas compressor station and associated infrastructure

4. Please provide the latitude and longitude coordinates for the center of the project. The coordinates should be in degrees, minutes and seconds (dd mm ss.ss)

Latitude 41 degrees 27 minutes 15.9 seconds Longitude -77 degrees 02 minutes 55.7 seconds

Reference Datum: ☒ North American Datum 1983 ☐ North American Datum 1927 ☐ World Geodetic System 1984

Horizontal Collection Method: ☒ GPS ☐ Interpolated from U.S.G.S. topo map ☐ DEP's eMAP

5. U.S.G.S. 7.5 min. Quad Map Name Trout Run, PA

6. Will the project be conducted as a phased permit project? ☐ Yes ☒ No If Yes, Include Master Site Plan

Estimated Timetable for Phased Projects ☐ Additional sheet(s) attached

Phase No. or Name	Description	Total Area	Disturbed Area	Start Date	End Date
1	Compressor Station	14.57	14.57	10/1/2011	10/1/2012

RECEIVED
SEP 06 2011
OIL & GAS

7. Existing and previous land use undeveloped, wooded

8. Other Pollutants: Will the stormwater discharge contain pollutional substances other than sediment? ☐ Yes ☒ No If yes, explain and provide any available quantitative data.

9. Will fuels, chemicals, solvents, other hazardous waste or materials be used or stored on site during earth disturbance activities?
Yes ☒ No ☐ **(If yes, a PPC Plan is required)**

10. Receiving Water/Watershed Name
Hagerman Run, Trout Run

Chapter 93 Designated Use or Existing Use Stream Classification
☒ High Quality ☐ Exceptional Value
☒ Other

Secondary Water Lycoming Creek

Name of Municipal or Private Separate Storm Sewer Operator

SECTION B. APPLICANT INFORMATION

Applicant's Last Name Clinger, PE	First Name Mike	MI	Phone FAX	814-220-1559 814-849-4795
Organization Name or Registered Fictitious Name Seneca Resources			Phone FAX	814-220-1559 814-849-4795
Mailing Address 51 Zents Boulevard	City Brookville		State PA	ZIP + 4 15825
Co-Applicant's Last Name	First Name	MI	Phone FAX	
Organization Name or Registered Fictitious Name			Phone FAX	
Mailing Address	City		State	ZIP + 4

SECTION C. SITE INFORMATION

Site Name
Hgerman Compressor Pad

Site Location
Proposed access from the existing access road off of Hagerman Run Rd

Site Location -- City	State	ZIP+4	
Cogan Station	PA	17728	

Detailed Written Directions to Site
From the intersection of US-15 & PA 14, take PA-14 S for 2.6 miles and turn left onto Hagerman Run Road. Proceed 3.0 miles to proposed access road on your left.

County	Municipality	City	Boro	Twp
Lycoming	Lewis/McIntyre Township	☐	☐	☒

SECTION D. SITE RESTORATION PLAN AND POST CONSTRUCTION STORMWATER BMPS
See the Attached Instructions on how to Complete This Section

1. Site restoration should be designed to use natural measures to eliminate pollution, infiltrate runoff, not require extensive construction and maintenance efforts, promote pollutant reduction, preserve the integrity of stream channels, and protect the physical, chemical and biological qualities of the receiving water.

Check those that apply:

☒ The Site Restoration Plan and PCSM BMPS are developed to be consistent with an Act 167 Stormwater Management Plan approved by the Department after January 2005.

☐ The Site Restoration Plan and PCSM BMPs are developed to be consistent with existing local ordinances.

☒ The Site Restoration Plan and PCSM BMPs were developed to employ water quality design features and the PCSM BMPs will manage any net increase in stormwater runoff volume resulting from the 2-year/24-hour frequency storm.

2. Site Restoration Plan Contents

a. Written narrative ☒ Yes ☐ No

b. Plan drawings ☒ Yes ☐ No

c. Identification and location of PCSM BMPs. Such PCSM BMPs should address: (1) infiltration; (2) volume and rate control; and (3) water quality treatment ☒ Yes ☐ No

d. Operation and maintenance procedures ☒ Yes ☐ No

e. Supporting calculations and measurements (when necessary): ☒ Yes ☐ No

Supporting calculations and measurements are required only if the answers to both questions 1 and 2 below are NO.

1) The approximate original contours of the project site will be maintained or replicated insuring the preservation of the pre-construction drainage pattern and features; and the disturbed areas will be re-vegetated or otherwise stabilized with pervious material. ☒ Yes ☐ No

2) PCSM BMPs will be employed which: use natural measures to eliminate pollution, do not require extensive construction and maintenance efforts, promote pollutant reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event, and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth. ☒ Yes ☐ No

If the responses to both questions 1 and 2, above are NO, please provide the requested post construction stormwater information in the Data Table for Supporting Calculations and Measurements below:

3. Explain how post construction stormwater runoff volume will be managed if BMPs will not infiltrate the total net increase in stormwater runoff volume. (Net increase volume = Post construction runoff volume minus Pre-construction runoff volume):

☒ N/A (check N/A only if BMPs **will** infiltrate all of the Net Change in Runoff)

4. Are there existing post construction stormwater management BMPs at this Location/Site? ☐ Yes ☒ No

Do you plan to use and/or expand these existing post construction stormwater management BMPs? ☐ Yes ☐ No ☒ N/A

5. **SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA**
See the Instructions on how to Complete This Section

☐ Check this box if supporting calculations and measurements are NOT required in accordance with Section D.2.e on the preceding page.

Design storm frequency 2 year Rainfall amount 3.0 inches	Pre-construction	Post Construction	Net Change
Impervious area (acres)	0	6.81	+6.81
Volume of stormwater runoff (acre-feet) without planned stormwater BMPs	0.867	1.567	+0.70
Volume of stormwater runoff (acre-feet) with planned stormwater BMPs		0.863	-0.004
Stormwater discharge rate for the design frequency storm	N/A	N/A	N/A

SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs

6. In the lists below, check the BMPs identified in the Site Restoration Plan. The primary function(s) of the BMP listed in the functions column (infiltration/recharge; detention/retention; water quality). Additional functions may be added if applicable to that BMP. List the stormwater volume and area of runoff to be treated by each BMP type when calculations are required. If any BMP in the Site Restoration Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
Bio-infiltration areas	Infiltration/Recharge		
☐ Infiltration Trench			
☐ Infiltration Bed			
☒ Infiltrated Basin		30,779 CF	14.57 Ac.
Natural Area Conservation	Infiltration/Recharge		
☐ Streamside Buffer Zone			
☐ Wetland Buffer Zone			
☐ Sensitive Area Buffer Zone			
☒ Pre-Construction Drainage Pattern Intact			
Stormwater Retention	Detention/Retention		
☐ Constructed Wetlands			
☐ Wet Ponds			
☐ Retention Basin			
Sediment and Pollutant Removal	Water Quality Treatment		
☐ Vegetated Filter Strips			
☐ Brush Barriers			
☐ Detention Basins			
Access Road Design	Infiltration/Recharge		
☐ Road Crowning			
☐ Ditches			
☐ Turnouts			
☐ Culverts			
☐ Roadside Vegetated Filter Strips			
Stormwater Energy Dissipaters	Infiltration/Recharge		
☐ Level Spreaders			
☒ Riprap Aprons			
☒ Upslope Diversions			
☐ _____			

SECTION E: SPECIAL PROTECTION WATERS

List the reasonable and cost effective best management practices (BMPs) that will be used to meet the requirements of 25 Pa. Code Chapter 93. Recommended Special Protection Watershed BMPs are found in the Oil and Gas Operators Manual.

☒ Minimize disturbed area	☐ Alternative Site Analysis	☒ Permanently stabilized ditches and Channels
☒ Earth Moving activities limited during rainstorms and spring thaw	☒ Roads stabilized with crushed rock and/or vegetation	☒ Rock lined culvert inlets and outlets
☒ No direct discharge to surface water	☒ Immediate Stabilization	☒ Proper vegetative cover techniques
☒ Designed temporary and permanent BMPs for surface water diversion	☒ Prompt site restoration	☒ 100 ft. vegetated riparian buffer
☐ Other	☒ Stabilized Upslope Diversion	

SECTION F: COMPLIANCE REVIEW

☐ Yes ☒ No

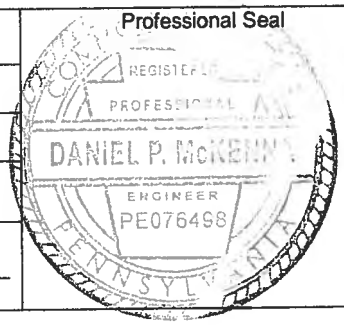
Is the applicant in violation of any existing permit, regulation, order, or schedule of compliance issued by the Department within the last 5 years? If yes, provide the permit number or facility name, a brief description of the violation, the compliance schedule (including dates and steps to achieve compliance) and the current compliance status. (Attach additional information on a separate sheets, when necessary)

SECTION G. CERTIFICATION BY PERSON PREPARING APPLICATION

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan are true and correct, represent actual field conditions, and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Print Name Daniel P. McKenna, P.E.	Signature D.P. McK
Company Wilkinson & Associates, Inc.	
Address 1220 Valley Forge Road, Unit 25, PO Box 987 Valley Forge, PA 19482	
Phone 610-415-1220	
Most Recent DEP Training Attended Location Harrisburg, PA Date March 2011	

Professional Seal



EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and PCSM/Site Restoration Plan developed and sealed by a licensed professional engineer, surveyor or professional geologist. The plans shall contain the following certification:

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan and Post Construction BMPs are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SECTION H. APPLICANT CERTIFICATION

Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Mike Clinger, PE, Manager - Project Engineering
Print Name and Title of Applicant

Print Name and Title of Co-Applicant (if applicable)

Signature of Applicant

Signature of Co-Applicant

8-29-2011
Date Application Signed

Date Application Signed

Notarization

Sworn to and subscribed to before me this
26 day of August, 2011

Commonwealth of Pennsylvania
County of Jefferson

Notary Public

My Commission expires Aug. 26, 2014

AFFIX SEAL

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Adam J. Krug, Notary Public
City of St. Marys, Elk County
My Commission Expires Aug. 26, 2014
Member, Pennsylvania Association of Notaries

NAME, ADDRESS AND PHONE NUMBER OF INDIVIDUAL TO BE CONTACTED IF ADDITIONAL INFORMATION IS REQUIRED

Name Daniel P. McKenna, P.E., Wilkinson & Associates, Inc.

Address 1220 Valley Forge Road, Unit 25, PO Box 987 Valley Forge, PA 19482	Phone 610-415-1220

SENECA RESOURCES

May 24, 2011

VIA CERTIFIED MAIL, RETURN RECEIPT REQUESTED
No. 7011 0110 0002 4919 2178

Lycoming County Planning Commission
330 Pine Street #300
Williamsport, PA 17701-6242

RE: ESCGP-1 Permit Application
DCNR 100 Hagerman Compressor Station
Tiadagton State Forest

Dear Chief Clerk:

This county notice, under the requirements of Act 14, is to inform you that Seneca Resources Corporation is applying for coverage under the Erosion and Sediment Control General Permit (ESCGP-1) for Earth Disturbance Associated with Oil and Gas Exploration, Production, and Transmission Facilities from the Pennsylvania Department of Environmental Protection (DEP):

Permit Type:	ESCGP-1 Permit Application
Applicant Contact:	Mike Clinger, P.E
Project Location:	Lewis Township, Lycoming County, Pennsylvania
Project Description:	Construction of 300' X 500' Compressor Station

Acts 67, 68 and 127, which amended the Municipalities Planning Code (MPC), direct State agencies to consider Comprehensive Plans and Zoning Ordinances when reviewing applications for permitting of facilities and infrastructure, and specify that State agencies may rely upon comprehensive plans and Zoning Ordinances under certain conditions as described in Sections 619.2 and 1105 of the MPC. The Pennsylvania DEP's Policy for Consideration of Local Comprehensive Plans and Zoning Ordinances in their review of Permits for Facilities and Infrastructure (DEP's Land Use Policy) provides direction and guidance to DEP staff, permit applicants, and local and county governments for the implementation of Acts 67, 68 and 127 of 2000. This policy can be found at www.depweb.state.pa.us; keyword: Land use.

In accordance with DEP's Land Use Policy, enclosed please find a County Land Use Letter that is to be submitted with our permit application to DEP. Please complete the enclosed form and return within 30 days to: Seneca Resources Attn: Mike Clinger, P.E., 51 Zents Blvd., Brookville, PA 15825. Please **DO NOT** send this form to DEP, as we must include the County Land Use Letter with our permit application. If we do not receive a response from you **within 30 days**, we shall proceed to submit our permit application to DEP without the County land Use Letter. If the County land Use Letter is not submitted with our permit application, and we provide proof to DEP that we attempted to obtain it, DEP will assume there are not substantive land use conflicts and proceed with the normal application review process. If any questions, please don't hesitate to contact me at (814) 715-5777.

Sincerely,

Michael Clinger, P.E.
Facilities & Regulatory Permit Specialist
clingerm@srcx.com

COUNTY LAND USE LETTER

Date: _____

TO: Seneca Resources Corporation
Attn: Mike Clinger, P.E.
51 Zents Blvd.
Brookville, PA 15825

FROM: Lycoming County Planning Commission

RE: Seneca Resources ESCGP-1 Permit Application
DCNR 100 Hagerman Compressor Station
Lewis Township, Lycoming County Pennsylvania

The County of Lycoming states that it:

_____ has adopted a county or multi-county comprehensive plan.
If yes, please provide date of adoption.

_____ has not adopted a county or multi-county comprehensive plan

***If Applicable*:**

The above reference project:

_____ is consistent with the adopted county or multi-county comprehensive plan.
_____ is not consistent with the adopted county or multi-county comprehensive plant.

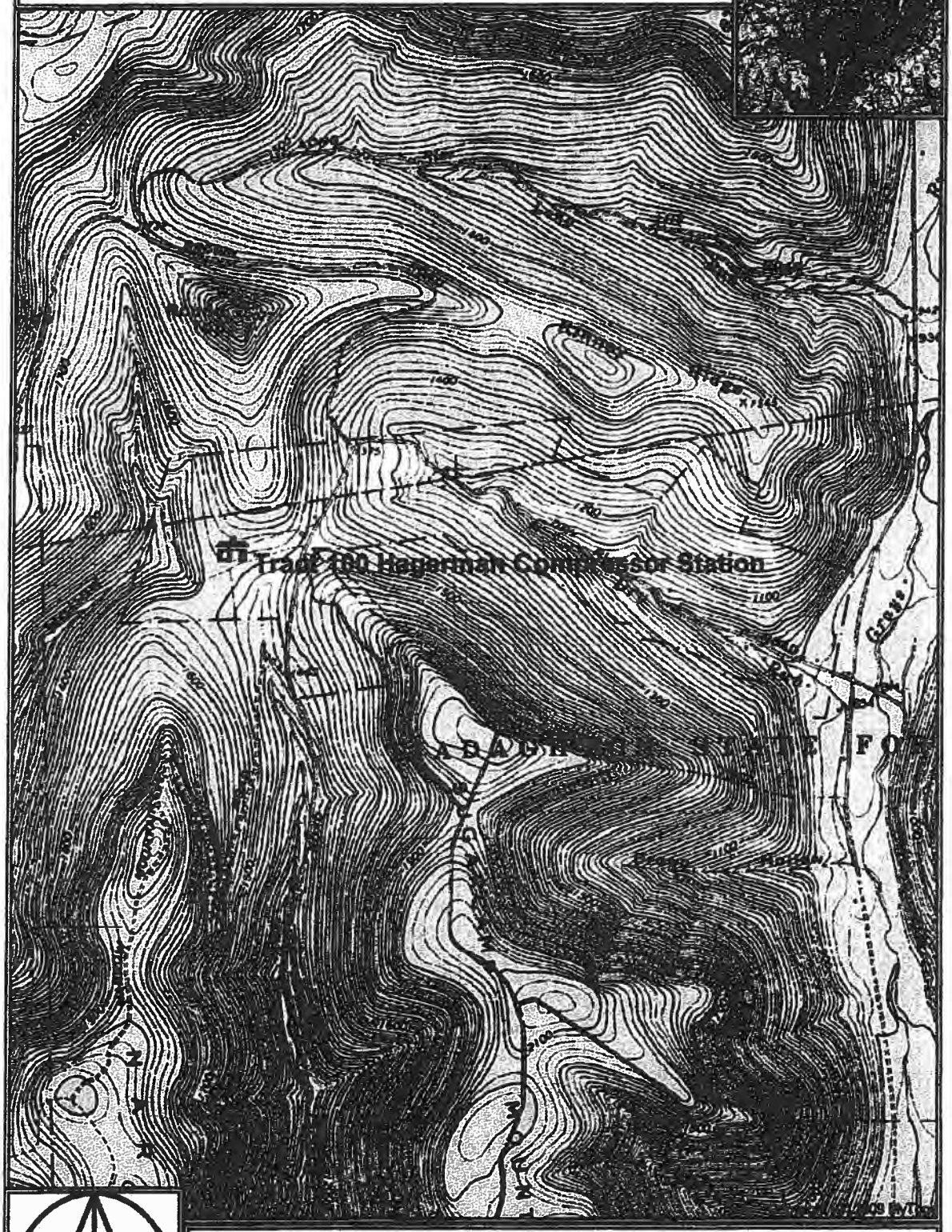
Additional Comments (attach additional sheets if necessary):

_____
_____
_____
_____
_____

Name:
Title:
Contact Information: (Address & Phone
Signature:
Date:

Map Name: TROUT RUN
Print Date: 05/25/11
Scale: 1 inch = 2,000 ft.
Map Center: 041° 27' 15.42" N 077° 02' 25.34" W

Horizontal Datum: NAD83



SENECA RESOURCES CORPORATION

SCALE 1:24000

0 1000 2000 3000

FEET

CJ

Hagerman Compressor Station Center
41.4553 -77.0532
Lewis Township Lycoming County

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Lycoming County Planning Commission
330 Pine Street #300
Williamsport, PA 17701-6242

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) [signature] C. Date of Delivery 10-3-11

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7011 0110 0002 4919 2178

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENECA RESOURCES

May 24, 2011

VIA CERTIFIED MAIL, RETURN RECEIPT REQUESTED
No. 7011 0110 0002 4919 2185

Lewis Township
P.O. Box 118
Trout Run, PA 17771

RE: ESCGP-1 Permit Application
DCNR 100 Hagerman Compressor Station
Tiadagton State Forest

Dear Supervisor/Secretary:

This county notice, under the requirements of Act 14, is to inform you that Seneca Resources Corporation is applying for coverage under the Erosion and Sediment Control General Permit (ESCGP-1) for Earth Disturbance Associated with Oil and Gas Exploration, Production, and Transmission Facilities from the Pennsylvania Department of Environmental Protection (DEP):

Permit Type:	ESCGP-1 Permit Application
Applicant Contact:	Mike Clinger, P.E
Project Location:	Lewis Township, Lycoming County, Pennsylvania
Project Description:	Construction of 300' X 500' Compressor Station

Acts 67, 68 and 127, which amended the Municipalities Planning Code (MPC), direct State agencies to consider Comprehensive Plans and Zoning Ordinances when reviewing applications for permitting of facilities and infrastructure, and specify that State agencies may rely upon comprehensive plans and Zoning Ordinances under certain conditions as described in Sections 619.2 and 1105 of the MPC. The Pennsylvania DEP's Policy for Consideration of Local Comprehensive Plans and Zoning Ordinances in their review of Permits for Facilities and Infrastructure (DEP's Land Use Policy) provides direction and guidance to DEP staff, permit applicants, and local and county governments for the implementation of Acts 67, 68 and 127 of 2000. This policy can be found at www.depweb.state.pa.us; keyword: Land use.

In accordance with DEP's Land Use Policy, enclosed please find a County Land Use Letter that is to be submitted with our permit application to DEP. Please complete the enclosed form and return within 30 days to: Seneca Resources Attn: Mike Clinger, P.E., 51 Zents Blvd., Brookville, PA 15825. Please **DO NOT** send this form to DEP, as we must include the County Land Use Letter with our permit application. If we do not receive a response from you **within 30 days**, we shall proceed to submit our permit application to DEP without the County land Use Letter. If the County land Use Letter is not submitted with our permit application, and we provide proof to DEP that we attempted to obtain it, DEP will assume there are not substantive land use conflicts and proceed with the normal application review process. If any questions, please don't hesitate to contact me at (814) 715-5777.

Sincerely,

Michael Clinger, P.E.
Facilities & Regulatory Permit Specialist
clingerm@srcx.com

Is there a legal challenge by the applicant with regard to zoning for the proposed project?

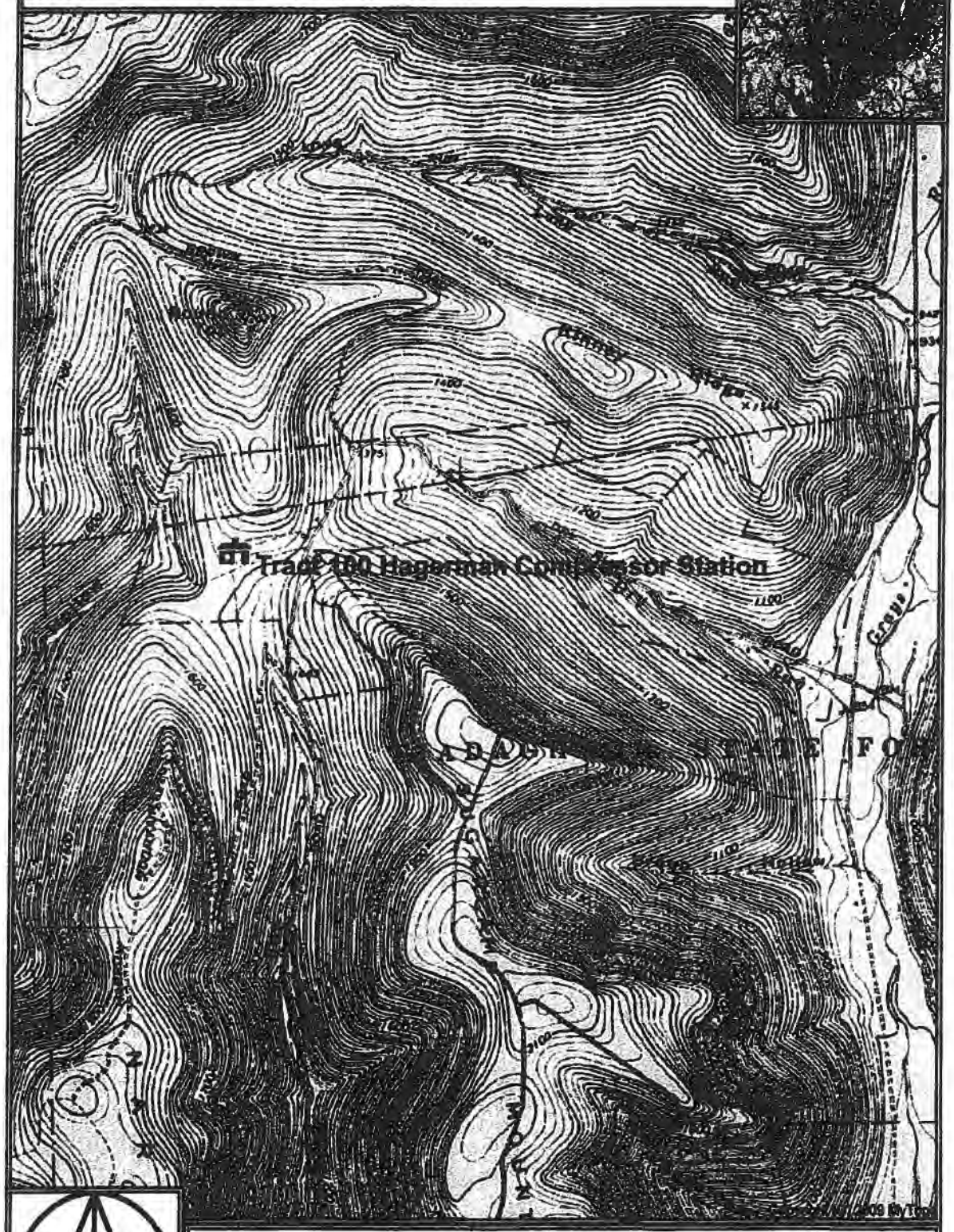
Name and Contact Information for Municipal Zoning Officer:

Additional Comments (attach additional sheets if necessary):

Name:
Title:
Contact Information: (Address & Phone)
Signature:
Date:

Map Name: TROUT RUN
Print Date: 05/25/11
Scale: 1 inch = 2,000 ft.
Map Center: 041° 27' 15.42" N 077° 02' 25.34" W

Horizontal Datum: NAD83



SENECA RESOURCES CORPORATION

SCALE 1:24000

0 1000 2000 3000

FEET

CJ

Hagerman Compressor Station Center
41.4553 -77.0532
Lewis Township Lycoming County

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Lewis Township
PO Box 118
Trout Run, PA 17771

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Mary Lou Coleman ☐ Agent ☒ Addressee

B. Received by (Printed Name) MARY Lou Coleman C. Date of Delivery 6/4/11

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7011 0110 0002 4919 2185

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

Overnight Fedex July 19
-SC

SENECA RESOURCES

July 19, 2011

McIntyre Township
10975 Route 14
Ralston, PA 17763-9800

RE: ESCGP-1 Permit Application
DCNR 100 Hagerman Compressor Station
Loyalsock State Forest

Dear Supervisor/Secretary:

This county notice, under the requirements of Act 14, is to inform you that Seneca Resources Corporation is applying for coverage under the Erosion and Sediment Control General Permit (ESCGP-1) for Earth Disturbance Associated with Oil and Gas Exploration, Production, and Transmission Facilities from the Pennsylvania Department of Environmental Protection (DEP):

Permit Type:	ESCGP-1 Permit Application
Applicant Contact:	Mike Clinger, P.E
Project Location:	McIntyre and Lewis Township, Lycoming County, Pennsylvania
Project Description:	Construction of 300' X 500' Compressor Station

Acts 67, 68 and 127, which amended the Municipalities Planning Code (MPC), direct State agencies to consider Comprehensive Plans and Zoning Ordinances when reviewing applications for permitting of facilities and infrastructure, and specify that State agencies may rely upon comprehensive plans and Zoning Ordinances under certain conditions as described in Sections 619.2 and 1105 of the MPC. The Pennsylvania DEP's Policy for Consideration of Local Comprehensive Plans and Zoning Ordinances in their review of Permits for Facilities and Infrastructure (DEP's Land Use Policy) provides direction and guidance to DEP staff, permit applicants, and local and county governments for the implementation of Acts 67, 68 and 127 of 2000. This policy can be found at www.depweb.state.pa.us; keyword: Land use.

In accordance with DEP's Land Use Policy, enclosed please find a County Land Use Letter that is to be submitted with our permit application to DEP. Please complete the enclosed form and return within 30 days to: Seneca Resources Attn: Mike Clinger, P.E., 51 Zents Blvd., Brookville, PA 15825. Please **DO NOT** send this form to DEP, as we must include the County Land Use Letter with our permit application. If we do not receive a response from you **within 30 days**, we shall proceed to submit our permit application to DEP without the County land Use Letter. If the County land Use Letter is not submitted with our permit application, and we provide proof to DEP that we attempted to obtain it, DEP will assume there are not substantive land use conflicts and proceed with the normal application review process. If any questions, please don't hesitate to contact me at (814) 715-5777.

Sincerely,

Michael Clinger, P.E.
Facilities & Regulatory Permit Specialist
clingerm@srcx.com

MUNICIPAL LAND USE LETTER

Date: _____

TO: Seneca Resources Corporation
Attn: Mike Clinger, P.E.
51 Zents Blvd.
Brookville, PA 15825

FROM: McIntyre Township

RE: Seneca Resources ESCGP-1 Permit Application
DCNR Tract 100 Hagerman Compressor Station
McIntyre and Lewis Township, Lycoming County Pennsylvania

The McIntyre Township states that it:

_____ has adopted a township or multi-township comprehensive plan.
If yes, please provide date of adoption.

_____ has not adopted a township or multi-township comprehensive plan

If Applicable:

The McIntyre Township states that it:
_____ has adopted a county zoning ordinance, or a township or joint-township zoning ordinance.
_____ has not adopted a county zoning ordinance, or a township or joint-township zoning ordinance.

The above referenced proposed project:
_____ meet the provisions of the local zoning ordinance

If zoning approval is required for the project to precede, the above referenced project:
_____ has received zoning approval.
_____ has not received zoning approval.

If the proposed project has not received zoning approval:

What is the status of the zoning request for the proposed project? (e.g., Special Exception Approval from the Zoning Hearing Board required, Conditional use approval for the Governing Body required:

_____

_____

_____

Is there a legal challenge by the applicant with regard to zoning for the proposed project?

Name and Contact Information for Municipal Zoning Officer:

Additional Comments (attach additional sheets if necessary):

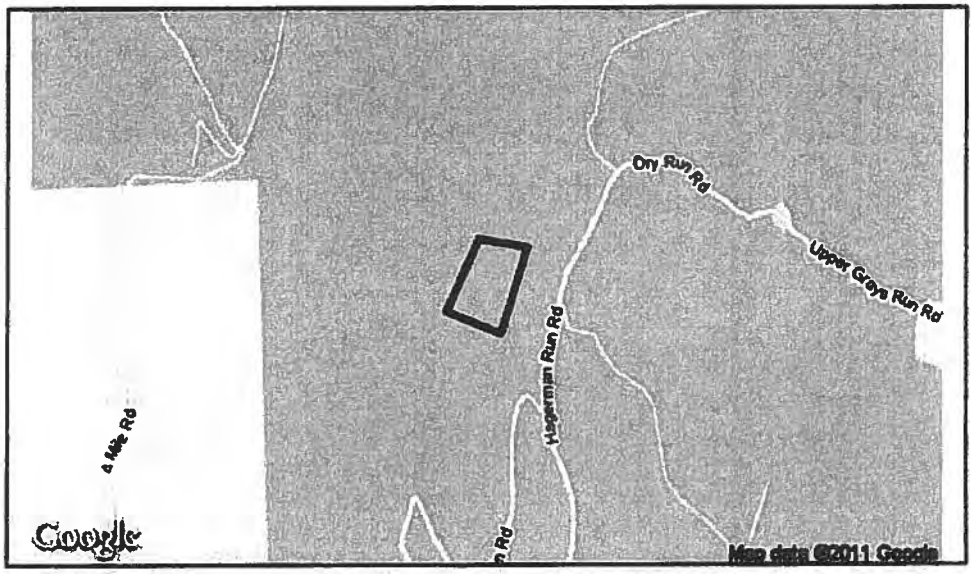
Name:
Title:
Contact Information: (Address & Phone)
Signature:
Date:

Map Name: TROUT RUN
Horizontal Datum: NAD83
Print Date: 05/25/11
Scale: 1 inch = 2,000 ft.
Map Center: 041° 27' 15.42" N 077° 02' 25.34" W
Tract 100 Hagerman Compressor Station
SENECA RESOURCES CORPORATION
SCALE 1:24000
0 1000 2000 3000
FEET
CJ
Hagerman Compressor Station Center
41.4553 -77.0532
Lewis Township Lycoming County

PNDI Project Environmental Review Receipt Project Search ID: 20110815311208

1. PROJECT INFORMATION

Project Name: **DCNR 100 Hagerman Compressor**
Date of review: **8/15/2011 12:54:49 PM**
Project Category: **Mining,Oil or Gas (including roads and pipelines),New Well**
Project Area: **16.8** acres
County: **Lycoming** Township/Municipality: **Lewis,McIntyre**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17763,17771**
Decimal Degrees: **41.454403 N, -77.048792 W**
Degrees Minutes Seconds: **41° 27' 15.9" N, -77° 2' 55.7" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jurisdictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to federally listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at

http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Michael Clinger
Company/Business Name: Seneca Resources Corporation
Address: 51 Zents Blvd.
City, State, Zip: Brookville, PA 15825
Phone: (814) 220-1639 Fax: (814) 849-4795
Email: clingerm@senecx.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature

8-15-2011
date

WILKINSON & ASSOCIATES
1220 VALLEY FORGE ROAD
UNIT 25, PO BOX #987
VALLEY FORGE, PA 19482
P (610) 415-1220 F (610) 415-1224

PROJECT:	DCNR TRACT 100 HAGERMAN COMPRESSOR PAD
DRAINAGE AREA:	0
SHEET:	OF
DATE:	8/29/2011
BY:	DPM
CHK'D:	
REV:	

WORKSHEET 4 - CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

PROJECT NAME: DCNR TRACT 100 HAGERMAN COMPRESSOR PAD
DRAINAGE AREA ID: 0
2-YEAR RAINFALL: 3.0 IN

TOTAL SITE AREA: 14.57 AC
PROTECTED SITE AREA: 0.00 AC
MANAGED AREA: 14.57 AC

EXISTING CONDITIONS:

COVER TYPE/CONDITION	SOIL GROUP	AREA (SF)	AREA (AC)	CN	S	Ia (0.2*S)	Q RUNOFF[1] (IN)	RUNOFF VOLUME[2] (CF)
MEADOW	B		0.00	58	7.24	1.45	0.274	0
MEADOW	C		0.00	71	4.08	0.82	0.760	0
MEADOW	D		0.00	78	2.82	0.56	1.129	0
IMPERVIOUS	C		0.00	98	0.20	0.04	2.768	0
WOODS	B		0.00	60	6.67	1.33	0.333	0
WOODS	C	634,670	14.57	70	4.29	0.86	0.714	37,778
WOODS	D		0.00	79	2.66	0.53	1.188	0
	TOTALS:	634,670	14.57				TOTAL:	37,778

DEVELOPED CONDITIONS:

COVER TYPE/CONDITION	SOIL GROUP	AREA (SF)	AREA (AC)	CN	S	Ia (0.2*S)	Q RUNOFF[1] (IN)	RUNOFF VOLUME[2] (CF)
1 AC RES	B		0.00	68	4.71	0.94	0.627	0
1 AC RES	C		0.00	79	2.66	0.53	1.188	0
1 AC RES	D		0.00	84	1.90	0.38	1.516	0
2 AC RES	B		0.00	65	5.38	1.08	0.506	0
2 AC RES	C		0.00	77	2.99	0.60	1.071	0
2 AC RES	D		0.00	82	2.20	0.44	1.379	0
1/2 AC RES	B		0.00	70	4.29	0.86	0.714	0
COMMERCIAL	B		0.00	92	0.87	0.17	2.161	0
LAWN	B		0.00	61	6.39	1.28	0.365	0
LAWN	C		0.00	74	3.51	0.70	0.908	0
LAWN	D		0.00	80	2.50	0.50	1.250	0
MEADOW	C	338,026	7.76	71	4.08	0.82	0.760	21,420
STONE	C	296,644	6.81	89	1.24	0.25	1.900	46,964
IMPERVIOUS	NA		0.00	98	0.20	0.04	2.768	0
TOWNHOUSES	C		0.00	90	1.11	0.22	1.984	0
TOWNHOUSES	D		0.00	82	2.20	0.44	1.379	0
	TOTALS:	634,670	14.57				TOTAL:	68,384

2-YEAR VOLUME INCREASE: 30,606 CF

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

NOTE: Runoff Volume must be calculated for EACH land use type/condition and HSG.
The use of a weighted CN value for volume calculations is not acceptable.

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	9.16	2	718	18,887	----	------	------	Pre-Development DA 1
2	SCS Runoff	4.99	2	718	10,282	----	------	------	Pre-Development DA 2
4	SCS Runoff	18.09	2	718	36,464	----	------	------	Post-Development DA 1
5	SCS Runoff	10.31	2	716	20,824	----	------	------	Post-Development DA 2
7	SCS Runoff	3.52	2	718	7,119	----	------	------	DA 1 BYPASS
8	SCS Runoff	1.61	2	718	3,227	----	------	------	DA 1 CAPTURED 1
9	SCS Runoff	14.13	2	716	29,029	----	------	------	DA 1 CAPTURED 2
11	Reservoir	0.01	2	1444	1,861	8	1530.17	2,919	INFILTRATION BASIN 2
12	Diversion1	0.01	2	1444	1,861	11	------	------	INFILTRATION
13	Diversion2	0.00	2	778	0	11	------	------	PIPE
14	Reservoir	6.36	2	722	25,670	9	1519.31	12,429	RAIN GARDEN 1
15	Diversion1	0.02	2	722	3,348	14	------	------	INFILTRATION
16	Diversion2	6.34	2	722	22,322	14	------	------	PIPE
17	Combine	8.85	2	720	29,441	7, 13, 16	------	------	POST DA 1 TOTAL
19	Reservoir	0.30	2	878	20,774	5	1513.65	13,360	DA 2 POST TOTAL
20	Diversion1	0.10	2	878	16,383	19	------	------	INFILTRATION
21	Diversion2	0.20	2	878	4,392	19	------	------	PIPE

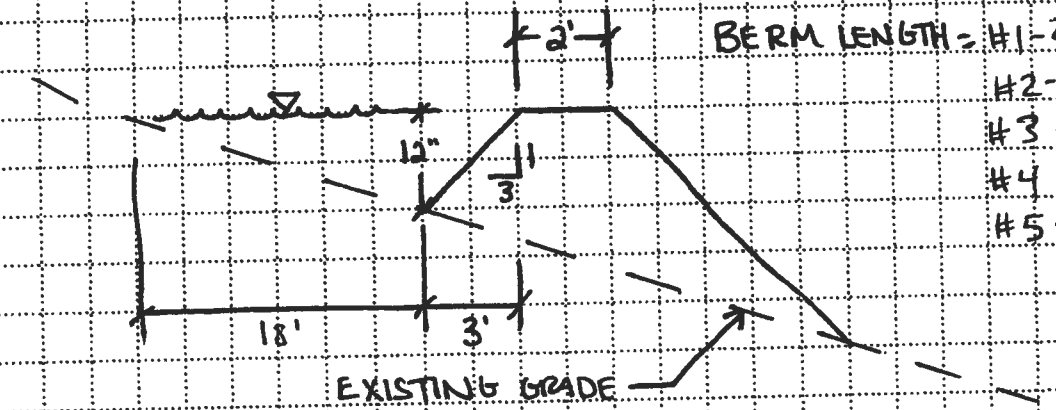
WILKINSON & ASSOCIATES, INC.

1220 Valley Forge Road
PO #987, Unit #25
Valley Forge, PA 19482
Phone (610) 415-1220
Fax (610) 415-1224

PROJECT NAME Haverman Compression Pad
PROJECT # 2011-152
DRAWN BY DPM
DATE 8/29/2011
WEATHER
SHEET #

INFILTRATION BERM DESIGN

ASSUME SLOPE TO THE BERM TO BE MAXIMUM :1.
PER BMP MANUAL CHAPTER 6, PAGES 113-122, THE BERM SHALL BE 12" HIGH & 2' WIDE, WITH SIDE SLOPES OF 3:1 MAX.



BERM LENGTH = #1 - 200 LF
#2 - 300 LF
#3 - 90 LF
#4 - 180 LF
#5 - 105 LF

PER BMP MANUAL CHAPTER 6
PAGE 119

BERM STORAGE VOLUME = $((\frac{1}{2}(3' \times 1')) + (\frac{1}{2}(18' \times 1'))) \times$ =

#1	18'	200'	= 2100 CF
#2	18'	300'	= 3150 CF
#3	18'	90'	= 945 CF
#4	18'	180'	= 1890 CF
#5	18'	105'	= 1102.5 CF
		TOTAL	= 9,187.5 CF

VOL REQUIRED = 30,606 CF - 9,187 CF (BERMS)
- 21,592 CF (RAIN GARDEN & BASINS)

NET = -173 CF OK

5500-FM-OG0111 Rev. 12/2009

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF OIL AND GAS MANAGEMENT

EROSION, SEDIMENT AND STORMWATER CONTROL PLAN FOR OIL AND GAS OPERATIONS

1. GENERAL INFORMATION

Project Name: DCNR 100 Hagermand Comp Municipality: Lewis/McIntyre Township County: Lycoming

Operator: Seneca Resources

Address: 51 Zents Boulevard City Brookville State: PA Zip Code: 15825

Latitude: 41 degrees 27 minutes 15.9 seconds Longitude: -77 degrees 02 minutes 55.7 seconds

Reference Datum: ☒ North American Datum 1983 ☐ North American Datum 1927 ☐ World Geodetic System 1984

Contour Collection Method: ☒ GPS ☐ Interpolated from U.S.G.S. topo map ☐ DEP's eMAP

Total Project Area (Acres): 14.57 Total Disturbed Area (Acres): 14.57

Project Type (Check All that Apply)

☐ Oil/Gas Well ☒ Pipeline/Transmission/Compressor Facility ☐ Processing Facility ☐ Treatment Facility ☐ Other

A. PROJECT DESCRIPTION

Will the earth disturbance activity encounter any coal seams? ☐ Yes ☒ No

If yes, have you contacted the local DEP District Mining Office for further assistance? ☐ Yes ☐ No

Provide a narrative description of the project. (Add additional sheets as necessary) Construction of a proposed Oil & Gas compressor station and associated infrastructure

B. RECEIVING WATERS

All streams in Pennsylvania are classified based upon their designated and existing uses and water quality criteria. Designated uses for waters of this Commonwealth are found in 25 Pa. Code §93.9a-z at http://www.pacode.com/secure/data/025/chapter93/chap93toc.html. Existing uses of waters of this Commonwealth are found at the DEP Web site www.depweb.state.pa.us. Type the phrase "existing use" in the DEP Keyword box. The county conservation district office can also supply this information. List the bodies of water likely to receive direct runoff within or from the oil and gas earth disturbance activity.

Stream Name/Watershed	Designated/Existing Use
Hagerman Run	HQ/CWF
Trout Run	HQ/CWF

C. RESPONSIBLE PARTIES

Person(s) responsible for construction and maintenance of erosion and sediment control BMPs during earth disturbance activities. (NOTE: If duties are assigned to more than one party, list all others under Section 9 of this plan.)

Name: Doug Kepler, Director of Environmental Engineering Phone: 814-220-1559

Address: 51 Zents Boulevard City: Brookville State: PA Zip Code: 15825

Erosion and Sediment Control Plan prepared by:

Name: Daniel P. McKenna, PE Phone: 610-415-1220

Address: 1220 Valley Forge Rd., Unit 25, PO Box 987 City: Valley Forge State: PA Zip Code: 19482

RECEIVED
SEP 06 2011
OIL & GAS

2. MAPS

A. LOCATION MAP

The map must include the location of the project with respect to roadways, streams, wetlands, lakes, ponds, floodplains, type and exten of vegetation and other identifiable landmarks. A United States Geologic Service (USGS) 7.5 min. quadrangle map may be used to show the existing topographical features of the project site and the immediate surrounding area.

B. SOIL MAP

A soils map is attached showing the proposed site including access roads, drill pads, impoundments, and pipelines. (Soils information i available from the Natural Resource Conservation Service (NRCS) website http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx Soils information should be addressed when determining roadway layout, pad configurations, and appropriate stabilization methods. Lis all soils that will be encountered and check off all limitations that apply. See Appendix B for LIMITATIONS OF PENNSYLVANIA soils pertaining to earthmoving projects and complete worksheet 1

C. PLAN MAP

Attach a site specific map with the site location, site boundaries, topographic features, existing land uses, north arrow and legend. The map must include the location of all earth disturbance activities (roads, drill pads, impoundments, pipelines and other associated activities). The scale and north arrow must be plainly marked. The map scale must be large enough to clearly depict the topographica features of the project. A complete legend of all symbols used on the map must also be included. The following should be clearly shown on the plan maps. In the case where significant cut and fill operations are to occur, the slope should be depicted with contour lines and/o cross-sections.

•Topographic features		Wetland Crossings
•North Arrow	•	Stream Crossings
•Drill Pads	•	Access Roads
		Existing Roads
	•	Proposed Erosion Control BMPs
	•	Receiving surface waters

D. STREAM AND WETLAND CROSSING MAP

A legible photocopy of a USGS 7.5 min. quadrangle map showing the location of the project boundaries and all surface water crossing will be attached to the plan map. Each crossing location as well as any earth disturbance that is to occur within 50 ft of a stream channe must include the type of water obstruction and encroachment permit that is to be secured. At all stream crossing locations, runoff must be directed to a sediment removal area, i.e., filter strip, straw bale, silt fence, sump, a trap for treatment. Waterbars and/or broad based dip should be installed and maintained as required on the approaches to the stream crossing.

Has application been made for required stream crossing permits? ☐ Yes ☐ No ☒ Not Applicable

3. SCHEDULE AND SEQUENCE OF OPERATIONS

A. PRE CONSTRUCTION

Starting Date: 10/1/2011 Completion Date: 10/1/2012

Disturbed Acreage Calculation

	Total Length (ft)		Average Width (ft)		Area (sq ft)			
Access Roads	495		16	=	7,920 SF			
Pipelines/Compressors				=	210,275 SF			
Drill Pads				=				
Other	Cut/Fill Slopes,		E&S Measures & Mobilization	=	416,475 SF			
			Total Area (sq. ft.)	=	634,670 SF	÷ 43,560 sq ft/A	=	14.57

B. SITE CONSTRUCTION/ WELL DRILLING/PRODUCTION CHECKLIST

☒ 1. Prior to commencement of any earth disturbance activity including clearing and grubbing, the registrant shall clearly delineate sensitive areas, riparian forest buffer boundaries, areas proposed for infiltration practices, the limits of clearing, and trees tha are to be conserved within the project site, and shall install appropriate barriers where equipment may not be parked, staged operated or located for any purpose.

☒ 2. Site access – This is the first land-disturbance activity to take place at the site and should provide BMPs to minimize accelerated erosion and sedimentation from the following areas: entrance to the site, construction routes, and area designated for equipment or other use at the site including parking, stockpiles.

☒ 3. Sediment Barriers – Install perimeter BMPs after the construction site is accessed, keeping associated clearing and grubbing limited to only that amount required for installing perimeter BMPs.

☒ 4. Upslope Diversion Channels – including outlet protection are constructed to divert upslope clean water runoff around the disturbed area (when necessary).

☐ 5. Sediment Basins and Traps – including outlet protection shall be constructed prior to the remaining clearing/grubbing and other earth disturbance activities.

☒ 6. Sediment Laden Water Channels or other Conveyance– used to divert stormwater runoff water to the appropriate BMPs such as traps and ponds should be installed prior to the remaining clearing/grubbing and other earth disturbance activities.

☒ 7. Land Clearing and Grading – Implement clearing and grading only after all downslope E&S BMPs have been constructed and stabilized.

☒ 8. Surface Stabilization – Apply temporary or permanent stabilization measures immediately to any disturbed areas where wor has reached final grade, has been delayed or otherwise temporarily suspended.

☒ 9. Construction of Buildings, Utilities, and Paving – During construction, install and maintain any additional erosion and sedimen control BMPs, and implement any structural post construction stormwater BMPs that may be required.

☒ 10. Final Stabilization, Topsoiling, Trees and Shrubs, After construction is completed, install stabilization BMPs including permanent seeding, mulching and riprap, and complete implementation of stormwater BMPs in this last construction phase Stabilize all open areas, including borrow and spoil areas, and remove all temporary BMPs and stabilize any disturbance associated with the removal of the BMP.

Minor modifications to the E & S Plan and Site Restoration Plan shall be noted on the plan that is available at the site and initialed by the appropriate Department staff. Minor changes to the plan may include adjustments to BMPs and locations within the permitted boundary to improve environmental performance, prevent potential pollution, change in ownership or address, typographical errors and on-site field adjustments such as the addition or deletion of BMPs, or alteration of earth disturbance activities to address unforeseen circumstances.

Major modifications to the approved E & S Plan involving new or additional earth disturbance activity other than those described as mino modifications above, and/or the addition of a discharge will require prior approval by the reviewing entity and may require the submittal o a new plan.

C. EROSION CONTROL & STORMWATER BEST MANAGEMENT PRACTICES (BMPS)

The Best Management Practices listed in this plan shall be installed and maintained in accordance with the ***Erosion and Sedimen Pollution Control Manual***, No. 363-2134-008, as amended and updated and the ***Oil and Gas Operator's Manual No. 550-0300-001*** a amended and updated. The BMPs contained in this plan shall be installed as shown (or indicated) prior to earth disturbance (including clearing and grubbing) within the drainage area of the BMP in question. Appropriate BMPs shall be provided for each stage of activit (including, but not necessarily limited to, access road construction and maintenance, drilling pad, frac ponds, & pipelines). Each BMP shall be kept functional until all earth disturbances within the drainage area are completed and a minimum vegetative cover (uniform 70% coverage of perennial vegetation over the entire disturbed area) has been achieved or other suitable permanent erosion protection ha been installed.

If no, please explain: _____

Will all erosion control and stormwater BMPs be installed and maintained as specified in this plan?	☒ Yes	☐ No
Will all unnecessary disturbed areas be limed, fertilized, seeded and mulched as specified in this plan?	☒ Yes	☐ No
Will all unnecessary culverts and waterbars be removed as specified in this plan?	☒ Yes	☐ No
Will all permanent waterbars be installed as specified in this plan?	☐ Yes	☒ No
Will all unnecessary disturbed areas be regraded, smoothed, limed, fertilized, seeded and mulch as specified in this plan?	☒ Yes	☐ No

4. DESCRIPTION OF EROSION AND SEDIMENT/STORMWATER CONTROL BEST MANAGEMENT PRACTICES

The following standard BMPs have been provided to fulfill the requirements of this plan Additional BMPS are listed in the Erosion and Sediment Pollution Control Manual as well as the Oil and Gas Operator's Manual and *the Underground Utility Line Construction BMP Manual*. BMP construction details are shown in Appendix A. If you plan to use any of these recommended BMPs, please check the appropriate boxes. If you plan to use alternative BMPs, you must provide drawings showing the details, specifications and spacing.

A. CROSS-DRAIN CULVERT

Culverts will be installed before the ground freezes. Culverts shall be placed with a slope of 2 to 4 percent and cross the road at a 30 degree downslope angle. Culverts will be 12" pipe or larger.

Will this BMP be used? ☐ Yes ☒ No Will recommended spacing be used? ☐ Yes ☒ No. If no, please explain:

_____

_____

B. WATERBARS

Waterbars will be placed on pipelines and **retired** roadways according to the spacing indicated below.

Will this BMP be used? ☐ Yes ☒ No Will recommended spacing be used? ☐ Yes ☐ No

C. BROAD-BASED DIPS

Broad-based dips will be installed and worked before the ground freezes. Broad-based dips on the road system are planned to be spaced as indicated in Appendix A.

Will this BMP be used? ☐ Yes ☒ No Will recommended spacing be used? ☐ Yes ☐ No. If no, please explain:

_____

_____

D. FILTER STRIPS

Filter strip widths vary by slope on land between roads and perennial streams.

The width of the filter strip depends on the slope between the road and the stream.

Will this BMP be used? ☐ Yes ☒ No Will recommended spacing be used? ☐ Yes ☐ No. If no, please explain:

_____

_____

E. FILTER FABRIC FENCE

Filter fabric fence must be installed on contour at the edge of disturbed areas. Both ends of each fence section must be extended upslope at 45 degrees to the main fence alignment. They should not be installed in streams, ditches or other areas of concentrated flow Install filter fabric fence before the ground freezes.

Will this BMP be used? ☐ Yes ☒ No

F. TURNOUTS

Channels that drain water away from roads into well-vegetated areas are known as turnouts. Turnouts (see Appendix A) are typicall located along crowned roadways where runoff cannot sheet flow off the roadway. Like ditch relief culverts, the purpose of turnouts is to minimize the volume of water in a roadside ditch. Turnouts should be located so as to take advantage of natural drainageways or buffe areas wherever possible. Where a suitable vegetative filter strip is not available, a compost filter sock, rock filter or other sedimen removal BMP should be installed at the outlet of the turnout.

Will this BMP be used? ☐ Yes ☒ No

G. ROADSIDE DITCH

In most cases, the ditches paralleling temporary access roads and haul roads need not be lined if sufficient ditch relief culverts are provided, erosion resistant soils are present, and flow velocities are less than 2 fps. However, protective liners are required for roadside ditches discharging to special protection waters, where they discharge directly to surface waters, or where necessary to prevent the erosion of the channel itself. A typical cross-section for a roadside ditch is shown in Appendix A.

Will this BMP be used? ☐ Yes ☒ No

H. CROWNED/INSLOPED ROADWAY

Crowned roadways are typically installed where the topography allows for sheet flow to infiltrate into the surrounding vegetation. In situations where crowned roadways will not function properly an insloped roadway will be constructed.

Will this BMP be used? ☒ Yes ☐ No Crowned ☐ Yes ☒ No Insloped ☒ Yes ☐ No

I. STABILIZED ROAD ENTRANCE

The purpose is to remove mud from tires and keep it off the public road. The construction entrance shall be constantly maintained.

Will this BMP be used? ☒ Yes ☐ No

J. COMPOST FILTER SOCK

Will this BMP be used? ☒ Yes ☐ No

K. CHANNELS

Channels are used for several purposes. Collector channels are used to collect runoff from disturbed areas and convey it to a sedimen removal facility (e.g. sediment trap) prior to discharge into receiving surface waters. Diversion channels are used to divert runoff from undisturbed upslope areas and convey it around areas of earth disturbance (i.e. drill pads, impoundments, etc.). Conveyance channel are used to convey discharges from sediment traps & cross drains to receiving surface waters.

Channels should be sized to convey the calculated peak flows as calculated in the table located in Appendix A. Otherwise supporting calculations must be attached to show sufficient capacity. They should also be provided with a suitable protective liner to prevent erosion within the channel. Wherever grass is used as a protective liner, a temporary erosion control mat (e.g. rolled fiber blanket) should be firmly anchored to the bottom and sides of the channel to hold soil in place until the vegetation becomes established.

Will this BMP be used? ☒ Yes ☐ No Check all that apply:

Temporary	☒ Yes	☐ No	Rip-rap	☐ Yes	☐ No
Permanent	☒ Yes	☐ No	Diversion	☒ Yes	☐ No
Vegetative	☒ Yes	☐ No	Collector	☐ Yes	☐ No

L. SEDIMENT TRAPS

Sediment traps may be used to control runoff from drainage areas up to 5.0 acres (disturbed and undisturbed). They must be sized to provide 2,000 cubic feet of total storage capacity for each acre tributary to the trap. The sediment storage zone is considered to be 700 cubic feet per acre. Outlets should be located as far from the inflow as possible. At a minimum, spillway widths should be equal to 6 fee for each acre tributary to the trap.

Will this BMP be used? ☐ Yes ☒ No

M. ALTERNATIVE BMPs

Will alternative BMPs be used? ☐ Yes ☒ No If yes, attach drawings showing the details, specifications and spacing.

N. POST CONSTRUCTION STORMWATER/SITE RESTORATION

Disturbed areas will be seeded and mulched as indicated below. Recommended Seed mixes may be found in Appendix A. Mulch will be applied at a rate of 3-4 tons/acre. The Department recommends that a soil test be done to determine proper soil amendment application rates for the proposed seed mixtures. Prior to seeding, soil amendments will be applied as follows:

Soil Amendment	Type	Rate of Application
Fertilizer	N2, P205, & K20 10-20-20	1,000 lbs/acre
Lime	Ground Agricultural Limestone	4-5 tons/acre

N. POST CONSTRUCTION STORMWATER/SITE RESTORATION (continued)

Area of Disturbance	Seed Mixture	Rate of Application (lb/acre)
Well Pads	2	8/40
Access Roads	2	8/40
Pipelines	2	8/40
Impoundments	2	8/40
Compressor Locations	2	8/40
Other		

1. *Non-Structural BMPs* which promote the treatment, infiltration, evaporation, and transpiration of stormwater runoff shall be used ☒ Yes ☐ No
2. *Low Impact, Conservation, and Green Infrastructure Designs* shall be used to minimize the generation of runoff by preserving open space, preserving natural areas, reducing the amount of impervious surface, and other green infrastructure design principles tha utilize or mimic infiltration or evapotranspiration. ☒ Yes ☐ No
3. *Infiltration practices* shall include either engineered structures or landscape features designed to capture and infiltrate runoff tha mimic pre-construction conditions. ☒ Yes ☐ No
4. *Runoff practices* shall be designed and constructed to convey runoff, increase evaporation, and manage rate. Such practices are to also promote infiltration, filtration, and biological uptake of pollutants. ☒ Yes ☐ No
5. *Filtration practices* shall be used to treat runoff through filter media that are designed to capture pollutants through the processes o physical filtration of solids or cation exchange of dissolved pollutants. ☒ Yes ☐ No

List the Stormwater/Site Restoration BMPs that will be used:

Rain Garden		
Infiltration Berms		
Infiltration Basin		

O. EROSION CONTROL BLANKETS

Erosion control blanketing (either rolled or sprayed) shall be installed or applied for all slopes 3H:1V or steeper within 50 feet of a surface water or where soil conditions indicate blanketing is needed to achieve the required vegetative cover.

Will this BMP be used? ☒ Yes ☐ No

P. OTHER

Please explain:

5. SPECIAL PROTECTION WATERSHEDS

Projects that are located in special protection watersheds that have a designated or existing use of high quality (HQ) or exceptional value (EV), Wild Trout Streams or non-special protection watersheds impaired for sediment or stormwater must demonstrate that a construction and post construction discharges will not degrade the physical, chemical or biological characteristics of the surface waters Plan preparers should utilize "non-discharge" BMPs in their E&S and PCSM Plans to the greatest extent possible. These BMPs may be found in the Post Construction Stormwater Manual and the Oil and Gas Operator's Manual. Calculations are not necessary if non discharge BMPs are used, the approximate original contours and the preservation of the preconstruction drainage pattern and feature are maintained or replicated and the disturbed areas will be revegetated or stabilized with pervious material (crushed rock and grave surface are considered pervious material). In addition, if stormwater BMPs will be employed that use natural measures, do not require extensive construction and maintenance, promote pollutant reduction and are capable of controlling the stormwater runoff from a 2-year 24-hour storm event and the net increase of stormwater is infiltrated or dissipated away from the waters of the Commonwealth calculations are not necessary.

5. SPECIAL PROTECTION WATERSHEDS (continued)

a. Is the project located in a Special Protection Watershed? ☒ Yes ☐ No. If yes, provide a detailed description o how the post-construction stormwater runoff will be managed.

The infiltration berms, basins and rain gardens will be used to manage the increase in volume from a 2-yr/24 hr storm event.

b. Will there be a net increase in accelerated erosion and sedimentation from the construction runoff? ☐ Yes ☒ No

c. Does the post construction runoff volume equal pre-construction runoff volume for the 2-year/24-hour storm? ☒ Yes ☐ No

d. Does the rate of post-construction stormwater equal pre-construction runoff rate for the 2, 5, 10, 25, 50 and 100 year storm events?
☐ Yes ☐ No ☒ NA

If NA please explain:

Calculations are not required per because the approx. original contours of the site will be replicated and the disturbed areas will be vegetated. A PCSM BMP will be used that reduces pollution, doesn't need extensive maintenance and controls the increase in volume and rate of runoff from a 2 yr/24 hr storm event. by infiltrating the net volume increase away from surface waters of the Commonwealth.

List the Post Construction Stormwater BMPs that will be used

Rain Garden
Infiltration Berm
Infiltration Basin

6. MAINTENANCE

BMPs will be inspected on a weekly basis and after each measurable rainfall event during the active construction/drilling phase of the project. ☒ Yes ☐ No

Culverts will be cleaned out, repaired or replaced as necessary. ☒ Yes ☐ No

Filter strips will be maintained. ☐ Yes ☒ No

Earth Disturbance areas will be repaired where signs of accelerated erosion are detected. ☒ Yes ☐ No

Seeding and mulching will be repeated in those areas that appear to be failing or have failed. ☒ Yes ☐ No

Other (describe)

7. SITE CLEANUP

Describe procedures which ensure the proper handling, storage, control, disposal and recycling of well drilling waste, including but no limited to fuels, oil, lubricants and other materials brought to the site or used in the process of drilling.

☒ Garbage, fuels or any substance harmful to human, aquatic or fish life, will be prevented from entering springs, streams, ponds lakes, wetlands or any water course or water body.

☒ Oils, fuels, lubricants and coolants will be placed in suitable containers and disposed properly.

☒ All trash and garbage will be collected and disposed properly.

☐ Other (describe).

8. ADDITIONAL EXPLANATION/COMMENTS (if needed)

9. CERTIFICATION BY PERSON PREPARING APPLICATION

I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control Plan and Site Restoration/ Stormwater Management Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Print Name: Daniel P. McKenna, PE	Signature:
Company: Wilkinson & Associates, Inc.	
Address: 1220 Valley Forge Road, Unit 25, PO Box 987 Valley Forge, PA 19482	
Phone: 610-415-1220	

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL DANIEL P. McKENNA ENGINEER PE076498

EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and Site Restoration Plan developed and sealed by a licensed professional engineer, surveyor or professional geologist, The plans shall both contain the following certification:

I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control and Site Restoration Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

10. APPLICANT CERTIFICATION

Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Mike Clinger, PE, Manager - Project Engineering
Print Name and Title of Applicant

Print Name and Title of Co-Applicant (if applicable)

Signature of Applicant

Signature of Co-Applicant

8-29-2011
Date Application Signed

Date Application Signed

Notarization

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Adam J. Krug, Notary Public
City of St. Marys, Elk County
My Commission Expires Aug 26, 2014
Member, Pennsylvania Association of Notaries

Sworn to and subscribed to before me this

26 day of August, 20 11

Commonwealth of Pennsylvania

County of Cameron

Notary Public

My Commission expires Aug 26 2014

NAME, ADDRESS AND PHONE NUMBER OF INDIVIDUAL TO BE CONTACTED IF ADDITIONAL INFORMATION IS REQUIRED

Name: Daniel P. McKenna, PE	
Address: 1220 Valley Forge Road, Unit 25, PO Box 987 Valley Forge, PA 19482	Phone: 610-415-1220

APPENDIX A

BMP CONSTRUCTION DETAILS

A. Cross Drain Culverts

Sizing and Spacing* of Cross Drain Culverts for Temporary Access Roads

Road Grade (%)	Culvert Spacing* (ft)	Length of Upslope Drainage (ft)				
		< 300	300 – 400	400 – 500	500 – 600	>600
		Minimum Culvert Size (in)				
2	300	12	15	15	15	18
3	235	12	15	15	15	18
4	200	12	15	15	15	18
5	180	12	12	15	15	15
6	165	12	12	12	15	15
7	155	12	12	12	12	15
8	150	12	12	12	12	15
9	145	12	12	12	12	15
10	140	12	12	12	12	15
12	135	12	12	12	12	15

Maximum Spacing* of Cross Drain Culverts (18" dia. CMP) For Permanent Access Roads

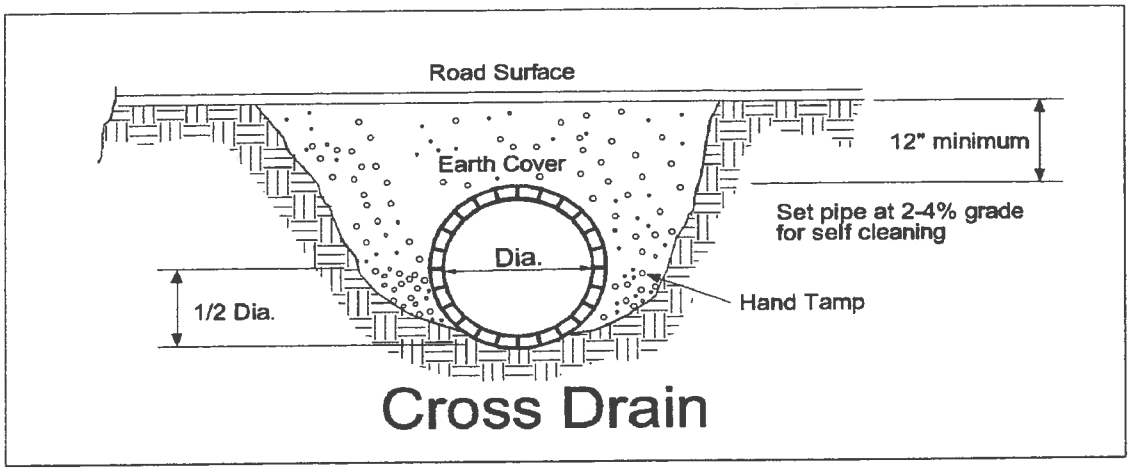
Road Grade	Soil Type in Ditch				
	Gravels, Sandy Gravels, Aggregate Surfacing	Silty Gravels, Clayey Gravels	Plastic and Nonplastic Inorganic Clays	Inorganic Silts, Silty or Clayey Sands	Sands, Silty Sands, and Gravelly Sands
Percent	Feet				
2	390	315	245	170	95
4	335	275	210	145	85
6	285	230	180	125	75
8	240	195	150	105	65
10	200	160	125	90	55
12	160	130	105	75	45
14	135	110	85	60	35

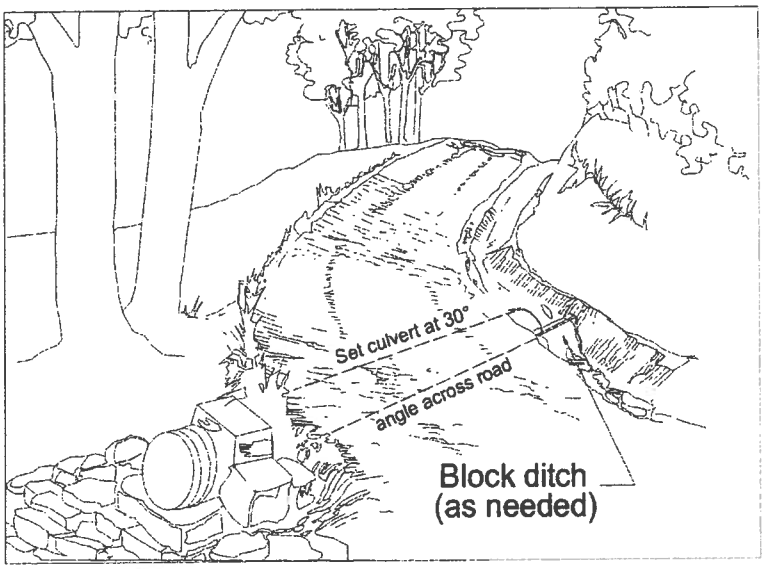
*Spacing may be adjusted slightly to take advantage of natural drainage-ways.

R-4 (Min.) Riprap protection will be provided at all outfalls.

At all stream crossing locations, runoff must be directed to a sediment removal area, i.e., filter strip, straw bale, silt fence, sump, or trap for treatment. Waterbars and/or broad based dips should be installed and maintained as required on the approaches to the stream crossing.

TYPICAL CROSS DRAIN CULVERT



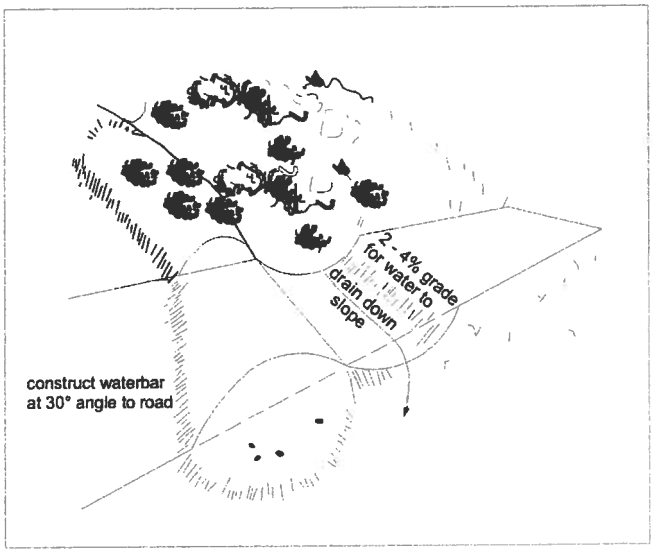


B. WATERBARS - Waterbars are typically used to control stormwater runoff on retired access roads as well as pipeline right-of-ways. They are not recommended for active access roads due to the difficulty of moving equipment over them as well as the need for continual maintenance due to damage from traffic. Waterbars will be installed before the ground freezes and will be spaced as indicated below

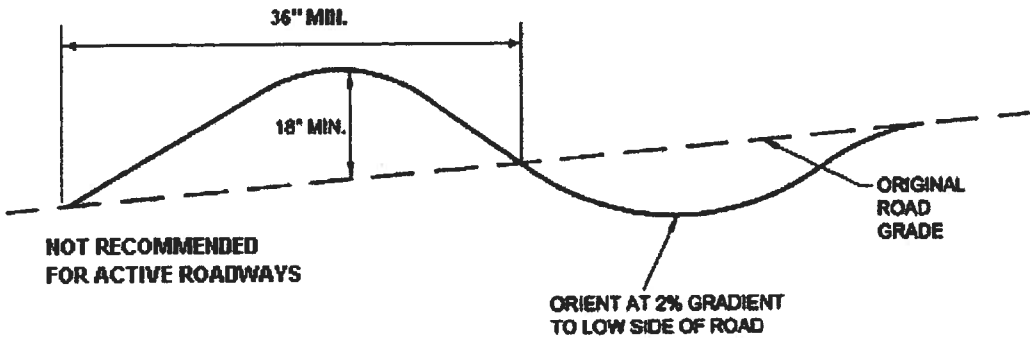
Waterbar Spacing: Circle all that apply

Road Grade (%)	Spacing (FT)
2	250
5	135
10	80
15	60
20	45
25	40
30	35
40	30

TYPICAL WATERBAR



STANDARD CONSTRUCTION DETAIL #3-5
WATERBAR

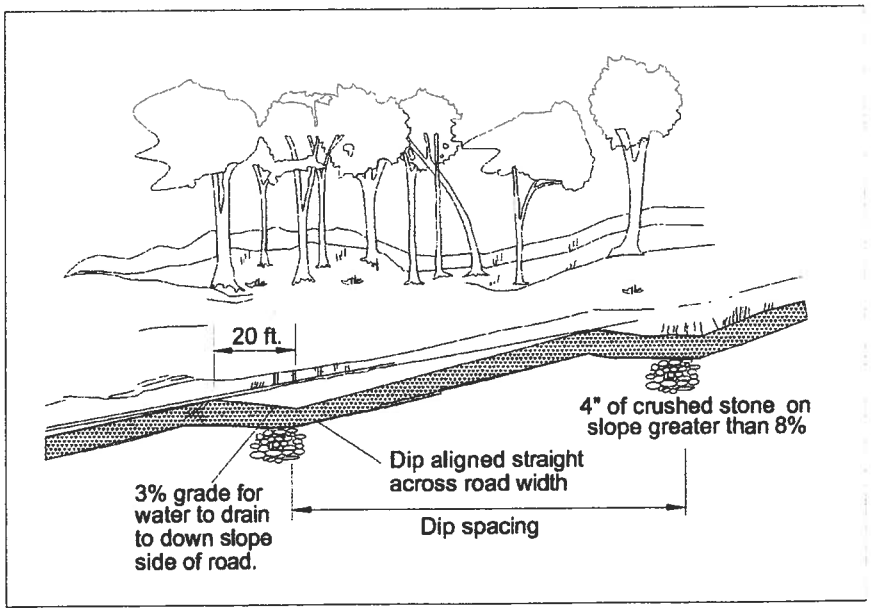


C. **BROAD-BASED DIPS** - Broad-based dips may be used to direct runoff from active access roads to well-vegetated areas or sediment removal BMPs (e.g. sediment traps). Broad-based dips, unlike waterbars, are easily traversed by construction equipment and typically require less maintenance to ensure their integrity. Due to the nature of broad-based dips, they should not be constructed on roads with grades exceeding 10%. Where access roads must exceed 10% gradients, insloping should be used to control runoff.

RECOMMENDED BROAD-BASED DIP SPACING

Road Grade (% Slope)	Recommended Spacing (feet)	Alternative Spacing* (feet)
2	300	_____
3	250	_____
4	200	_____
5	180	_____
6	170	_____
7	160	_____
8	150	_____
9-10	140	_____

TYPICAL BROAD-BASED DIP



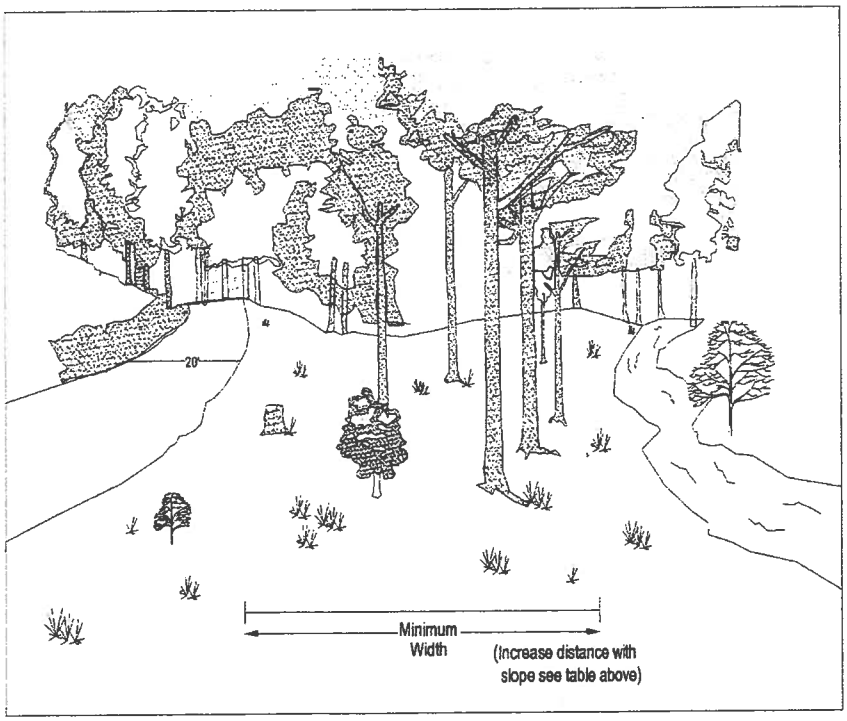
D. FILTER STRIPS

Slope of Land Between Road and Stream (%)	Minimum Length of Filter Strip (feet) +
0	25++
10	45++
20	65
30	85
40	105
50	125
60	145
70	165

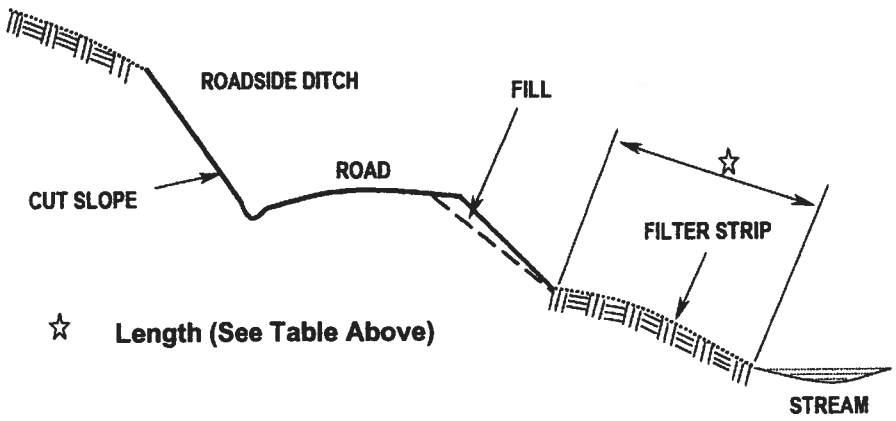
+ Lengths should be doubled when the earth disturbance activity is located where receiving waters have a designated use/existing use of High Quality or Exceptional Value or within a municipal water supply, source water area.

++ Earth disturbance 50 feet or less from the top of the stream bank (absent evidence to the contrary) requires a water obstruction and encroachment permit from the appropriate DEP Oil and Gas Management Program or Conservation District.

TYPICAL VEGETATIVE FILTER STRIP



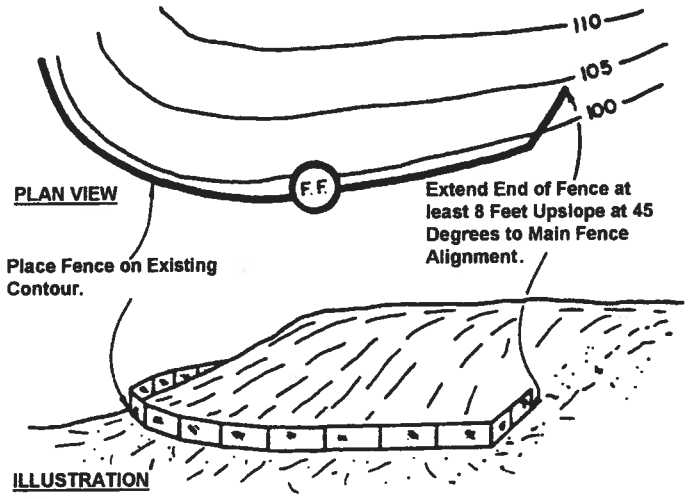
VEGETATIVE FILTER STRIP LENGTH



E. SILT FENCE - Silt fence may be used to control runoff from small disturbed areas when it is in the form of sheet flow, and the discharge is to a stable area. Only those fabric types specified for such use by the manufacturer should be used. Standard Filter Fabric width shall be 30" min.; Reinforced and Super Filter Fabric width shall be 42" min. Do not use silt fence in areas of concentrated flows (e.g. channels, swales, erosion gullies, across pipe outfalls, etc. Silt fence should not be used in areas where rock or rocky soils prevent the full and uniform anchoring of the fence. Forested areas are not recommended unless tree roots can be severed during excavation of the anchor trench.

Silt fence must be installed on existing level grade. Maximum slope length above silt fence may not exceed those shown in the table below.

SILT FENCE ALIGNMENT

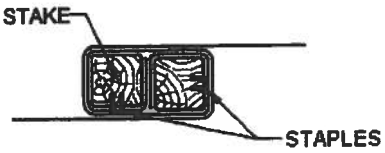


Maximum Slope Lengths for Silt Fence

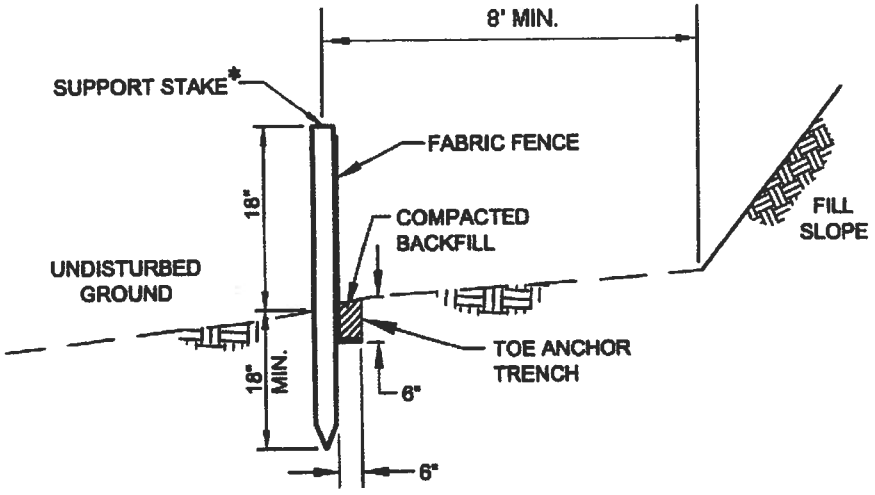
Slope - Percent	Maximum Slope Length (ft) Above Fence		
	Standard (18" High) Silt Fence	Reinforced (30" High) Silt Fence	Super Silt Fence
2 (or less)	150	500	1000
5	100	250	550
10	50	150	325
15	35	100	215
20	25	70	175
25	20	55	135
30	15	45	100
35	15	40	85
40	15	35	75
45	10	30	60
50	10	25	50

STANDARD SILT FENCE (18" HIGH)

*STAKES SPACED @ 8' MAX.
USE 2" x 2" (± 3/8") WOOD
OR EQUIVALENT STEEL
(U OR T) STAKES

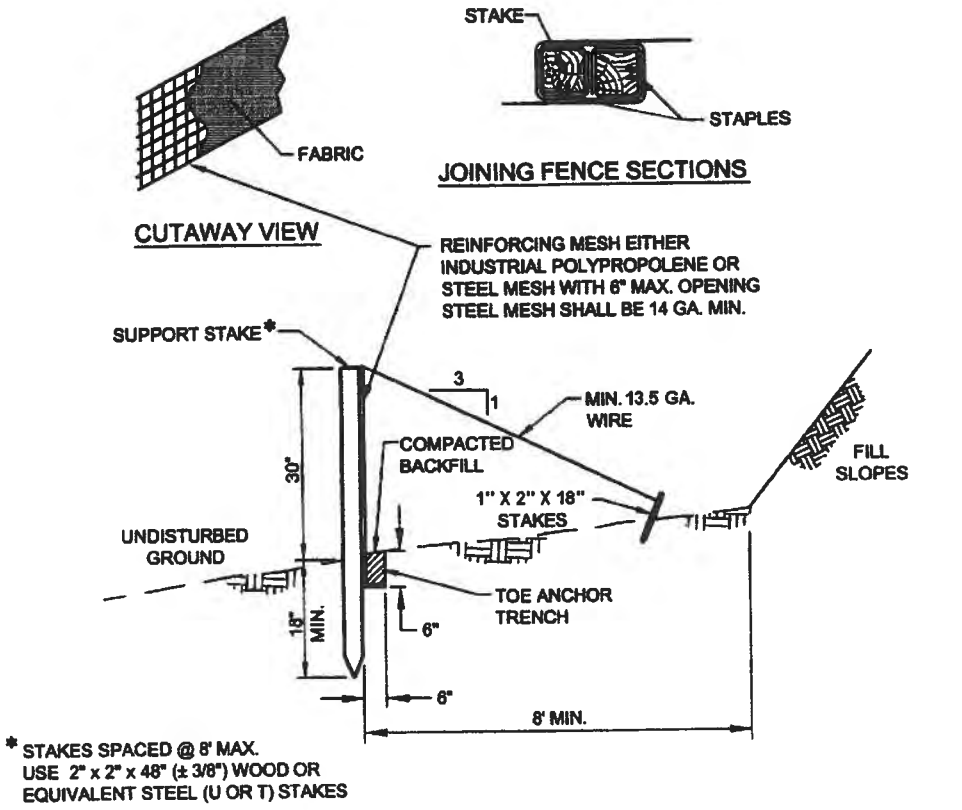


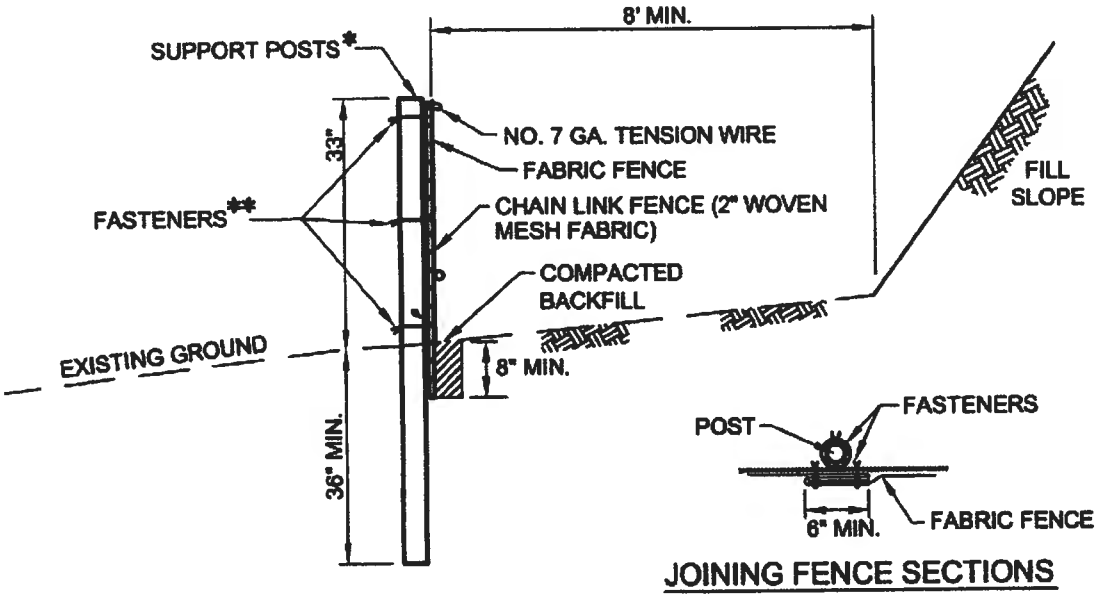
JOINING FENCE SECTIONS



ELEVATION VIEW

REINFORCED SILT FENCE (30" HIGH)

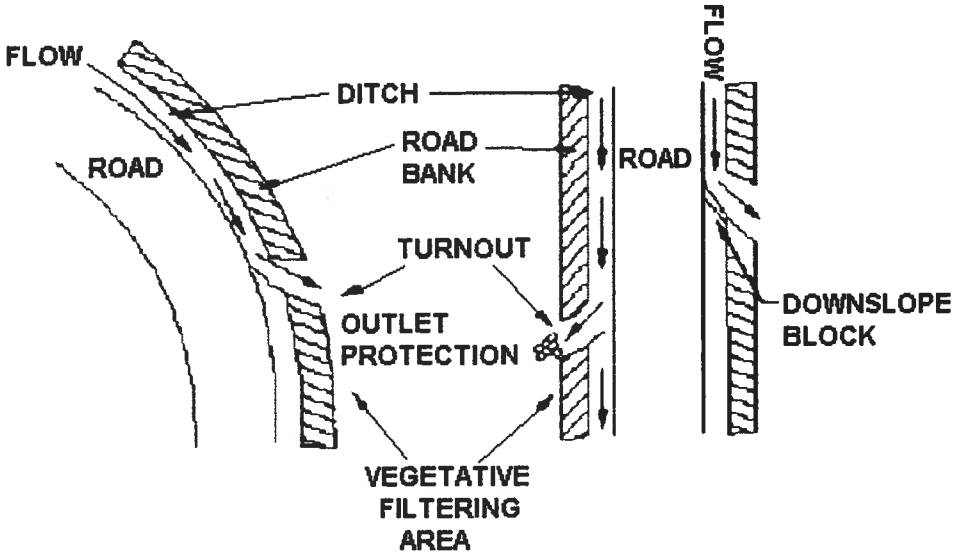




* POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. HEAVY DUTY GALVANIZED OR ALUMINUM POSTS.

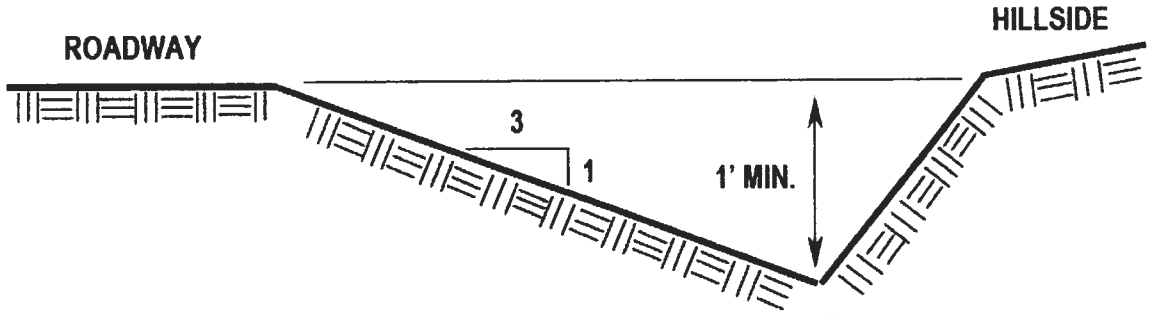
** CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 9 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE-FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 13.5 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX C. TO C.

F. **TURNOUT** Turnouts are typically located along crowned roadways where runoff cannot sheet flow off the roadway. Like ditch relief culverts, the purpose of turnouts is to minimize the volume of water in a roadside ditch. Turnouts should be located so as to take advantage of natural drainageways or buffer areas wherever possible. Where a suitable vegetative filter strip is not available, a compost filter sock, rock filter or other sediment removal BMP should be installed at the outlet of the turnout.

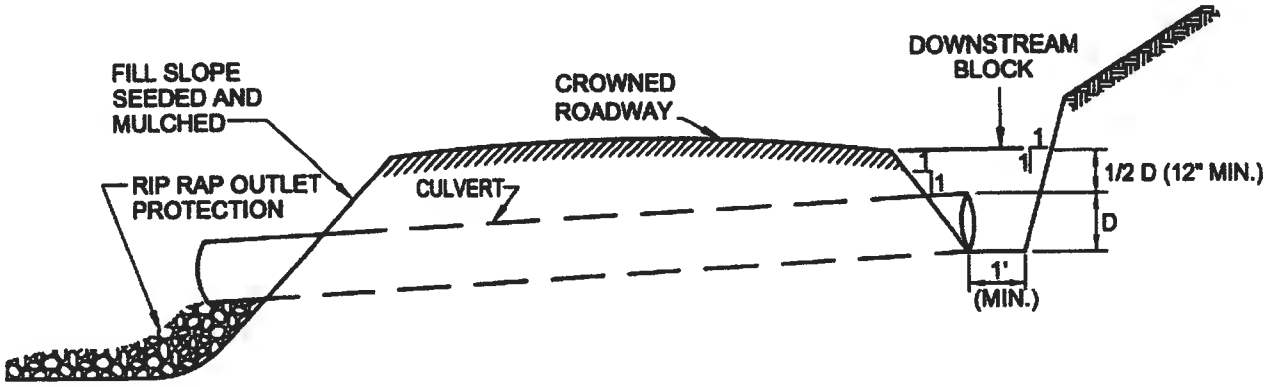


G. **ROADSIDE DITCH** - In most cases, the ditches paralleling temporary access roads and haul roads need not be lined if sufficient ditch relief culverts are provided, erosion resistant soils are present, and flow velocities are less than 2 fps. However, protective liners are required for roadside ditches discharging to special protection waters, where the discharging directly to surface waters, or where necessary to prevent the erosion of the channel itself.

Typical Roadside Ditch Section

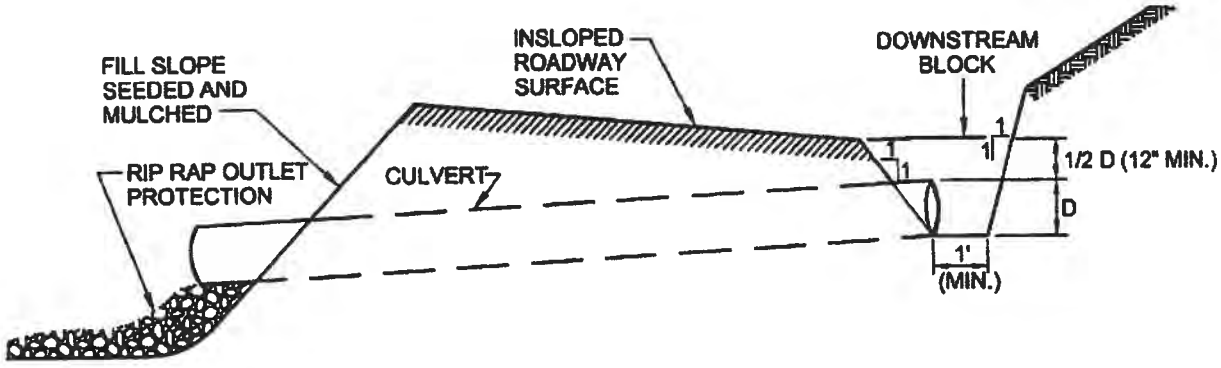


H. CROWNED / INSLOPED ROADWAY

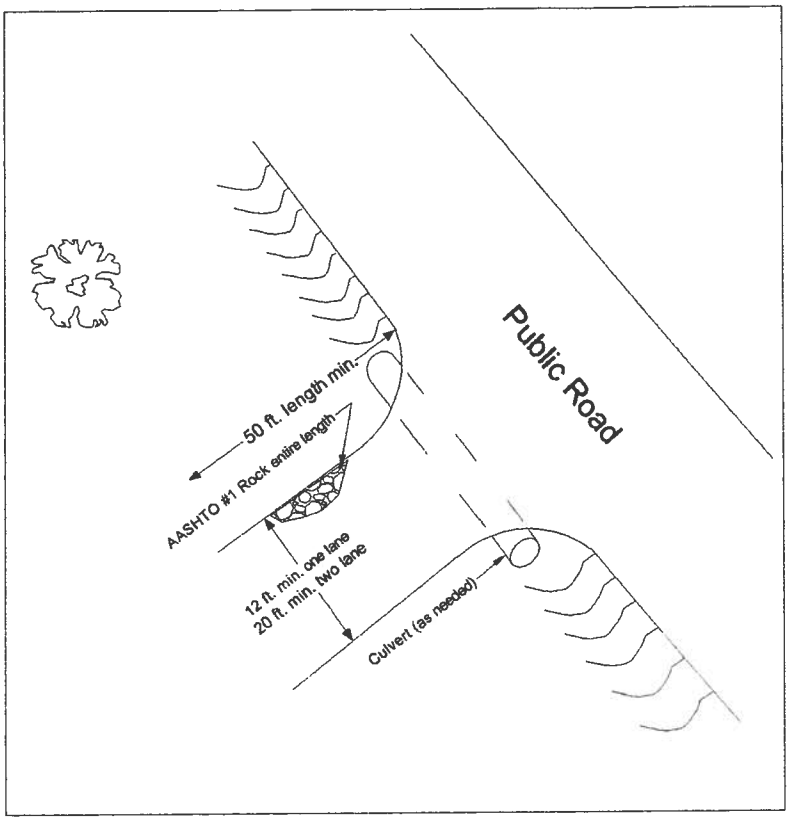


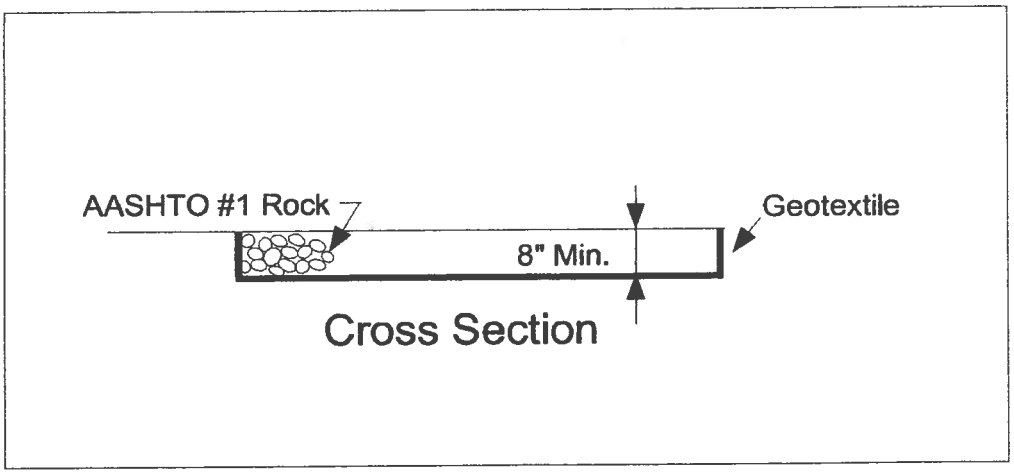
Cut and fill slopes shall be stabilized immediately upon completion of roadway grading. These areas shall be blanketed wherever they are located within 50 feet of a surface water or within 100 feet of a surface water where a suitable vegetative filter strip does not exist. A durable top dressing shall be provided for soils having low strength.

Roadside ditches shall be provided with adequate protective lining. Adequately sized culverts or other suitable cross drains shall be provided at all seeps, springs, and drainageways. Ditch relief culverts shall be provided at the intervals indicated on the Tables below. Roadway shall be inspected weekly and after each runoff event. Damaged roadways, ditches, or cross drains shall be repaired immediately.

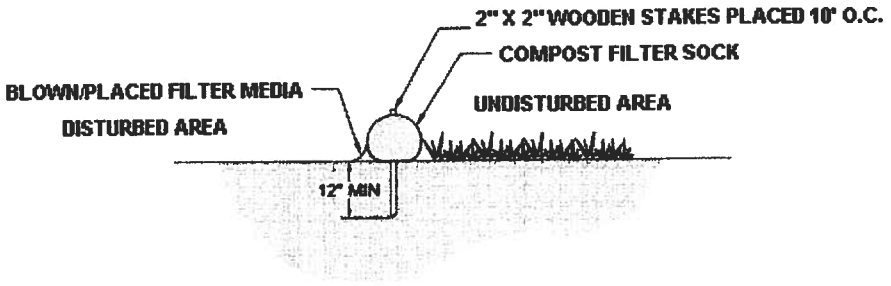


I. **STABILIZED ROAD ENTRANCE** - A rock construction entrance should be installed wherever it is anticipated that construction traffic will exit the project site onto any roadway, public or private. Access to the site should be limited to the stabilized construction entrance(s).

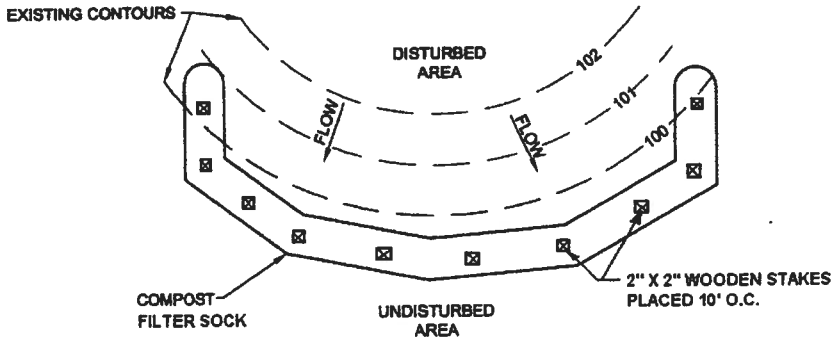




J. COMPOST FILTER SOCK



SECTION VIEW
NTS



PLAN VIEW
NTS

Compost shall meet the following standards:

Organic Matter Content	**80% - 100% (dry weight basis)**
Organic Portion	**Fibrous and elongated**
pH	**5.5 – 8.0**
Moisture Content	**35% – 55%**
Particle Size	**98% pass through 1" screen**
Soluble Salt Concentration	**5.0 dS Maximum**

Compost Filter Sock shall be placed at existing level grade. Both ends of the sock shall be extended at least 8 feet up slope at 45 degrees to the main sock alignment. Maximum slope length above any 18" diameter sock shall not exceed that shown on above table for reinforced silt fence. Maximum slope length for a 24" diameter sock shall not exceed that for super silt fence.

Traffic shall not be permitted to cross filter socks.

Accumulated Sediment shall be removed when it reaches ½ the above ground height of the sock and disposed in the manner described elsewhere in the plan.

Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired according to manufacturer's specifications or replaced within 24 hours of inspection.

Biodegradable filter sock shall be replaced after 6 months; photodegradable socks after 1 year. Polypropylene socks shall be replaced according to manufacturer's recommendations.

Upon stabilization of the area tributary to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed. In the latter case, the mesh shall be cut open and the mulch spread as a soil supplement.

K. CHANNELS

TEMPORARY VEGETATED TRAPEZOIDAL CHANNEL SIZING CHART (2H:1V SIDE SLOPES)										
Tributary Acres	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Minimum Channel Depth (ft)	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Channel Bed Slope (FT/FT)	**Minimum Channel Bottom Width (FT)**									
≤ 0.04	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
0.05	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.0
0.06	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0
0.07	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
0.08	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	6.0	6.0
0.09	2.0	2.0	2.0	2.0	2.0	2.0	4.0	6.0	6.0	6.0

TEMPORARY VEGETATED TRAPEZOIDAL CHANNEL SIZING CHART (2H:1V SIDE SLOPES) SPECIAL PROTECTION WATERSHED										
Tributary Acres	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Minimum Channel Depth (ft)	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Channel Bed Slope (FT/FT)	**Minimum Channel Bottom Width (FT)**									
≤ 0.04	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	6.0
0.05	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	6.0
0.06	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	6.0	6.0 TRM
0.07	2.0	2.0	2.0	2.0	2.0	4.0	4.0	6.0	6.0 TRM	6.0 TRM
0.08	2.0	2.0	2.0	2.0	2.0	4.0	6.0	6.0	6.0 TRM	6.0 TRM
0.09	2.0	2.0	2.0	2.0	4.0	6.0	6.0	6.0 TRM	6.0 TRM	6.0 TRM

TRM = Turf reinforcement matting

Supporting calculations are attached to show sufficient channel capacity and adequate protective liner. ☐ Yes ☐ No

VEGETATED CHANNEL

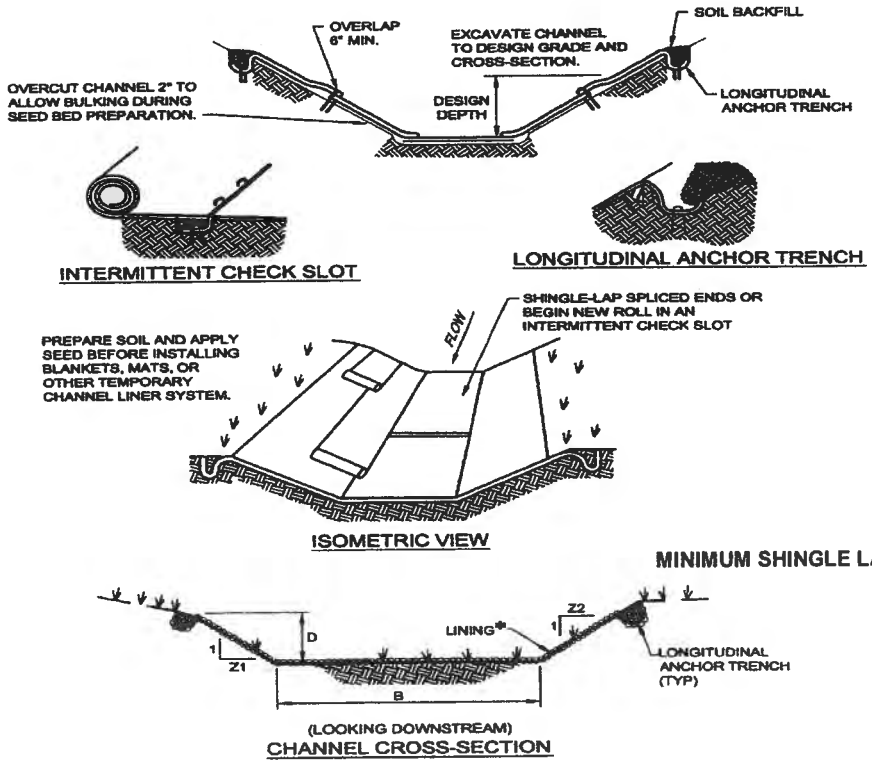
CHANNEL NO.	STATIONS	BOTTOM WIDTH B (FT)	DEPTH D (FT)	TOP WIDTH W (FT)	Left Side Slope Z1 (FT)	Right Side Slope Z2 (FT)	LINING*

Anchor trenches shall be installed at beginning and end of channel in the same manner as longitudinal anchor trenches.

Channel dimensions shall be constantly maintained. Sediment deposits shall be removed within 24 hours of discovery.

Damaged lining shall be repaired or replaced within 48 hours of discovery.

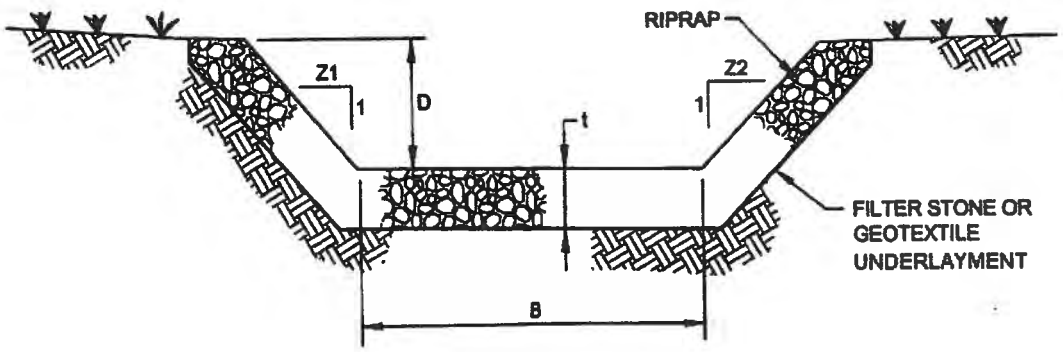
VEGETATED CHANNEL



* SEE MANUFACTURER'S LINING INSTALLATION DETAIL FOR STAPLE PATTERNS, AND VEGETATIVE STABILIZATION SPECIFICATIONS FOR SOIL AMENDMENTS, SEED MIXTURES AND MULCHING INFORMATION.

RIP-RAP CHANNEL

Channel	Stations	B	D	Z1	Z2	Riprap Gradation	t	Underlayment	Underlayment Thickness



STANDARD DESIGN FOR PERMANENT RIPRAP CHANNELS WITH 2:1 SIDE SLOPES & 2 FOOT TOTAL DEPTH																				
ACRES	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10
Bottom Width (Ft)	2	4	2	4	2	4	2	4	2	4	2	4	4	6	4	6	4	6	4	6`
Bed Slope (Ft/Ft)	RIPRAP R-SIZE																			
0.10	R-3	R-3	R-4	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-6	R-5	R-5	R-4	R-5	R-4	R-5	R-4	R-6	R-5
0.11	R-3	R-3	R-4	R-3	R-5	R-4	R-6	R-4	R-6	R-4	R-7	R-5	R-5	R-4	R-5	R-4	R-5	R-4	R-6	R-5
0.12	R-3	R-3	R-4	R-3	R-5	R-4	R-6	R-4	R-6	R-4	R-7	R-5	R-5	R-4	R-5	R-4	R-5	R-4	R-6	R-5
0.13	R-3	R-3	R-4	R-3	R-5	R-4	R-6	R-4	R-6	R-4	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.14	R-3	R-3	R-4	R-3	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.15	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.16	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.17	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.18	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.19	R-3	R-3	R-5	R-4	R-5	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5
0.20	R-3	R-3	R-5	R-4	R-6	R-4	R-6	R-4	R-7	R-5	R-7	R-5	R-5	R-4	R-6	R-5	R-6	R-5	R-6	R-5

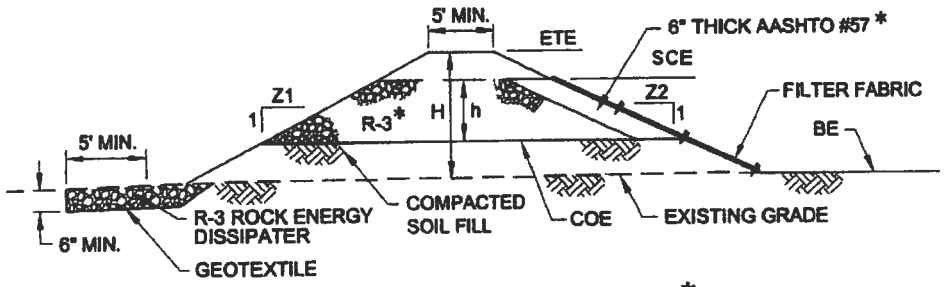
STANDARD DESIGN DIMENSIONS AND LINING FOR A PERMANENT GRASS CHANNEL WITH 2H:1V SIDE SLOPES AND 2 FOOT TOTAL DEPTH																				
ACRES	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10
Channel Bottom Width (Ft)	2	4	2	4	2	4	2	4	2	4	4	6	4	6	4	6	4	6	4	6`
Bed Slope	CHANNEL LINER = GRASS PLUS																			
0.01	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB
0.02	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	TRM	ECB	TRM	TRM	TRM	TRM
0.03	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	ECB	TRM	ECB	TRM	ECB	TRM	TRM	TRM	TRM
0.04	ECB	ECB	ECB	ECB	ECB	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.05	ECB	ECB	ECB	ECB	TRM	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.06	ECB	ECB	ECB	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.07	ECB	ECB	TRM	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.08	ECB	ECB	TRM	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM
0.09	ECB	ECB	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM	TRM

ECB = Erosion Control Blanket; TRM = Turf reinforcement Matting

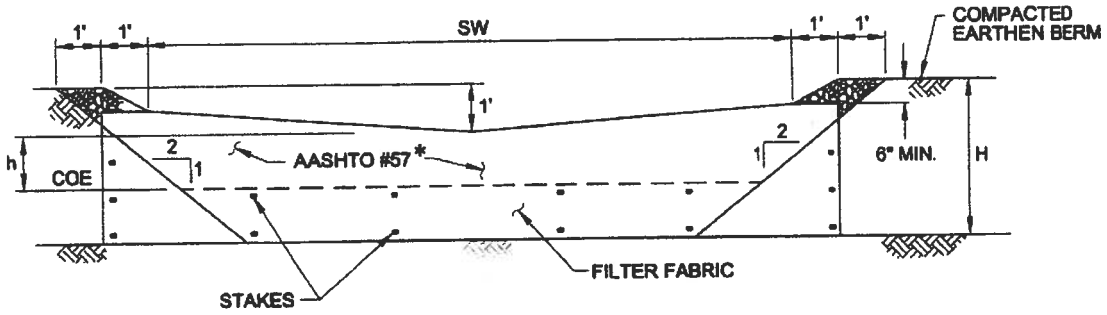
L. SEDIMENT TRAPS

Sediment traps may be used to control runoff from drainage areas up to 5.0 acres (disturbed and undisturbed). They must be sized to provide 2,000 cubic feet of total storage capacity for each acre tributary to the trap. The sediment storage zone is considered to be 700 cubic feet per acre. Outlets should be located as far from the inflow as possible. At a minimum, spillway widths should be equal to 6 feet for each acre tributary to the trap

Trap No.	Total Tributary Acres	Required Storage Capacity 2000 X Acres (CF)	Length (FT)	Width (FT)	Depth (FT)	Storage Capacity Provided (CF)



SECTION THROUGH SPILLWAY *



INSIDE FACE

M. SITE STABILIZATION

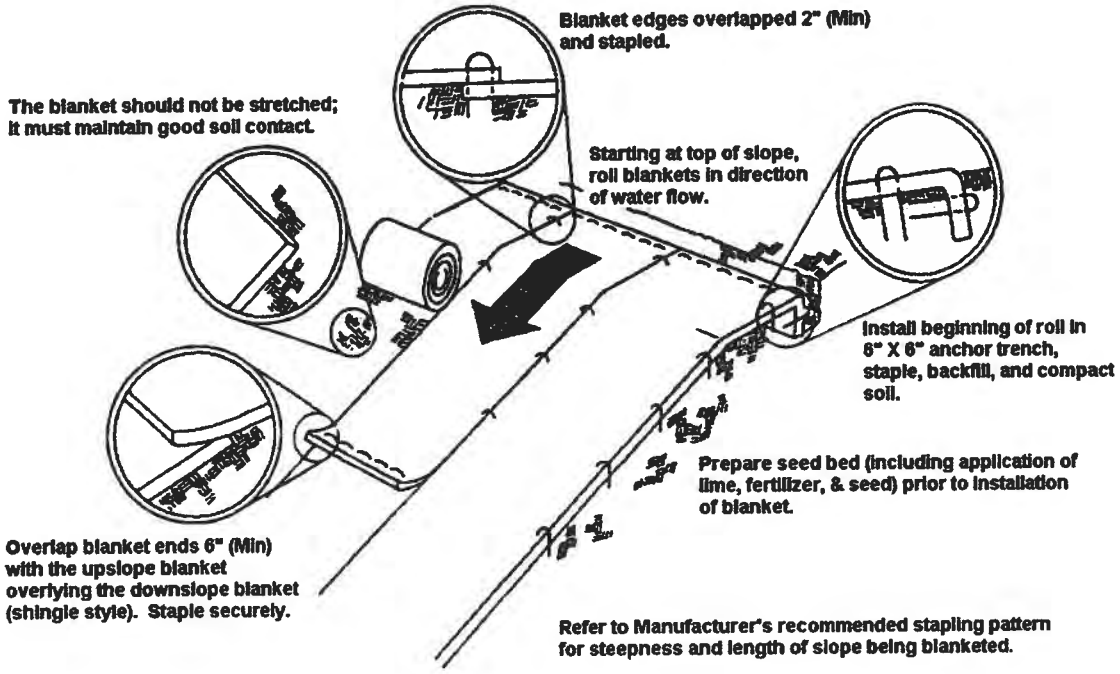
Recommended Permanent Seed Mixtures Cool and Warm Season Grass

Mixture Number	Season	Species	Seeding Rate lb./ac.
1	Cool	Tall fescue*, or Fine fescue, plus Redtop, or Perennial ryegrass, plus Birdsfoot trefoil	79 46 4 19 8
2	Cool	Birdsfoot trefoil, plus Tall fescue*	8 40
3	Cool	Orchardgrass, or Smooth bromegrass, plus Birdsfoot trefoil	26 33 8
4	Warm	Flatpea, plus Tall fescue*, or Perennial ryegrass	27 26 25
5	Warm	Deertongue, plus Birdsfoot treefoil	21 8
6	Warm	Switchgrass, or Big Bluestem, plus Birdsfoot trefoil	15 15 8

Recommended Seed Mixtures for Stabilizing Disturbed Areas

Site Condition	Seed Mixture (Select One Mixture)
Cut Slopes and Fills (not mowed) Well-drained Variable drainage	2, 4, or 6 2
Cut Slopes and Fills (mowed)	1
Cut Slopes and Fills (grazed/hay)	1, 2, or 3
Gullies and Eroded Areas	2 or 6
Erosion Control BMPs Channels, Drainage ditches, Trap embankments, etc. For hay or silage	1 or 2 2 or 3
Right-of-way Well-drained Variable drainage Well-drained areas for grazing/hay	4 or 6 2 2 or 3
Strip Mined Areas Spoils, waste areas, fly ash, slag, etc. (lime to soil test) For grazing/hay	2, 4, or 5 2, 3, or 6

N. EROSION CONTROL BLANKETS



Spray-on erosion control blankets (e.g. bonded fiber matrix or flexible growth medium) may be used in lieu of roll-on blankets if manufacturers' recommendations are followed.

APPENDIX B

LIMITATIONS OF PENNSYLVANIA SOILS PERTAINING TO EARTHMOVING PROJECTS
(Absence of an X does not mean "No Potential Limitation")
NOTE: THIS IS NOT NECESSARILY AN ALL-INCLUSIVE LIST.

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRET\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Abbottstown	X	C/S		X		X	X	X	X	X	X	X				X
Aeric Epiaquents	X	C/S	X			X	X				X	X				X
Albrights	X	C/S	X	X		X	X	X	X	X	X	X				X
Alden	X	C/S				X	X	X	X	X	X	X	X		X	X
Aldino	X	C/S				X	X	X	X	X		X				
Allegheny	X	C		X			X	X	X	X	X	X				
Allenwood	X	C/S					X	X	X	X	X	X				
Allis	X	X	X			X	X	X	X	X	X	X	X			
Alluvial Land	X	C/S			X	X	X		X	X	X	X		X		X
Alton	X	C	X						X		X	X				
Alvira	X	C/S	X	X		X	X	X	X	X	X	X				X
Amwell	X	C/S		X		X	X	X	X	X		X				
Andover	X	C/S	X	X		X	X	X	X	X	X	X				X
Aquepts	X	C/S				X	X	X	X	X	X	X			X	X
Aquults	X	C/S		X		X		X	X	X	X	X	X			X
Arents							X									
Arendtsville	X	C	X			X			X	X	X	X				X
Armagh	X	C/S				X	X	X	X	X	X	X	X			X
Arnot	X	C	X	X				X	X		X	X				
Ashton	X				X			X	X	X						
Atherton	X	S				X	X	X	X	X	X	X			X	X
Athol	X	C					X		X	X	X	X				
Atkins	X	C/S			X	X	X	X	X	X	X	X				X
Bagtown	X	C				X	X		X		X	X				X
Baile	X	C/S		X		X	X	X	X	X	X	X	X		X	X
Barbour	X	C	X		X	X	X				X	X				X
Basher	X	C/S			X	X	X	X	X	X	X	X				X
Bath	X	C/S				X	X		X		X	X				

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\ STEEL*	DROUGHTY	EASILY ERODED ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Beach & Riverwash	X	C/S				X	X	X		X		X				
Beach Sand	X	C/S			X	X	X		X		X					
Bedington	X	C	X	X			X		X		X	X				
Belmont				X									X			
Beltsville	X	C/S		X		X	X	X	X	X		X				
Benson	X	C	X					X	X	X	X	X				
Berks	X	C	X	X			X		X	X	X					
Bermudian	X	C		X	X	X	X	X		X	X	X				X
Berrien	X	S		X		X	X		X	X		X			X	
Bethesda	X	C/S	X			X	X	X	X		X	X				X
Birdsall	X	C/S				X	X	X	X	X	X	X	X		X	X
Birdsboro	X	C/S		X		X	X		X	X	X	X				X
Blairton	X	C/S		X		X	X	X	X	X	X	X				X
Bowmansville	X	C/S			X	X	X	X	X	X	X	X				X
Braceville	X	C/S	X	X		X	X	X	X	X	X	X				X
Brandywine	X	C	X	X				X	X		X					
Brecknock	X	C	X						X	X	X	X				
Brinkerton	X	C/S	X	X		X	X	X	X	X	X	X	X			X
Brooke	X	S						X	X		X	X	X			
Brownsburg	X	C		X			X	X	X	X	X	X				
Buchanan	X	C/S	X	X		X	X	X	X	X	X	X				X
Buckingham	X	C/S		X		X	X	X	X	X	X	X				X
Bucks	X	C						X	X	X	X	X	X			
Burgin						X		X	X			X	X			
Butlertown	X	C/S		X		X	X	X	X	X		X				
Califon	X	C/S				X		X	X			X				X
Calvert	X	C/S		X		X	X	X	X	X	X	X	X			X
Calvin	X	C	X	X			X			X		X				
Cambridge	X	C/S		X		X	X	X	X	X		X			X	X
Canadice	X	S		X		X	X	X	X		X	X	X		X	X
Canaseraga	X	C/S		X		X		X	X	X		X				X
Caneadea	X	C/S		X		X	X	X	X		X	X	X			X
Canfield	X	C/S		X		X	X	X	X	X		X				X
Carbo	X	S	X	X				X	X		X		X	X		
Catden	X	S				X		X	X			X			X	X
Carlisle	X	S				X	X		X			X			X	X
Catoctin	X	C/S	X								X					
Cattaraugus	X	C	X			X			X		X	X				
Cavode	X	C/S		X		X	X	X	X	X		X	X			X

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRET\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Cedarcreek	X	C/S	X			X	X	X			X					
Ceres	X	C						X	X		X	X				
Chagrin	X	C		X	X	X	X	X	X	X		X	X		X	X
Chalfont	X	C/S		X		X	X	X	X	X	X	X				X
Chavies		C		X	X			X		X		X				
Chenango	X	C	X		X	X	X		X	X	X	X				
Chester	X	C		X				X	X	X	X	X				
Chewacla	X	C/S			X	X	X	X	X	X		X				X
Chili	X	C					X	X	X		X	X				
Chippewa	X	C/S	X	X		X	X	X	X	X		X	X		X	
Chrome	X	C/S	X					X	X		X	X	X			
Clarksburg	X	C/S		X		X	X	X	X	X	X	X	X	X		X
Clearbrook	X	C/S	X				X	X	X	X	X	X	X			
Clymer	X	C	X	X			X	X	X	X	X	X				X
Codorus	X	C/S			X	X	X	X	X	X		X				X
Cokesbury	X					X			X	X		X				
Collamer	X	C/S		X		X	X	X	X	X		X				X
Colonie	X	C	X					X	X		X					
Comly	X	C/S	X	X		X	X			X	X	X				
Comus	X	C		X	X		X	X	X	X		X				
Conestoga	X	C/S						X	X	X		X		X		
Congaree	X	C		X	X		X	X	X	X		X				
Conotton	X	C/S	X	X		X	X	X	X	X	X	X				
Conowingo	X	C/S		X		X		X	X	X		X	X			X
Cookport	X	C/S	X	X		X	X	X	X	X	X	X				X
Covegap	X	C/S							X		X	X		X		
Craigsville	X	C	X		X		X	X			X	X				
Croton	X	C/S		X		X	X	X	X	X	X	X			X	X
Culleoka	X	C		X				X	X	X	X	X				
Culvers	X	C/S	X			X		X	X	X		X				X
Dalton	X	C/S		X		X	X		X	X	X	X			X	
Darien	X	C/S				X		X	X	X	X	X	X			X
Dekalb	X	C	X					X	X	X	X	X				
Delaware	X	C			X		X		X			X				
Deposit	X	C/S	X		X	X	X		X		X					X
Dormont	X	C/S		X		X	X	X	X	X	X	X	X	X		X
Downsville	X	C							X		X	X		X		
Doylestown	X	C/S	X	X		X	X	X	X	X	X	X				X
Drifton	X	C/S		X		X	X	X	X		X	X				

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Dryrun	X	C/S		X		X	X		X		X	X				
Duffield	X	C/S		X			X	X	X	X	X		X	X		X
Duncannon	X	C		X				X	X	X		X				
Dunning	X	C/S		X	X	X	X	X	X		X		X	X	X	X
Dystrochrepts	X	C/S	X	X	X	X	X	X	X	X	X	X				
Edgemere	X	C/S				X	X	X	X	X	X	X			X	X
Edgemont	X	C	X				X		X		X	X				
Edom	X	S	X	X				X	X	X	X	X	X	X	X	
Elk	X	C/S		X			X	X	X	X						
Elkins	X	c/s			X	X	X	X	X	X	X	X	X			
Elko	X	C/S	X			X		X	X			X	X			X
Ellery	X	C/S	X			X	X	X	X	X	X	X			X	X
Elliber	X	C	X						X		X	X		X		
Elnora	X	C	X			X			X		X					X
Empyville	X	C	X			X	X		X		X	X				
Erie	X	S	X	X		X	X	X	X	X	X	X			X	X
Ernest	X	C/S		X		X	X	X	X	X	X	X	X			X
Evendale	X	C/S				X	X	X	X	X	X	X	X	X		X
Fairplay	X	S		X	X	X	X	X	X	X	X	X			X	
Fairpoint	X	C/S	X				X	X	X		X	X	X	X		
Fitchville	X	C/S				X	X	X	X	X	X	X	X			X
Fountainville	X	C/S		X		X		X	X	X		X				
Fleetwood	X	C	X					X			X					X
Fluvents	X	C/S	X	X	X	X	X			X		X				
Fluvequents	X	C/S	X	X	X	X	X	X		X		X				
Fredon	X	C/S	X	X		X	X	X	X		X	X				X
Freetown	X	C/S				X	X	X				X			X	
Frenchtown	X	C/S		X		X	X	X	X	X	X	X			X	X
Freshwater Marsh	X	S				X	X	X	X		X	X			X	
Funkstown	X	S		X	X	X		X	X	X		X				X
Gageville	X	C/S		X		X		X	X	X	X	X	X			X
Gaila	X	C/S						X	X		X	X				
Gibralter	X	C/S		X	X	X	X	X	X	X		X				
Gilpin	X	C	X	X			X	X	X	X	X	X				
Ginat	X	C/S		X		X	X	X	X	X	X	X	X		X	X
Gladstone	X	C		X			X		X			X	X			
Glenelg	X	C		X			X	X	X	X	X	X				X
Gleneyre	X	C/S			X	X	X	X	X	X	X	X			X	X
Glenford	X	C/S				X	X	X	X	X		X	X			

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Glenville	X	C/S				X	X	X	X	X	X	X				X
Gresham		X		X			X	X	X	X		X				X
Guernsey	X	C/S		X		X	X	X	X		X	X	X	X		X
Guthrie							X									
Hagerstown	X	S		X		X	X	X	X	X	X	X	X	X		
Halsey	X	C/S		X	X	X	X	X	X	X	X	X				X
Hanover	X	C/S				X	X	X	X	X		X	X			
Harbor	X	C/S				X		X	X			X	X			
Haplaquents							X									
Hartleton	X	C	X					X	X	X	X	X				
Hatboro	X	C/S			X	X	X	X	X	X	X	X				X
Haven	X	C	X					X	X			X				
Hazleton	X	C	X	X			X	X	X	X	X	X				
Henrietta	X					X		X	X		X	X			X	
Highfield	X	C	X				X		X		X	X				
Hollinger	X	C						X	X	X		X		X		
Holly	X	C/S			X	X	X	X	X	X	X	X			X	X
Hornell	X	C/S	X	X		X		X	X		X	X	X			X
Howard	X		X	X			X		X		X	X				
Howell	X	C/S		X		X		X		X		X	X			
Hublersburg	X	C/S						X	X	X	X	X	X			
Huntington	X	C			X	X	X	X				X		X		
Hustontown	X	C/S	X			X	X		X	X		X				
Itmann	X	C/S	X					X	X		X	X				
Ivory	X	C/S		X		X	X	X	X	X	X	X	X			
Jimtown	X	C/S				X	X	X			X	X				X
Joanna	X	C					X	X	X	X		X				
Jugtown	X	S			X	X	X	X	X	X		X		X		
Kedron	X	C/S				X	X	X	X	X	X	X				X
Kanona							X									
Kimbles	X	C/S				X	X	X	X		X	X				X
Kingsville	X	C/S	X			X	X		X		X	X			X	X
Kinzua	X	C						X	X		X	X				
Klinesville	X	C/S	X	X			X		X		X	X				
Knauers	X	C/S	X		X	X	X	X	X		X	X			X	X
Kreamer	X	C/S		X		X	X	X	X	X		X		X		
Lackawanna	X	C	X			X	X	X			X	X				X
Laidig	X	C/S	X	X		X	X	X	X	X	X	X				
Lakin	X	C	X						X							

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Lamington	X	C/S		X		X	X		X	X	X	X			X	X
Langford	X	S	X	X		X	X	X	X		X	X			X	X
Lansdale	X	C	X					X	X		X	X				
Lantz	X	C/S		X	X	X	X	X	X	X	X	X	X			X
Lawrenceville	X	C/S		X		X	X	X	X	X		X				X
Leck Kill	X	C						X	X	X	X	X				X
Leetonia	X	C	X	X			X				X					
Legore	X	C/S	X					X	X	X	X	X	X			
Lehew	X	C	X						X		X					
Lehigh	X	C/S				X	X		X	X	X	X				X
Lewisberry		C								X	X	X				
Library	X	C/S		X		X	X	X	X		X	X	X	X		X
Lickdale	X	C/S		X		X	X	X	X		X	X	X			
Linden	X	C			X	X	X	X	X	X		X				
Lindside	X	S			X	X	X	X	X	X		X		X		X
Lobdell	X	C/S		X	X	X	X	X	X	X		X	X			X
Lordstown	X	C	X	X				X	X	X		X				
Loudonville	X	C/S						X	X	X		X	X			
Lowell	X	C/S						X	X	X	X	X	X	X		
Luray		X		X		X		X	X	X	X	X	X		X	X
Macove	X	C/S						X	X		X	X				
Mahoning	X	C/S		X		X	X	X	X	X	X	X	X		X	X
Manlius	X	C	X				X		X		X	X				
Manor	X	C		X				X	X	X	X	X				
Mardin	X	S	X	X		X	X	X	X	X		X				X
Markes	X	C/S	X			X		X	X		X	X				X
Matapeake	X	C/S		X			X	X	X			X				
Matewan	X	C	X						X		X					
Mattapex	X	C/S		X		X	X	X	X	X		X				
Maurertown	X	C/S		X	X	X	X	X	X	X	X	X	X		X	
Meckesville	X	C/S				X		X	X	X	X	X				X
Medihemists	X	S				X	X	X				X			X	X
Medifibrists	X	S				X	X					X			X	X
Medisaprists		S				X	X	X				X			X	X
Melvin	X	S		X	X	X	X	X	X	X	X	X	X	X	X	X
Mertz	X	C/S								X		X				
Middlebury	X	S			X	X	X		X	X		X	X			
Mill	X	C/S				X	X	X	X	X	X	X	X		X	X
Millheim		C/S		X				X	X	X	X		X			

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Miner	X	C/S				X	X	X	X		X	X	X		X	X
Monongahela	X	C/S		X		X	X	X	X	X		X	X			X
Montalto	X	C/S					X	X	X		X	X	X			
Montevallo		C/S	X				X	X			X	X				
Morris	X	C/S	X	X		X	X	X	X		X	X				X
Morrison	X	C		X				X	X			X		X		
Mt. Airy	X	C	X				X				X	X				
Mt. Lucas	X	C/S				X	X	X	X	X	X	X				X
Mt. Zion	X	C/S		X		X	X	X	X	X	X	X	X			
Muck		X			X	X	X			X					X	X
Muck and Peat	X	S				X	X	X	X		X	X	X		X	X
Murrill	X	C/S					X	X	X	X	X	X		X		
Myersville	X	C/S						X	X	X	X	X				
Nanticoke	X	C			X	X	X	X	X	X	X				X	X
Natalie							X									
Neshaminy	X	C/S				X	X	X	X	X	X	X				
Newark	X	S		X	X	X	X	X	X	X	X	X		X		
Nockamixon	X	C/S		X		X	X	X	X	X		X				X
Nolin	X	C			X	X	X	X	X	X				X		
Nollville	X	C/S						X	X		X	X	X	X		
Nolo	X	C/S	X			X	X	X	X	X	X	X				X
Norwich	X	C/S	X	X		X	X	X	X		X	X			X	X
Ochrepts	X	C	X						X		X	X				
Onoville	X	C/S	X			X		X	X	X	X	X	X			X
Opequon	X	S	X	X				X	X		X	X	X	X		
Oquaga	X	C	X	X			X		X			X				
Orrville	X	C/S			X	X	X	X	X	X		X				X
Otego	X	S		X	X	X		X	X	X		X				X
Othello	X	C/S				X	X	X	X	X	X	X				X
Ottawa	X	C	X						X			X				
Painesville	X	C/S				X	X		X	X	X	X				X
Palms	X	C/S				X	X	X	X		X	X			X	X
Papakating	X	C/S			X	X	X	X	X	X	X	X			X	X
Parker	X	C	X						X		X	X				
Paupack	X	S				X	X		X			X			X	X
Pecktonville	X	C/S		X		X		X	X		X	X	X	X		
Pekin					X		X			X		X				
Penlaw	X	C/S		X		X	X	X	X	X	X	X	X	X		X
Penn	X	C	X				X	X		X	X	X				

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Penn Val	X	C/S							X		X	X				
Pequea	X			X						X	X	X				
Phelps	X	S		X		X	X		X	X	X	X				X
Philo	X	C/S		X	X	X	X	X	X	X	X	X				X
Platea	X	C/S		X		X	X	X	X	X		X				X
Pocono	X	C	X						X		X					
Pope	X	C/S		X	X		X	X	X	X	X	X				
Portville	X	C/S				X	X		X	X	X	X	X			
Potomac	X	C	X		X						X					
Psamments	X	C	X		X	X			X		X					
Purdy	X	C/S		X		X	X	X	X	X	X	X	X			X
Rainsboro	X	X		X		X	X	X	X			X				
Ramsey		C	X						X		X					
Raritan	X	C/S				X	X		X	X	X	X				X
Ravenna		C/S		X		X			X	X	X	X				X
Ravenrock	X	C/S				X			X		X	X				
Rayne	X	C		X				X	X	X	X	X				
Readington	X	C/S		X		X	X	X	X	X	X	X				X
Reaville	X	C/S	X	X		X	X		X	X	X	X				X
Red Hook	X	C/S		X	X	X	X		X	X	X	X				
Rexford	X	C/S	X		X	X	X	X	X	X	X	X				X
Rimer	X	C/S	X	X		X	X		X	X	X	X	X			X
Riverhead	X	C	X					X	X		X	X				X
Riverwash							X									
Rohrersville	X	C/S		X		X	X	X	X	X		X	X			X
Rowland	X	C/S		X	X	X	X	X	X	X	X	X				X
Rubble Land											X					
Rushtown	X	C	X						X							
Ryder	X	C/S						X	X	X		X		X		
Sassafras	X	C						X	X			X				
Scio	X	C/S		X		X	X	X	X	X		X				X
Sciotoville	X	C/S		X		X	X	X	X	X		X	X			X
Sebring	X	C/S				X	X	X	X	X	X	X	X		X	X
Sequatchie		X		X						X						
Sheffield	X	C/S				X	X	X	X	X		X			X	
Shelmadine	X	C/S	X			X	X	X	X	X	X	X				
Shelocta	X	C						X	X		X	X				
Shohola	X	C/S	X			X	X	X	X	X	X	X				X
Shongo	X	C/S				X	X	X	X	X	X	X	X			X

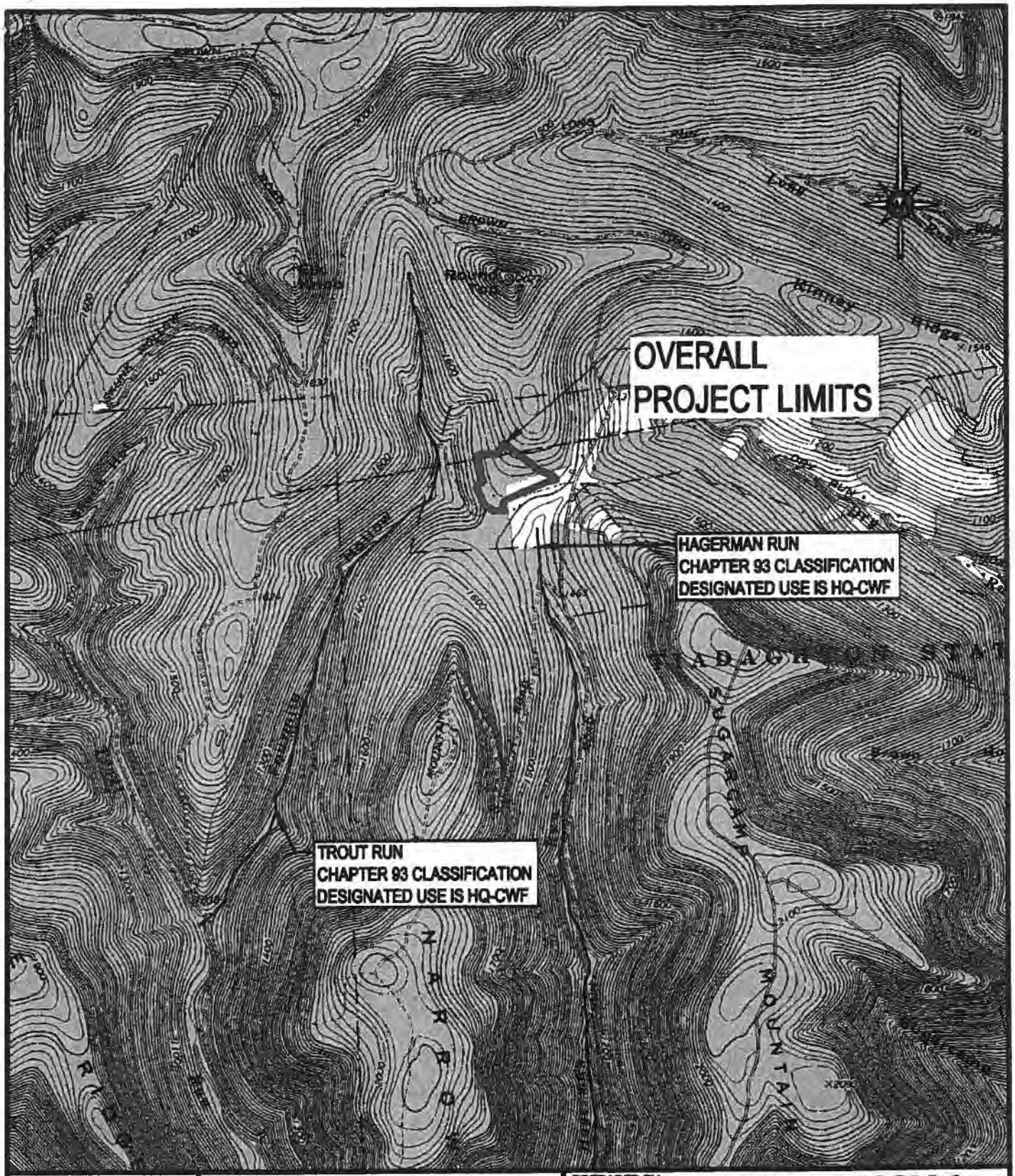
SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Sideling	X	C/S				X			X	X	X	X	X			
Skidmore	X	C	X		X	X	X		X		X					
Sloan	X	S		X	X	X	X	X	X	X	X	X	X			X
Solon	X	C	X					X			X	X				
Stanhope	X	C/S		X	X	X	X	X	X	X	X	X	X			X
Steff					X	X	X	X				X				
Steinsburg	X	C	X						X		X					
Stoney Land											X					
Swanpond	X	S		X		X		X	X		X	X	X			X
Suncook	X	C	X		X		X		X		X					
Swartswood	X	C	X	X		X		X	X	X	X					
Thorndale	X	C/S				X	X	X	X	X	X	X	X	X		X
Thurmont	X	C/S				X		X	X		X	X				
Tilsit	X	C/S		X		X	X	X	X	X						X
Tioga	X	C		X	X	X	X		X							
Timberville	X	C			X			X	X	X	X	X	X			
Titusville	X	C/S		X		X	X	X	X	X		X	X			X
Towhee	X			X		X	X	X	X	X	X	X	X			
Trego	X	C/S		X		X		X	X		X	X	X			
Trumbull	X	C/S		X		X	X	X	X	X	X	X	X		X	X
Tunkhannock	X	C	X				X		X		X					
Tygart	X	C/S		X		X	X	X	X	X	X	X	X			X
Tyler	X	C/S		X		X	X	X	X	X	X	X	X			X
Udifluvents	X	C/S			X	X	X		X	X		X				
Udorthents	X	C/S	X	X				X	X		X	X				
Unadilla	X	C		X			X	X	X	X		X				
Ungers	X	C		X				X	X			X				
Upshur	X	C/S	X	X				X	X		X	X	X			
Urbana						X						X				
Valois	X	C					X	X	X		X	X				
Vandergrift	X	C/S		X			X	X	X		X	X	X			X
Vanderlip	X	C	X						X							
Venango	X	C/S		X		X	X	X	X	X	X	X				X
Volusia	X	C/S	X	X		X	X	X	X	X	X	X				
Wallington	X	C/S		X		X	X	X	X	X	X	X				X
Warners		S		X	X	X	X	X	X		X	X			X	X
Washington	X	S				X	X	X	X	X		X	X	X		
Watchung	X	C/S		X		X	X	X	X	X	X	X	X			X
Watson	X	C/S	X			X	X	X	X	X		X	X			

SOIL NAME	CUTBANKS CAVE	CORROSIVE TO CONCRETE\ STEEL*	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Wauseon	X	C/S				X	X	X	X	X	X	X			X	X
Wayland	X	S		X	X	X	X	X	X	X	X	X			X	X
Wehadkee	X	C/S			X	X		X	X	X		X				X
Weikert	X	C/S	X				X	X	X	X	X	X				
Weinbach	X	C/S		X		X	X	X	X	X	X	X	X			X
Wellsboro	X	C/S	X	X		X	X	X	X	X		X				X
Westmoreland	X	C		X				X	X	X		X				
Weverton	X	C/S	X					X	X		X	X				
Wharton	X	C/S		X		X	X	X	X	X	X	X	X			X
Wheeling	X	C						X	X	X		X				
Whiteford																
Whitwell																
Wick	X	C/S		X	X	X	X	X	X	X	X	X				X
Wickham																
Williamson	X	C/S		X		X	X	X	X	X		X				X
Wiltshire					X					X						
Woodglen																
Woodstown	X	C/S				X		X	X	X	X	X				X
Wooster	X	C		X		X		X	X	X	X	X				
Worsham	X	C/S		X		X	X	X	X	X	X	X	X			
Worth	X	C	X	X		X	X		X	X	X	X				
Wurno	X		X					X	X		X	X		X		
Wurstboro	X	C/S				X	X		X		X	X				
Wyalusing	X	C/S			X	X	X	X	X		X	X				X
Wyoming	X	C	X				X		X		X					
Zipp		X				X	X	X		X	X	X	X			
Zoar	X	C/S				X	X	X	X	X		X	X			

WORKSHEET 1

List the soils that will be encountered by earthmoving required to construct the drill pad(s), access road(s), pits, impoundments, collector & feeder lines, or other activities associated with the proposed well site(s).

		Limiting Soil Characteristics							
Map Symbol	Soil Name	Erodible	Cut Banks Cave	Corrosive to Concrete or Steel	High Water Table	Low Strength	Piping	Poor Topsoil	Potentially Hydric
LaB	Lackawanna		X	C	X	X		X	X
LaC	Lackawanna		X	C	X	X		X	X
LdB	Lackawanna		X	C	X	X		X	X
LdD	Lackawanna		X	C	X	X		X	X
OgD	Oquaga & Lordstown	X	X	C		X	X		X
OxB	Oquaga & Lordstown	X	X	C		X	X		X
OxD	Oquaga & Lordstown	X	X	C		X	X		X
OxE	Oquaga & Lordstown	X	X	C		X	X		X



PROJ. MNGR: DPM	DATE: 08/29/2011
DRAFTED BY: DPM	SCALE: 1"=2000'
PROJECT NO.: 2011152	
DRAWING NO.: 2011152SLM	

PLAN TITLE:

DCNR TR 100
HAGERMAN
COMPRESSOR PAD

PREPARED FOR:

SENECA RESOURCES
LEWIS/MCINTYRE TOWNSHIP
LYCOMING COUNTY
COMMONWEALTH OF PENNSYLVANIA

PREPARED BY:

WILKINSON & ASSOCIATES, INC.
1220 VALLEY FORGE ROAD
THE COMMONS AT VALLEY FORGE
UNIT 25, P.O. BOX 987
VALLEY FORGE, PA 19482
PHONE (610) 415-1220
FAX (610) 415-1224

© 2010 WILKINSON & ASSOCIATES, INC. ALL RIGHTS RESERVED

FIGURE 1

Hydrologic Soil Group—Lycoming County, Pennsylvania
(Hagerman Compressor Pad)

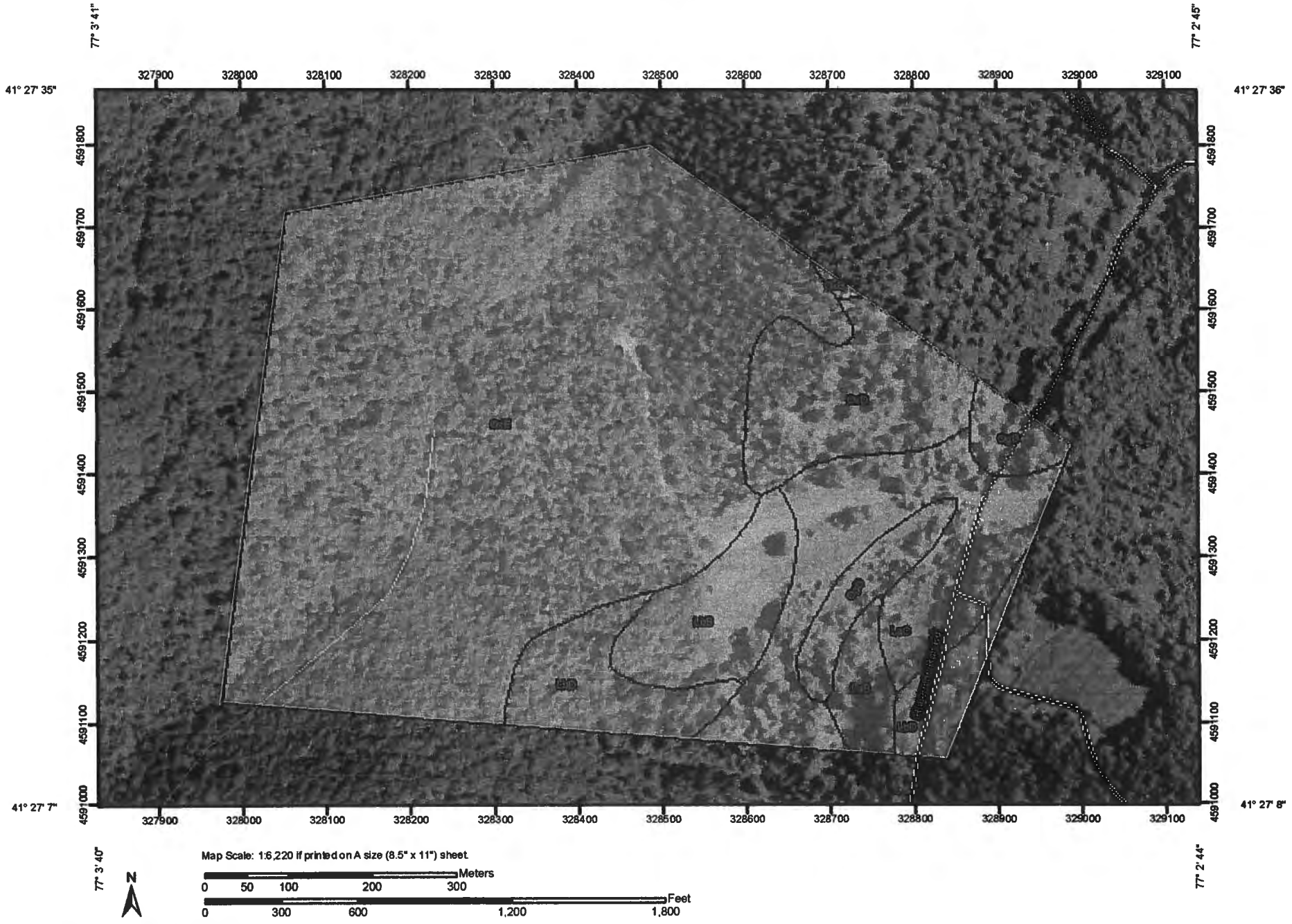


FIGURE 2A

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:6,220 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lycoming County, Pennsylvania
Survey Area Data: Version 5, Jul 31, 2009

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

FIGURE 2B

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Lycoming County, Pennsylvania (PA081)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LaB	Lackawanna channery silt loam, 3 to 8 percent slopes	C	2.6	1.9%
LaC	Lackawanna channery silt loam, 8 to 15 percent slopes	C	15.9	11.6%
LbB	Lackawanna very stony silt loam, 0 to 8 percent slopes	C	7.0	5.1%
LbD	Lackawanna very stony silt loam, 8 to 25 percent slopes	C	9.2	6.7%
OgD	Oquaga channery loam, 15 to 25 percent slopes	C	5.5	4.0%
OxB	Oquaga and Lordstown very stony loams, 0 to 8 percent slopes	C	0.2	0.2%
OxD	Oquaga and Lordstown very stony loams, 8 to 25 percent slopes	C	10.4	7.6%
OxE	Oquaga and Lordstown very stony loams, 25 to 70 percent slopes	C	86.6	63.0%
Totals for Area of Interest			137.4	100.0%

FIGURE 2C

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes: PNDI: 6/15/11	OGO # 15547	Objection Date - Do not issue before: 6/11/12	API #'s37- 081-20885
	Client Id	Date Approved: 6/19/12	and - ; - ; - ; - ; -
	Bond # 5133		Watershed Name: Antes/Lycoming Creeks
	C: BS G: 4/11/12	Special Cond. E	Designation: ☒ HQ ☐ EV
	INV: 6-20-12		
	APS # 770059 Auth Id 929131	Site Id 751163	PF Id 148987 SR Id 1079078

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator: Seneca Resources Corp.	DEP ID#: 72933	Well API # (if available): 37-081-20885	Well Farm Name: DCNR 100 22H		Well #: 50732
Address: 51 Zents Blvd.		LAT: 41°27' 44.43" / LONG: 77°2' 2.81"	NAD 83	Project Number	Serial #
City: Brookville	State: PA	Zip: 15825	Municipality Name/ City, Borough, Township: McIntyre Township	County: Lycoming	
Phone: 814-220-1511	Fax: 814-849-4795	Email: keplerd@srcx.com		USGS 7.5 min. quadrangle map: TROUT RUN, PA	Section: 3

☐ Check if this is a new address

24/7 Emergency Phone contact number: 800-526-2608-mention SRC

911 address of well site (if available): 586 Brown Road, Trout Run, PA

Freshwater Impoundment Name/ Identification: NA

Centralized Impoundment Name/ Identification: NA

Well Pad (cluster) Name/Identification: DCNR 100 Pad G

Borrow Area Name/Identification: NA

Surface Elev: 1660

Deepest Formation to be penetrated: Marcellus

Anticipated TVD: 8229

Target Formation(s) proposed for production: Marcellus

Anticipated Target Top/Bottom TVD: 7826 8016

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 14924 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☐ Drill a new well
☐ Re-permit expired permit
☒ Deepen well
☐ Redrill wellbore
☐ Alter well
☐ Other (specify)

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☐ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☐ Unconventional
3600
Total Application Fee
$ 3850
CK# 1195
3850

Bond Agreement Id: 5133

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

RECEIVED
MAY 25 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

081-20885

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☒ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed Long Run.	☒	☐
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX11-081-0075	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership & Control form 8000-FM-OOGM0118		

Signature of Applicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
Signature of Person Authorized to Submit Application	*(Print or Type)*	Name of Signer: DOUG A. KEPLER Title: Vice President Environmental Engineering	Date 5/16/2012

Application Preparer/Contact: BARB REINARD Phone: 814-220-1511

RECEIVED
MAY 25 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

8000-PM-OOGM0002 4/2012

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

081 20885

DEP USE ONLY	Auth ID #:	
	Project #:	

Denotes location of top of well on topo map.

True Latitude: NORTH

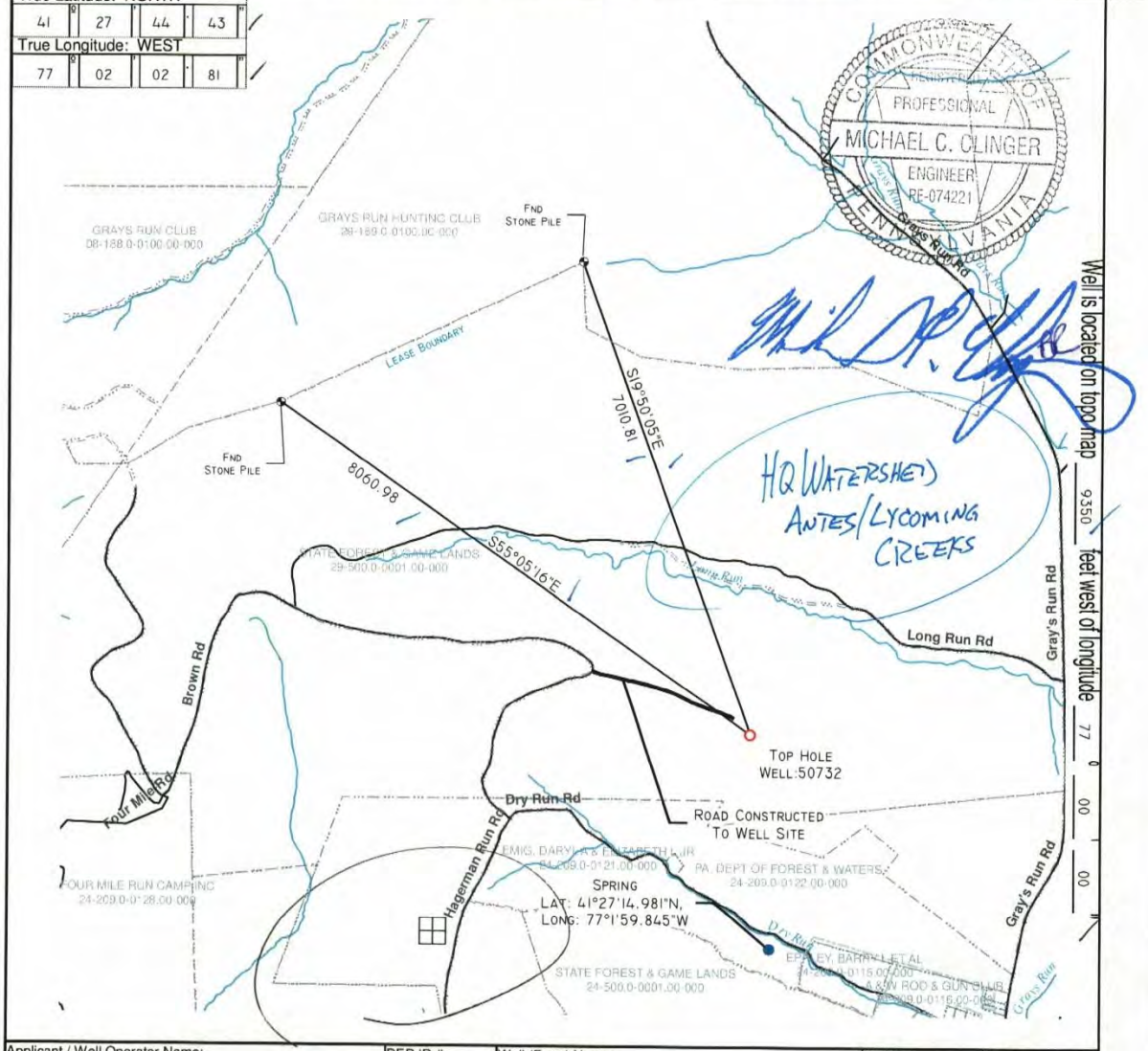
41	°	27	'	44	'	43	"

True Longitude: WEST

77	°	02	'	02	'	81	"

Well is located on topo map 13677 feet south of latitude 41 ° 30 ' 00 "

Well is located on topo map 9350 feet west of longitude 77 ° 00 ' 00 "



Applicant / Well Operator Name:	DEP ID #:	Well (Farm) Name:	Well #:	Serial #:
SENECA RESOURCES CORP	72933	DCNR 100 22H	50732	

Address:	County:	Municipality:	Well Type:
51 ZENTS BLVD BROOKVILLE, PA 15825	LYCOMING - 41	MCINTYRE TOWNSHIP	GAS

911 address of well site:	USGS 7½' Quadrangle Map Name:	Map Section:	Surface Elevation:
586 BROWN ROAD, TROUT RUN, PA 17771	TROUT RUN, PA	3	1660 ft.

Surveyor or Engineer:	Phone #:	Dwg #:	Date:	Scale:	Tract Acreage:
MICHAEL C. CLINGER	814-849-4555	50732.MXD	5/9/12	1" =2000'	8,940

Lat. & Long Metadata Method:	Accuracy:	Datum:	Elevation Metadata Method:	Accuracy:	Datum:	Survey Date:
GPSDF	±3 ft.	NAD-83	TOPO	±10 ft	NGVD-29	9/13/2010

RECEIVED
MAY 25 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

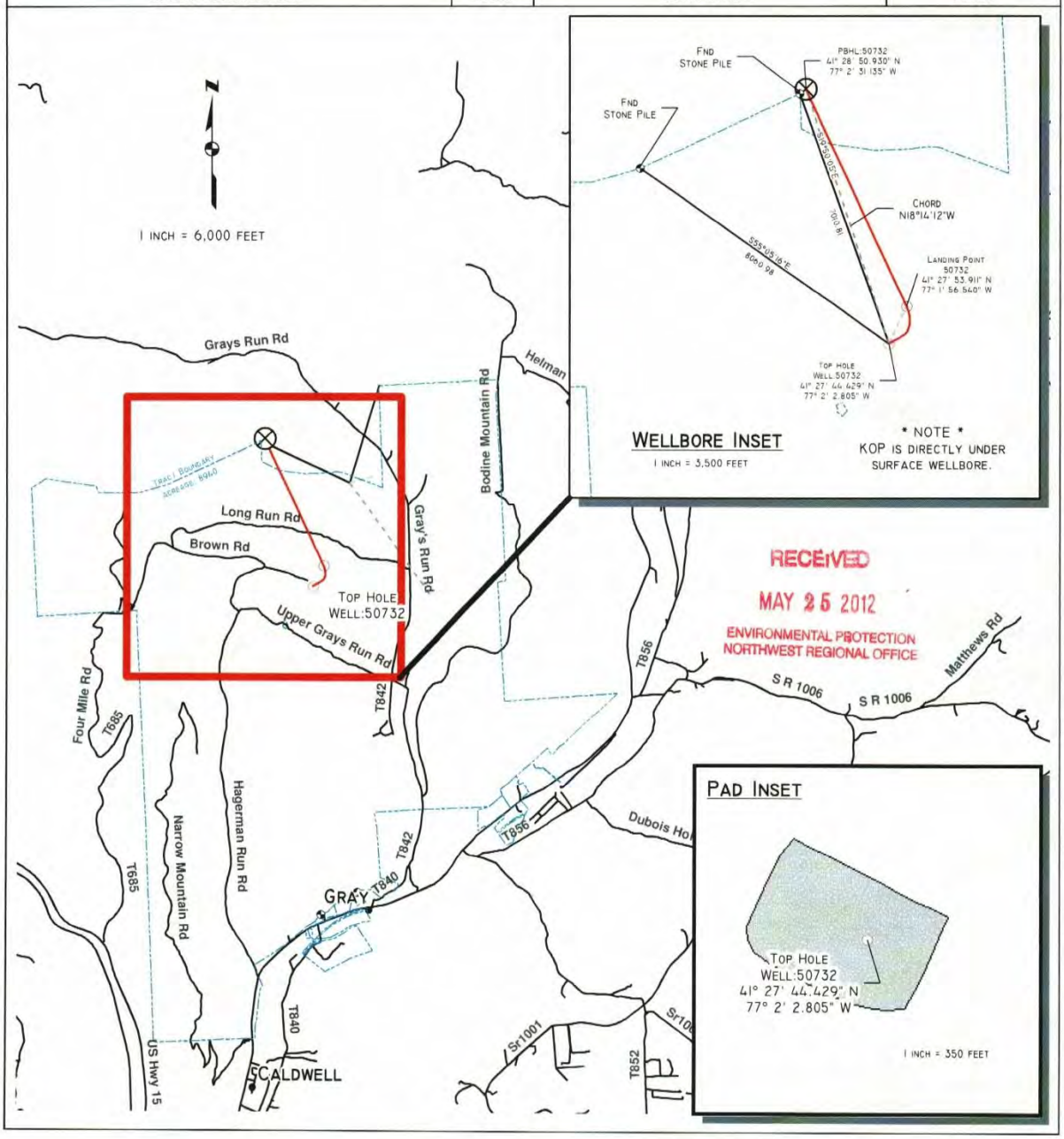
8000-PM-OOGM0002 4/2012

WELL LOCATION PLAT

Page 3 Plan View of Deviated Well Bore

If well has a lateral other than vertical show the bottom hole location on the plat drawing as ⊗ and include the Coordinates in the provided section at the bottom of the drawing area. The top hole and bottom hole locations are to be connected by a bolded line this is to depict the proposed courses of the actual wellbore to be drilled.

Applicant / Well Operator Name	DEP ID#	Well (Farm) Name	Well #
SENECA RESOURCES CORP	72933	DCNR 100 22H	50732



RECEIVED
MAY 25 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit #	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator Seneca Resources Corporation	DEP ID# 72933	Well Farm Name and Number DCNR 100 22H	50732
Address 51 Zents Blvd.		Project Number (if previously assigned)	
City Brookville	State / Zip Code PA 15825	County LYCOMING	Municipality MCINTYRE TWP
Phone 8148494555	Fax 8148494795	Latitude N 41 ° 27 ′ 44.43 ″	Longitude W 77 ° 2 ′ 2.81 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   LOYALSOCK NATIONAL FOREST

   List the name, address and phone number of the person responsible for management of the public resource.

   Richard A. Glinski, 6735 Route 220, Dushore, PA 18614

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☐ Yes ☒ No

   If yes, provide PNDI Search Number 20110615302136 or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   RECEIVED
   JAN 12 2012
   ENVIRONMENTAL PROTECTION
   NORTHWEST REGIONAL OFFICE

   Has the potential conflict been resolved? ☐ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   A site specific Erosion & Sedimentation Control Plan will be followed during construction to protect the public resources.

   A spill Prevention and Response (PPC) Plan will be on site and followed during the drilling/completion and/or in the event of any spills.

   The public safety will be insured by restricting public access to the site during the procedures listed above.

5500-FM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID: 72933	Auth ID: 930116
Watershed Name: Antes-Lycoming Creeks	Quality HQ

Permittee: SENECA RESOURCES CORPORATION	OGO.#: OGO-15547	Permit Number: 37-081-20993-00-00	Date Issued: 07/17/2012
Address: 51 ZENTS BLVD		Farm Name & Well Number: DCNR 100 50H 51099	Well Serial #
		Municipality: Lewis	County: Lycoming
BROOKVILLE, PA 15825-2701		7½ ' Quadrangle Name: Trout Run	Map Section #: 5
Phone: (814) 220-1511	Project #	Latitude: 41-25-47.5000	Longitude: -77-3-29.4600
Surf Elev at Site: 2106 feet	Anticipated Total Depth: 9293 feet / Well Type: GS	Offset distances referenced to NE corner of map section. South 10341 feet West 4532 feet	

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

The permittee shall not withdraw or use water from water sources within the Commonwealth of Pennsylvania, for well drilling and fracing activities unless the permittee does so in accordance with a Water Management Plan approved by the Department.

Permittee shall obtain a permit or Environmental Assessment approval from the Department prior to the construction of any dam, reservoir, water obstruction, and/or encroachment for which a permit or Environmental Assessment approval is required by 25 Pa. Code Chapter 105. Any dam embankment including centralized dam embankments utilized to impound freshwater or frac water associated with well fracing not requiring a permit pursuant to 25 Pa. Code Chapter 105 will be constructed in accordance with requirements of 25 Pa. Code §§ 78.56-78.63 and Department guidelines 5500-PM-OG0085 entitled, Design, construction and maintenance standards for dam embankments associated with impoundments for oil and gas wells.

Prior to fracturing the well, as part of its Preparedness, Prevention and Contingency Plan the permittee shall implement a Control and Disposal Plan for the control and disposal of fluids and residual wastes in accordance with 25 Pa. Code § 78.55. The Control and Disposal Plan shall identify the control and disposal methods and practices utilized to prevent pollutants from directly or indirectly reaching waters of the Commonwealth during the impoundment, production, processing and transportation of pollutants, including identification of the permitted processing or disposal facilities where residual wastes will be processed or disposed, in accordance with 25 Pa. Code §§ 78.55 and 91.34.

Prior to transport of the residual wastewater off site, chemical analysis and characterization of the waste shall be conducted and provided to the processing or disposal facility intended for acceptance of the waste in accordance with 25 Pa. Code § 287.54.

RECEIVED
JUL 24 2012
OIL & GAS
NCRO

well may only be drilled and its associated well site prepared if it is in ocation restrictions). Under 58 Pa.C.S. § 3215(g), the well location to be drilled on a well site was substantially constructed by April 16, hat well site on April 16, 2012. If the well or well site does not comply waiver or variance may be obtained from the department.

urvey of the intentionally deviated well. The deviation survey is to be d shall be filed with the Department within thirty (30) days after drilling rts. The deviation report shall include a well location plat and vertical

15, ensure the following precautions to safeguard the workers and

st, who has the proper permits (Scientific Collector's Permit), and the be on-site prior to and during construction.

gist must be on-site prior to and during construction activities, during ncluding staging areas and access roads) of timber rattlesnakes and to re with work activities. Note: After the biologist has "cleared" the area ke exclusion fencing should be installed depending on the size of the control netting must not be used due to potential entrapment of snakes

e measured, sexed, and the habitat characterized where the snake was n close proximity (under 100 meters) of the capture site if possible. ocumented by photographs, habitat descriptions, in addition to being uld submit a report to the Natural Diversity Section office listed on the project documenting all of the activity and herpetofauna encountered.

roject will be advised that timber rattlesnakes may be encountered and s to personal safety. It is suggested a procedure be implemented for advised that the timber rattlesnake is a state protected species and is hibited by the PFBC pursuant to 58 PA. Code, section 79.6.

---

or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

STE 101
RT, PA 17701

Address

(570) 974-2615

Phone Number

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes: LOYALSOCK STATE FOREST	OGO # 15547	Objection Date - Do not issue before: 6/16/2012	API #s37- 081-20993
	Client Id	Date Approved: 6/27/12	and -
	Bond # 5133		Watershed Name: LANDES-LYCOMING CREEKS
	C: BS G: 6/11/2012 JLS	Special Cond. (E)	Designation: ☒ HQ ☐ EV
PNDI: 10/3/11	INV: 7-17-12 APS # 930116 Auth Id	Site Id 7E2242	PF Id 453332 SF Id 1079596

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator: Seneca Resources Corp.	DEP ID#: 72933	Well API # (if available): 37- - - -	Well Farm Name: DCNR 100 50H	Well #: 51099
Address: 51 Zents Blvd.		LAT: 41°25' 47.50" LONG: 77°3' 29.46"	NAD: 83	Project Number / Serial #
City: Brookville	State: PA	Zip: 15825	Municipality Name/ City, Borough, Township: Lewis Township	County: Lycoming
Phone: 814-220-1511	Fax: 814-849-4795	Email: keplerd@srcx.com	USGS 7.5 min. quadrangle map: TROUT RUN, PA 0729	Section: 5

☐ Check if this is a new address		24/7 Emergency Phone contact number: 800-526-2608-mention SRC	911 address of well site (if available): 3560 Narrow Mtn Rd, Trout Run, PA
Freshwater Impoundment Name/ Identification: none	Centralized Impoundment Name/ Identification: none	Well Pad (cluster) Name/Identification: DCNR 100 Pad N	Borrow Area Name/Identification: NA
Surface Elev: 2106	Deepest Formation to be penetrated: Marcellus	Anticipated TVD: 9293	
Target Formation(s) proposed for production: Marcellus		Anticipated Target Top/Bottom TVD: 9069 9281	

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 16495 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE (Check applicable. Application is to:)
- ☒ Drill a new well
- ☐ Re-permit expired permit
- ☐ Deepen well
- ☐ Redrill wellbore
- ☐ Alter well
- ☐ Other (specify)

TYPE OF WELL (Check applicable.)
- ☒ Gas
- ☐ Oil
- ☐ Comb. (gas & oil/condensate)
- ☐ Other (specify)

Configuration
- ☐ Vertical
- ☒ Horizontal
- ☐ Deviated
- ☐ Multiple laterals

APPLICATION FEE (Check applicable.)
- ☒ Marcellus I 3900
- ☐ Unconventional

Total Application Fee
$ 4150
CK# 1201
$ 25,700

Bond Agreement Id
5133

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

RECEIVED
JUN 05 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

8000-PM-OOGM0001b 4/2012

081-20993

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☒ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed Hagerman Run.	☒	☐
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX12-081-0053	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership & Control form 8000-FM-OOGM0118		

Signature of Applicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
Signature of Person Authorized to Submit Application	*(Print or Type)*	Name of Signer: DOUG A. KEPLER Title: Vice President Environmental Engineering	Date 5/25/2012

Application Preparer/Contact: BARB REINARD

Phone: 814-220-1511

RECEIVED
JUN 05 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

8000-PM-OOGM0002 4/2012

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

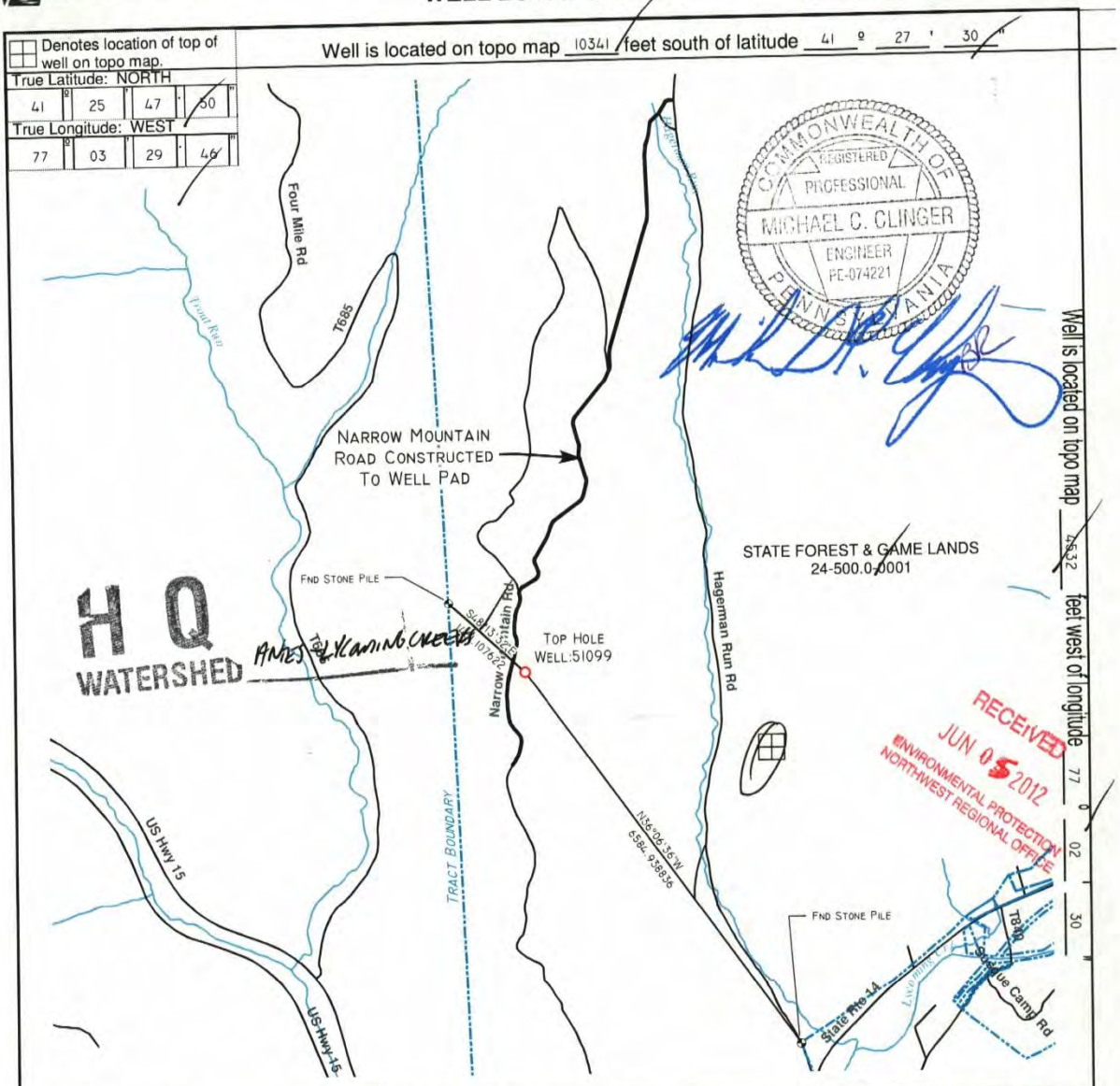
DEP USE ONLY	Auth ID #:	
	Permit #: 081-20993	G: JLS 6/27/2012
	Project #:	C:

Denotes location of top of well on topo map.

Well is located on topo map 10341 feet south of latitude 41 ° 27 ' 30 "

True Latitude: NORTH
41 ° 25 ' 47.50 "

True Longitude: WEST
77 ° 03 ' 29.46 "



Applicant / Well Operator Name: SENECA RESOURCES CORP	DEP ID #: 72933	Well (Farm) Name: DCNR 100 50H		Well #: 51099	Serial #:
Address: 51 ZENTS BLVD BROOKVILLE, PA 15825		County: LYCOMING	Municipality: LEWIS TOWNSHIP		Well Type: GAS
911 address of well site: 3560 NARROW MOUNTAIN ROAD, TROUT RUN, PA 17771		USGS 7½' Quadrangle Map Name: TROUT RUN, PA OTP	Map Section: 5		Surface Elevation: 2106 ft.
Surveyor or Engineer: MICHAEL C. CLINGER	Phone #: 814-849-4555	Dwg #: 51099_PAGE1.MXD	Date: 5/24/2012	Scale: 1" = 2000'	Tract Acreage: 8,940 +/-
Lat. & Long Metadata Method: GPSDF	Accuracy: ±3 ft.	Datum: NAD-83	Elevation Metadata Method: TOPO	Accuracy: ±10 ft	Datum: NGVD-29 / Survey Date: 9/3/2010

- If work is to be conducted from April 15-October 15, then the following precautions to safeguard workers and rattlesnakes must be taken:

    1. A PFBC approved timber rattlesnake biologist who has the proper permits (Scientific Collector's Permit), and the proper skills to handle this venomous species will be on-site prior to and during construction.

    2. The PFBC approved timber rattlesnake biologist will be on-site prior to and during construction activities, during the above time frame, to inspect and clear the area (including staging areas and access roads) of timber rattlesnakes and to capture and remove any rattlesnakes that may interfere with work activities. Note: After the biologist has "cleared" the area of rattlesnakes, silt fences or other timber rattlesnake exclusion fencing may be installed depending on the size of the project. If fencing is used, Curlex or similar types of control netting should not be used due to the potential entrapment of snakes within this material.

    3. Timber rattlesnakes observed on-site are to be measured, sexed, and the habitat characterized where the snake was found. All captured snakes should be released within close proximity (under 100 meters) of the capture site if possible. Rattlesnake captures and relocations are to be documented by photographs, habitat descriptions, in addition to being mapped and labeled accordingly. The biologist is to submit a report to PFBC office (Natural Diversity Section) following the completion of the project documenting all of the activity and herpetofauna encountered.

    4. Workers responsible for implementing this project should be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. It is suggested a procedure be implemented for timber rattlesnake encounters and workers are to be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of the timber rattlesnakes is prohibited by the Commission pursuant to Chapter 79.6. subsection 2102 (b) of the fishing and boating regulations.

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit # 081-20993	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator: Seneca Resources Corp	DEP ID#: 72933	Well Farm Name and Number: DCNR 100 50H	51099
Address: 51 Zents Blvd.		Project Number (if previously assigned)	
City: Brookville	State: PA Zip Code: 15825	County: Lewis Twp	Municipality: Lycoming
Phone: 8148494555	Fax: 8148494795	Latitude: N 41 ° 25 ′ 47.50 ″	Longitude: W 77 ° 03 ′ 29.46 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Loyalsock State Forest

   List the name, address and phone number of the person responsible for management of the public resource.

   Richard A. Glinski, 6735 Route 220, Dushore, PA 18614-8101 (570) 946-4049

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☒ Yes ☐ No

   If yes, provide PNDI Search Number 20111003319057 or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   PA Fish and Boat Commission

   Has the potential conflict been resolved? ☒ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   A site specific Erosion and Sedimentation Control Plan will be followed during construction to protect the public resource. A spill Prevention and Response (PPC) Plan will be on site and followed during the drilling/completion and/or in the event of any spills.

   The public safety will be insured by restricting public access to the site during the procedures listed above.

RECEIVED
JUN 05 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

ECB
681-20983
Land Recycling
Tech Corr
Lycoming
Seneca Resources DCNR Tract 100 Pad N
MEMO Lewis T

TO Randy Farmerie, P.G.
Licensed Professional Geologist Manager
Land Recycling Section
Environmental Cleanup and Brownfields

FROM Jessica Ritenour, P.G.
Licensed Professional Geologist
Land Recycling Section
Environmental Cleanup and Brownfields

DATE 5/30/14

RE Alternative Remediation Review
Addressing Spills and Releases at Oil and Gas Well Sites
or Access Roads
Technical Memo Summary
Seneca DCNR Tract 100 Site
eFACTS PF# 776162
Lewis Township, Lycoming County

erty Owner Name and Site Address: Seneca Resources – DCNR Tract 100, Tiadaghton Forest, Narrow Mountain Road, adjacent to Pad N

lard(s) Sought: Alternative Remediation under department policy document 800-5000-001 Addressing Spills and releases at Oil and Gas Well Sites or Access Roads

erty Size: NA

ct Site History: On February 4, 2014 a release of diesel fuel was discovered where a's contractor, Brubacher staged equipment to work on the well pad. It was estimated that ximately 50 gallons of diesel fuel was lost.

indings: The release impacted surface soils where the diesel fuel migrated downslope of cation where the equipment was parked. There were no surface water impacts reported.

Cleanup History: The remediation was completed in two parts. Initially Brubacher hired Environmental to perform the cleanup. 33.78 tons of impacted soil were excavated from pacted area that was approximately 60'x12'x1'. Samples were collected for diesel range ics only. The sample results were provided to Rettew who asked the lab to analyze for the short list, as required. Although the holding times were exceeded and the bottleware was ect, some of the trimethylbenzenes were above the Department's Statewide Health

Standards in the soil, so additional excavation was performed. The second excavation measured 55'x11'x2.5' and 33.67 additional tons of material were removed.

Discussion of Cleanup Involved and Demonstration of Attainment: A total of approximately 67 tons of material were excavated. Confirmation samples collected in accordance with Act 2 protocols detected no diesel fuel parameters above the Act 2 Statewide Health Standard.

DEP Final Action Approval/Disapproval Letter: Approval

DEP Contact: Jessica Ritenour **Phone:** 570.327.3569

Site Contact: Doug Kepler **Phone:** 814.849.4555

Site Consultant: Edward Dziedzic **Phone:** 717.394.3721

cc: Dave Engle
File

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS PROGRAM

May 30, 2014

Mr. Doug Kepler
51 Zents Boulevard
Brookville, PA 15825

Re: Approval of Remedial Action Plan Completion Report
Seneca DCNR Tract 100 Site
eFACTS PF# 776162
eFACTS Remediation #44545
Lewis Township, Lycoming County

Dear Mr. Kepler:

The Department of Environmental Protection (DEP) has reviewed the May 12, 2014 document titled "Remedial Action Completion Report Diesel Fuel release – Seneca DCNR Tract 100 site" (REPORT) for the property referenced above. The REPORT was prepared by Rettew and submitted to DEP.

DEP has reviewed the subject document in accordance with Alternative Remediation provision of the department policy document 800-5000-001 Addressing Spills and Releases at Oil & Gas Well Sites or Access Roads. No technical deficiencies were noted.

Response actions conducted under the Alternative Remediation provision do not qualify for the relief of environmental liability provided by the Land Recycling and Environmental Remediation Standards Act. If you would like to take the additional actions necessary to meet all of the requirements and receive the relief of liability provided by the Land Recycling and Environmental Remediation Standards Act you should contact the Regional Program Manager of the Environmental Cleanup and Brownfields Program.

Please feel free to contact Jessica Ritenour by e-mail at jeritenour@pa.gov or by telephone at 570.327.3569 with any questions or if further clarification is needed regarding this matter.

Sincerely,

Jennifer Means
Regional Program Manager
Oil and Gas Program

PROGRAM ECB CONF. Y/N N
FILE NAME O&G Permit# 081-20993
BREAKDOWN Land Recycling
TYPE Tech Corr
COUNTY Lycoming MUNICIPALITY Lewis T
COMMENTS Seneca Resources DCNR Tract 100 Pad N

cc: Rettew
Lewis Township, Lycoming County

208 West Third Street | Williamsport, PA 17701-6448
570.327.3636 | Fax 570.327.3420
Printed on Recycled Paper
www.depweb.state.pa.us

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF FORESTRY **October 1, 2012**

Ms. Doug Kepler
Seneca Resources
51 Zents Blvd.
Brookville, PA 715825

SENT VIA ELECTRONIC MAIL KeplerD@srcx.com

Re: Department Review and Approval for Construction of Well Drilling Pad N, on State Forest Tract 100
State Forest Tract 100 8,891 acres; Lease Date – February 10, 2009
Loyalsock State Forest – Forest District 20
Lewis Township, Lycoming County, PA

Dear Mr. Kepler:

The Bureau of Forestry, as manager for all State Forest lands in Pennsylvania, has reviewed and approved Seneca Resources request for the construction of well drilling Pad P, water impoundment and associated features within State Forest Tract 100. Seneca Resources is recognized as Lessee of Record for State Forest Tract 100 under an oil and gas lease issued by the Department on February 10, 2009.

Seneca contacted the District and requested a waiver of the stipulations of the Tract 100 lease agreement wherein the location of lease lands, location and construction of Pad N and access roads, within 200 feet of a wetland is restricted and requires a waiver by the Department to encroach on the buffer. The requested buffer waiver has been reviewed and approved by the Department.

The area of disturbance for the pad and associated features is planned for 6.8 acres. Pad N surface is designed to encompass 4.0 acres.

A search of the Pennsylvania Natural Diversity Inventory (PNDI) records on October 3, 2011 indicated that there may be potential impacts to special concern species and resources within the project area. Further review was required by the Pennsylvania Fish and Boat Commission (PFBC), to resolve potential impact to timber rattlesnakes. A Timber Rattlesnake Habitat Assessment was performed by Wildlife Specialists, LLC in October, 2011. Potential denning habitat was located with the 300' buffer area, although not within the area of

disturbance. PFBC reviewed the report and expressed concerns about direct or indirect impacts that the project could have on the local timber rattlesnake population. PFBC recommends a PFBC approved timber rattlesnake biologist be onsite prior to and during construction if work is conducted from April 15 to October 15,. This individual will inspect and clear the area of any timber rattlesnakes that may interfere with work activities. If silt fences or other exclusion fencing is installed after an area has been cleared of timber rattlesnakes, Curlex or similar types of fencing should be avoided since these products and materials have the potential to entrap the snakes. Please be cognizant that the timber rattlesnake is a state protected species and is not to be harmed. If timber rattlesnakes are observed on site during construction or operations, please notify the PFBC, Division of Environmental Services, Natural Diversity Section.

No other Impacts were noted on the PNDI environmental review. A wetland report conducted by Rettew Associates, Inc on April 13, 2012 delineated one wetland, within the area of investigation. The report identified the small (0.01 acre) wetland as a palustrine open water wetland. No vegetation was present within the wetland, which is surrounded by *Quercus rubra* (red oak), Quercus prinus (chestnut oak), and Kalmia latifolia (mountain laurel. It is not anticipated that the wetland will be impacted during construction activities. To ensure no impacts occur, proper erosion and sedimentation controls should be implemented and properly maintained during all phases of construction. If impacts do occur, construction will be suspended until corrective actions are taken and impacts are mitigated

The Bureau of Forestry hereby approves the above captioned well pad and associated features and Seneca Resources is free to plan its construction of the subject drill pad in coordination with the Loyalsock District Forester and his staff. The District requests that all stumps be removed from the pad sites and upon development completion, the well pad shall be returned to the original contours to the greatest extent possible.

All field logistics and timber charges should be coordinated with Mr. Joe Dotzel of the Lycoming State Forest office (570.946.4049). Should you require additional information, please free to contact me via electronic mail (garprice@pa.gov) or telephone (717.783.7940). I look forward to hearing from you in the future.

Sincerely,

Garry L Price
Licensed Professional Geologist
Marcellus Shale Program
Bureau of Forestry

Cc: Subsurface Programs (via email)
Lycoming State Forest (via email)
Seneca Resources (via email)

5500-FM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID: 72933	Auth ID: 926652
Watershed Name: Antes-Lycoming Creeks	Quality HQ

Permittee: SENECA RESOURCES CORPORATION	OGO.#: OGO-15547	Permit Number: 37-081-20967-00-00	Date Issued: 06/19/2012
Address: 51 ZENTS BLVD		Farm Name & Well Number: DCNR 100 42H 50856	Well Serial #
		Municipality: Lewis	County: Lycoming
BROOKVILLE, PA 15825-2701		7½ ' Quadrangle Name: Trout Run	Map Section #: 6
Phone: (814) 220-1511	Project #	Latitude: 41-26-3.3200	Longitude: -77-2-21.9200
Surf Elev at Site: 2134 feet	Anticipated Total Depth: 9354 feet / Well Type: GS	Offset distances referenced to NE corner of map section. South 8745 feet West 10810 feet	

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

The permittee shall not withdraw or use water from water sources within the Commonwealth of Pennsylvania, for well drilling and fracing activities unless the permittee does so in accordance with a Water Management Plan approved by the Department.

Permittee shall obtain a permit or Environmental Assessment approval from the Department prior to the construction of any dam, reservoir, water obstruction, and/or encroachment for which a permit or Environmental Assessment approval is required by 25 Pa. Code Chapter 105. Any dam embankment including centralized dam embankments utilized to impound freshwater or frac water associated with well fracing not requiring a permit pursuant to 25 Pa. Code Chapter 105 will be constructed in accordance with requirements of 25 Pa. Code §§ 78.56-78.63 and Department guidelines 5500-PM-OG0085 entitled, Design, construction and maintenance standards for dam embankments associated with impoundments for oil and gas wells.

Prior to fracturing the well, as part of its Preparedness, Prevention and Contingency Plan the permittee shall implement a Control and Disposal Plan for the control and disposal of fluids and residual wastes in accordance with 25 Pa. Code § 78.55. The Control and Disposal Plan shall identify the control and disposal methods and practices utilized to prevent pollutants from directly or indirectly reaching waters of the Commonwealth during the impoundment, production, processing and transportation of pollutants, including identification of the permitted processing or disposal facilities where residual wastes will be processed or disposed, in accordance with 25 Pa. Code §§ 78.55 and 91.34.

Prior to transport of the residual wastewater off site, chemical analysis and characterization of the waste shall be conducted and provided to the processing or disposal facility intended for acceptance of the waste in accordance with 25 Pa. Code § 287.54.

RECEIVED
JUN 25 2012
OIL & GAS
NCRO

Unless this well is subject to 58 Pa.C.S. § 3215(g), this well may only be drilled and its associated well site prepared if it is in compliance with 58 Pa.C.S. § 3215 (relating to well location restrictions). Under 58 Pa.C.S. § 3215(g), the well location restrictions in 58 Pa.C.S. § 3215 do not apply to wells to be drilled on a well site was substantially constructed by April 16, 2012 where there was a valid well permit for a well on that well site on April 16, 2012. If the well or well site does not comply with the well location restrictions in 58 Pa.C.S. § 3215, a waiver or variance may be obtained from the department.

The operator shall run a complete angular deviation survey of the intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after drilling is completed along with other regularly required reports. The deviation report shall include a well location plat and vertical section of the borehole as drilled.

If work is to be conducted from April 15-October 15, ensure the following precautions to safeguard the workers and rattlesnakes are in place.

1. A PFBC approved timber rattlesnake biologist, who has the proper permits (Scientific Collector's Permit), and the proper skills to handle this venomous species should be on-site prior to and during construction.

2. The PFBC approved timber rattlesnake biologist must be on-site prior to and during construction activities, during the above time frame, to inspect and clear the area (including staging areas and access roads) of timber rattlesnakes and to capture and remove any rattlesnakes that may interfere with work activities. Note: After the biologist has "cleared" the area of rattlesnakes, silt fences or other timber rattlesnake exclusion fencing should be installed depending on the size of the project. If fencing is used, Curlex or similar types of control netting must not be used due to potential entrapment of snakes within this material.

3. Timber rattlesnakes observed on site must be measured, sexed, and the habitat characterized where the snake was found. All captured snakes will be released within close proximity (under 100 meters) of the capture site if possible. Rattlesnake captures and relocations should be documented by photographs, habitat descriptions, in addition to being mapped and labeled accordingly. The biologist should submit a report to the Natural Diversity Section office listed on the PFBC resolution letter following the completion of the project documenting all of the activity and herpetofauna encountered.

4. Workers responsible for implementing this project will be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. It is suggested a procedure be implemented for timber rattlesnake encounters and workers are to be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes is prohibited by the PFBC pursuant to 58 PA. Code, section 79.6.

5. During the construction period, PFBC personnel may communicate with the on-site biologist and may visit the site area periodically to view the progression of the project and answer any questions or concerns that may arise. For safety purposes, PFBC personnel will register with the on-site manager upon entering the construction area.

This permit expires **06/19/2013** unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Gringrich

Regional Oil and Gas Program Manager

RICHARD SWANK	208 W 3RD ST STE 101 WILLIAMSPORT, PA 17701	(570) 974-2615
Oil & Gas Inspector	Address	Phone Number

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes: LOYALSOCK STATE FOREST M
PNDI: 10/3/11

OGO # 15547
Client Id
Bond # 5133
C: BS G: JLS 5/10/2012
INV: 6-19-12
APS # 738276 Auth Id 921052

Objection Date - Do not issue before: 5/23/2012
Date Approved: 6/13/12
Special Cond. E
Site Id 764422

API #'s37- 081-20967 and -
Watershed Name: ANTES-LYCOMING CREEKS
Designation: ☑ HQ ☐ EV

PF Id 752643
SF Id 1077918

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator	DEP ID#	Well API # (if available)	Well Farm Name	Well #
Seneca Resources Corp.	72933	37- - - -	DCNR 100 42H	50856

Address	LAT / LONG	NAD	Project Number	Serial #
51 Zents Blvd.	LAT 41°26' 03.32" / LONG - 77°02' 21.92"	83		

City	State	Zip	Municipality Name/ City, Borough, Township	County	Section
Brookville	PA	15825	Lewis Township	Lycoming	6

Phone	Fax	Email	USGS 7.5 min. quadrangle map
814-220-1511	814-849-4795	keplerd@srcx.com	TROUT RUN, PA

☐ Check if this is a new address

24/7 Emergency Phone contact number: 800-526-2608-mention SRC

911 address of well site (if available): 1844 Sugarcamp Mtn Rd. Trout Run,

Freshwater Impoundment Name/ Identification	Centralized Impoundment Name/ Identification	Well Pad (cluster) Name/Identification	Borrow Area Name/Identification
Impoundment #6	NA	DCNR 100 Pad P	NA

Surface Elev	Deepest Formation to be penetrated:	Anticipated TVD
2134	Marcellus	9354

Target Formation(s) proposed for production	Anticipated Target Top/Bottom TVD
Marcellus	9132 9345

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 15788 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☐ Other (specify)

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☐ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☐ Unconventional
3800

Total Application Fee
$ 4250
CK# 1183
$ 33,900

Bond Agreement Id
6298480

RECEIVED
MAY 08 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

001b 4/2012

081-20967

rtical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
, print the names of: Storage Field: Operator:		
osed well location within the permitted area of a **landfill**?	☐	☒
rtical wellbore of the unconventional well be drilled within 500 feet from any existing building or an ater supply?	☐	☒
s," is written consent from the owner attached?	☐	☐
ten consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
ertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, ater intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
s," is written consent from the owner attached?	☐	☐
ten consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
vell be located where it may impact a public resource as outlined in the "Coordination of a Well with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and letters from applicable agencies.	☒	☐
ortion of the well site be in a Special Protection High Quality ☒ (HQ) or Exceptional Value ☐ (EV) d?	☒	☐
ame of special protection watershed Lycoming Creek.		
l part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued.	☒	☐
including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
ell or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
to be located within a H_2S area pursuant to §78.77a?	☐	☒

n a current Ownership & Control form 8000-FM-OOGM0118

plicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
ure of Person Authorized to Submit Application	(Print or Type)	Name of Signer: DOUG A. KEPLER Title: Vice President Environmental Engineering	Date 5/2/2012

DAlCepler BR

r/Contact: BARB REINARD Phone: 814-220-1511

8000-PM-OOGM0002 4/2012

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

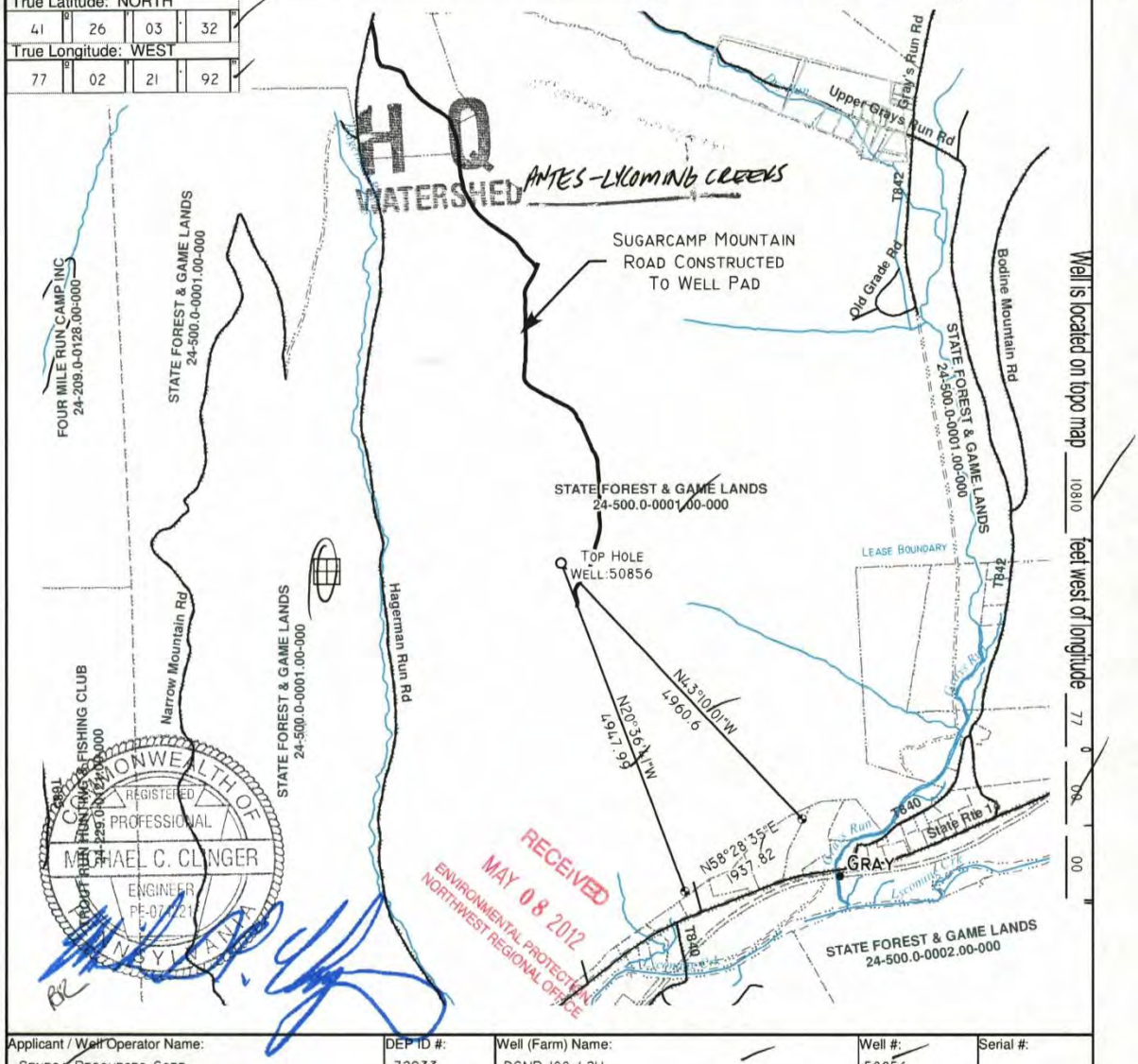
DEP USE ONLY	Auth ID #:	G: JLS 5/15/2012
	Permit #: 081-20967	C:
	Project #:	

Denotes location of top of well on topo map.

Well is located on topo map 8745 feet south of latitude 41 ° 27 ' 30 "

True Latitude: NORTH
41 ° 26 ' 03 . 32 "

True Longitude: WEST
77 ° 02 ' 21 . 92 "



Applicant / Well Operator Name:	DEP ID #:	Well (Farm) Name:	Well #:	Serial #:
SENECA RESOURCES CORP	72933	DCNR 100 42H	50856	

Address:	County:	Municipality:	Well Type:
51 ZENTS BLVD BROOKVILLE, PA 15825	LYCOMING	LEWIS TOWNSHIP	GAS

911 address of well site:	USGS 7½ Quadrangle Map Name:	Map Section:	Surface Elevation:
1844 SUGARCAMP MOUNTAIN RD TROUT RUN, PA 17771	TROUT RUN, PA 0729	6	2,134 ft.

Surveyor or Engineer:	Phone #:	Dwg #:	Date:	Scale:	Tract Acreage:
MICHAEL C. CLINGER	814-849-4555	50856.MXD	4/30/12	1" =2000'	8,940

Lat. & Long Metadata Method:	Accuracy:	Datum:	Elevation Metadata Method:	Accuracy:	Datum:	Survey Date:
GPSDF	±3 ft.	NAD-83	TOPO	±10 ft	NGVD-29	9/7/2010

8000-PM-OOGM0002 4/2012

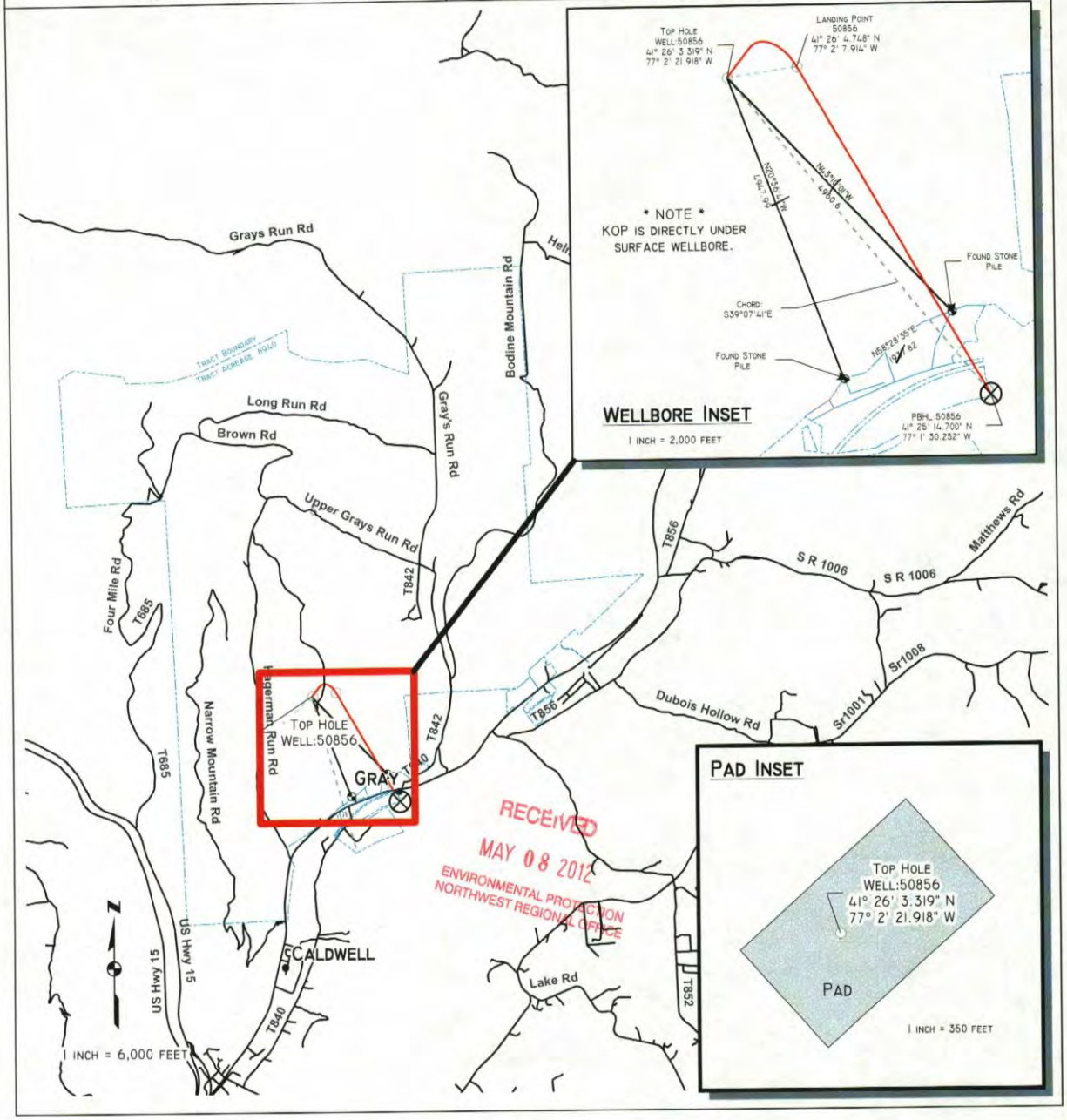
WELL LOCATION PLAT

081-20967

Page 3 Plan View of Deviated Well Bore

If well has a lateral other than vertical show the bottom hole location on the plat drawing as ⊗ and include the Coordinates in the provided section at the bottom of the drawing area. The top hole and bottom hole locations are to be connected by a bolded line this is to depict the proposed courses of the actual wellbore to be drilled.

Applicant / Well Operator Name	DEP ID#	Well (Farm) Name	Well #
SENECA RESOURCES CORP[]	72933	DCNR 100 42H	50856



RECEIVED
MAY 08 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit # 081-20967	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
Seneca Resources Corp	72933	DNCR 100 42H	50856
Address		Project Number (if previously assigned)	
51 Zents Blvd.			
City	State Zip Code	County	Municipality
Brookville	PA 15825	Lycoming	Lewis Twp
Phone	Fax	Latitude	Longitude
8148494555	8148494795	N 41 ° 26 ′ 03.32 ″	W 77 ° 2 ′ 21.92 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Loyalsock State Forest

   List the name, address and phone number of the person responsible for management of the public resource.

   Richard A. Glinski, 6735 Route 220, Dushore, PA 18614 570-946-4049

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☒ Yes ☐ No

   If yes, provide PNDI Search Number 20111003319052 or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   PA Fish and Boat Commission

   Has the potential conflict been resolved? ☒ Yes ☐ No

RECEIVED
MAY 08 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   A site specific Erosion and Sedimentation Control Plan will be followed during construction to protect the public resource. A spill Prevention and Response (PPC) Plan will be on site and followed during the drilling/completion and/or in the event of any spills.

   The public safety will be insured by restricting public access to the site during the procedures listed above.

5500-FM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

REVISED WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID: 72933	Auth ID: 954739, 975239
Watershed Name: Trout Run	Quality: HQ

Permittee	OGO.#	Permit Number	Date Issued
SENECA RESOURCES CORPORATION	OGO-15547	37-081-21108-00-00, 081-21108-01-00	06/21/2013

Address	Farm Name & Well Number	Well Serial #
51 ZENTS BLVD	DCNR 100 57H 50883	
	Municipality: Lewis / County: Lycoming	
BROOKVILLE, PA 15825-2701	7½' Quadrangle Name: Trout Run	Map Section #: 5

Phone	Project #	Latitude	Longitude
(814) 220-1511		41-25-8.7400	-77-3-33.6500

Surf Elev at Site	Anticipated Total Depth	Well Type	Offset distances referenced to NE corner of map section.
2015 feet	V-9790, H- 9640 feet	GS	South 14252 feet West 4851 feet

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

Vertical: 081-21108-00-00

Prior to setting casing/tubing in or producing from the Target Formation lateral, the vertical portion of the hole, if it extends below the Kick-Off Point (KOP), must be plugged back to the KOP according to the requirements of §§ 78.91 through 78.95. The procedure used to plug this section of the well will be submitted with or as part of the Well Record and Completion Report.

Horizontal: 081-21108-01-00

The permittee shall not withdraw or use water from water sources within the Commonwealth of Pennsylvania, for well drilling and fracing activities unless the permittee does so in accordance with a Water Management Plan approved by the Department.

Permittee shall obtain a permit or Environmental Assessment approval from the Department prior to the construction of any dam, reservoir, water obstruction, and/or encroachment for which a permit or Environmental Assessment approval is required by 25 Pa. Code Chapter 105. Any dam embankment including centralized dam embankments utilized to impound freshwater or frac water associated with well fracing not requiring a permit pursuant to 25 Pa. Code Chapter 105 will be constructed in accordance with requirements of 25 Pa. Code §§ 78.56-78.63 and Department guidelines 5500-PM-OG0085 entitled, Design, construction and maintenance standards for dam embankments associated with impoundments for oil and gas wells.

RECEIVED
JUN 28 2013
OIL & GAS

Prior to fracturing the well, as part of its Preparedness, Prevention and Contingency Plan the permittee shall implement a Control and Disposal Plan for the control and disposal of fluids and residual wastes in accordance with 25 Pa. Code § 78.55. The Control and Disposal Plan shall identify the control and disposal methods and practices utilized to prevent pollutants from directly or indirectly reaching waters of the Commonwealth during the impoundment, production, processing and transportation of pollutants, including identification of the permitted processing or disposal facilities where residual wastes will be processed or disposed, in accordance with 25 Pa. Code §§ 78.55 and 91.34.

Prior to transport of the residual wastewater off site, chemical analysis and characterization of the waste shall be conducted and provided to the processing or disposal facility intended for acceptance of the waste in accordance with 25 Pa. Code § 287.54.

The operator shall run a complete angular deviation survey of the intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after drilling is completed along with other regularly required reports. The deviation report shall include a well location plat and vertical section of the borehole as drilled.

This permit expires **12/27/2013** unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig Lobb

Regional Oil and Gas Program Manager

MICHAEL PANETTIERI	600 GATEWAY DRIVE MANSFIELD, PA 16933	570-662-0832
Oil & Gas Inspector	Address	Phone Number

8000-PM-OOGM0001b 4/2012

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes: $4050 SCNC Vert. Plug Back Check No. 1309 - $19650.00 1324 $100 PNDI - 3/14/13

OGO # 15547 | Client Id 72933 | Bond # 5133 | C 5/1/13 | G: 6/19/13 | INV: | APS # 999731 | Auth Id 975239

Objection Date - Do not issue before: 4/23/13

Date Approved: 6/20/13

Special Cond. (E)

Site Id 767692

API #'s37- 081-21108 and -

Watershed Name: Trout Run
Designation: ☒ HQ ☐ EV

PF Id 758884 | SF Id V - 109250 #-1105451

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator: Seneca Resources Corp.	DEP ID#: 72933	Well API # (if available): 37-81-21108- -	Well Farm Name: DCNR 100 57H	Well #: 50883
Address: 51 Zents Blvd.		LAT: 41°25 8.74 / LONG: 77°3 33.65	NAD 83	Project Number / Serial #
City: Brookville	State: PA	Zip: 15825	Municipality Name/ City, Borough, Township: Lewis Township	County: Lycoming
Phone: 814-220-1511	Fax: 814-849-4795	Email: keplerd@srcx.com	USGS 7.5 min. quadrangle map: TROUT RUN, PA	Section: 5

☐ Check if this is a new address

24/7 Emergency Phone contact number: 800-526-2608-mention SRC

911 address of well site (if available): 2803 Narrow Mtn Rd., Trout Run, PA

Freshwater Impoundment Name/ Identification: Impoundment #7

Centralized Impoundment Name/ Identification: NA

Well Pad (cluster) Name/Identification: DCNR 100 Pad R

Borrow Area Name/Identification: NA

Surface Elev: 2015

Deepest Formation to be penetrated: Helderberg

Anticipated TVD: ~~9640~~ 9790 Rev Pilot

Target Formation(s) proposed for production: Marcellus Helderberg,

Anticipated Target Top/Bottom TVD: 9497 9710

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 15613 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled**, if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☒ Other (specify)
Revised--add ~~pilot hole~~ lateral

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☐ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☐ Unconventional
Total Application Fee $ 3950.00

Bond Agreement Id: 5133

RECEIVED
APR 26 2013
Environmental Protection
Northwest Regional Office

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☒	☐
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☒	☐
b. Does the location fall within an area covered by a spacing order?	☐	☒
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

6/20/13

7/5/13

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☒ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed Trout Run.	☒	☐
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX13-081-0008	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership & Control form 8000-FM-OOGM0118		

Signature of Applicant The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.

Signature of Person Authorized to Submit Application	(Print or Type)	Name of Signer: DOUG A. KEPLER Title: Vice President Environmental Engineering	Date
DAKepler BR			4/11/2013

Application Preparer/Contact: BARB REINARD Phone: 814-220-1511

RECEIVED
APR 26 2013
Environmental Protection
Southwest Regional Office

8000-PM-OOGM0002 4/2012

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

DEP USE ONLY	Auth ID #:	Permit #: 081-21168	G:	C:

Denotes location of top of well on topo map.

True Latitude: NORTH

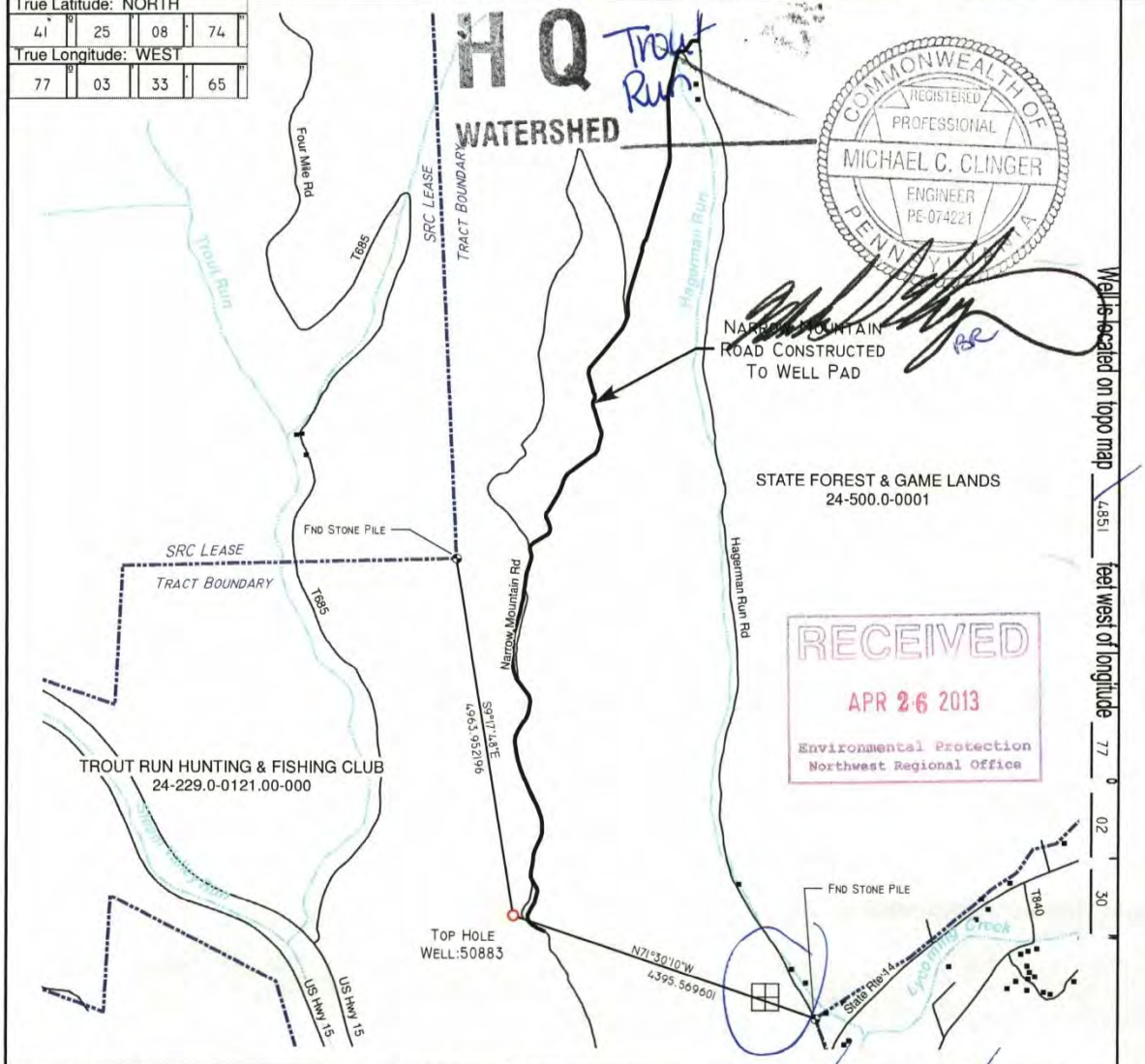
41	25	08	74

True Longitude: WEST

77	03	33	65

Well is located on topo map 14252 feet south of latitude 41 ° 27 ' 30 "

Well is located on topo map 4851 feet west of longitude 77 ° 02 ' 30 "



RECEIVED
APR 26 2013
Environmental Protection
Northwest Regional Office

Applicant / Well Operator Name:	DEP ID #:	Well (Farm) Name:		Well #:	Serial #:
SENECA RESOURCES CORP	72933	DCNR 100 57H		50883	
Address:		**County:**	**Municipality:**		**Well Type:**
51 ZENTS BLVD BROOKVILLE, PA 15825		LYCOMING	LEWIS TOWNSHIP		GAS
911 address of well site:		**USGS 7½' Quadrangle Map Name:**	**Map Section:**		**Surface Elevation:**
2803 NARROW MOUNTAIN ROAD, TROUT RUN, PA 17771		TROUT RUN, PA	5		2015 ft.

Surveyor or Engineer:	Phone #:	Dwg #:	Date:	Scale:	Tract Acreage:
MICHAEL C. CLINGER	814-849-4555	50883_PAGE1 .MXD	11/19/2012	1" =2000'	8,940 +/-

Lat. & Long Metadata Method:	Accuracy:	Datum:	Elevation Metadata Method:	Accuracy:	Datum:	Survey Date:
GPSDF	±3 ft.	NAD-83	TOPO	±10 ft	NGVD-29	9/3/2010

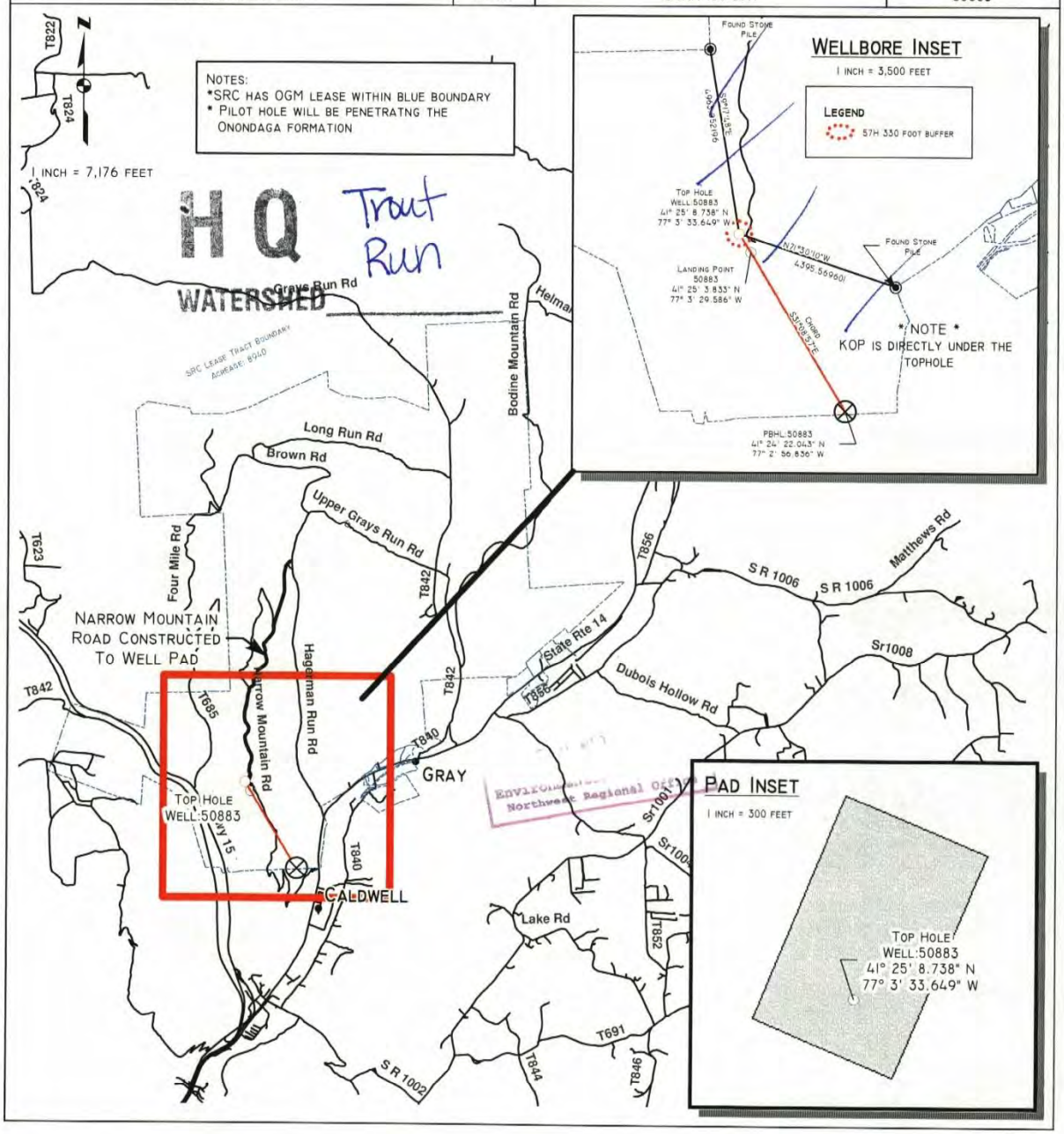
8000-PM-OOGM0002 4/2012

WELL LOCATION PLAT

Page 3 Plan View of Deviated Well Bore

If well has a lateral other than vertical show the bottom hole location on the plat drawing as ⊗ and include the Coordinates in the provided section at the bottom of the drawing area. The top hole and bottom hole locations are to be connected by a bolded line this is to depict the proposed courses of the actual wellbore to be drilled.

Applicant / Well Operator Name	DEP ID#	Well (Farm) Name	Well #
SENECA RESOURCES CORP	72933	DCNR 100 57H	50883



Environmental... Northwest Regional Office

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit #	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
Seneca Resources Corp	72933	DNCR 100 57H	50883
Address		Project Number (if previously assigned)	
51 Zents Blvd.			
City	State Zip Code	County	Municipality
Brookville	PA 15825	Lycoming	Lewis Twp
Phone	Fax	Latitude	Longitude
8148494555	8148494795	N 41 ° 25 ′ 08.74 ″	W 77 ° 03 ′ 33.65 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Loyalsock State Forest

   List the name, address and phone number of the person responsible for management of the public resource.

   Richard A. Glinski, 6735 Route 220, Dushore, PA 18614 570-946-4049

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☒ Yes ☐ No

   If yes, provide PNDI Search Number 20130314395278 or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   Pennsylvania Fish & Boat Commission

   Has the potential conflict been resolved? ☒ Yes ☐ No

   RECEIVED
   APR 26 2013
   Environmental Protection
   Northwest Regional Office

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   A site specific Erosion and Sedimentation Control Plan will be followed during construction to protect the public resource. A spill Prevention and Response (PPC) Plan will be on site and followed during the drilling/completion and/or in the event of any spills.

   The public safety will be insured by restricting public access to the site during the procedures listed above.

5500-FM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID: 72933	Auth ID: 961944
Watershed Name: Grays Run	Quality HQ:

Permittee: SENECA RESOURCES CORPORATION	OGO.#: OGO-15547	Permit Number: 37-081-21123-00-00	Date Issued: 03/21/2013
Address: 51 ZENTS BLVD		Farm Name & Well Number: DCNR 100 98H 51139	Well Serial #
		Municipality: Lewis	County: Lycoming
BROOKVILLE, PA 15825-2701		7½' Quadrangle Name: Trout Run	Map Section #: 6
Phone: (814) 220-1511	Project #	Latitude: 41-26-19.1800	Longitude: -77-1-48.7300
Surf Elev at Site: 1889 feet	Anticipated Total Depth: 9030 feet / Well Type: GS	Offset distances referenced to NE corner of map section: South 7145 feet West 8282 feet	

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

The permittee shall not withdraw or use water from water sources within the Commonwealth of Pennsylvania, for well drilling and fracing activities unless the permittee does so in accordance with a Water Management Plan approved by the Department.

Permittee shall obtain a permit or Environmental Assessment approval from the Department prior to the construction of any dam, reservoir, water obstruction, and/or encroachment for which a permit or Environmental Assessment approval is required by 25 Pa. Code Chapter 105. Any dam embankment including centralized dam embankments utilized to impound freshwater or frac water associated with well fracing not requiring a permit pursuant to 25 Pa. Code Chapter 105 will be constructed in accordance with requirements of 25 Pa. Code §§ 78.56-78.63 and Department guidelines 5500-PM-OG0085 entitled, Design, construction and maintenance standards for dam embankments associated with impoundments for oil and gas wells.

Prior to fracturing the well, as part of its Preparedness, Prevention and Contingency Plan the permittee shall implement a Control and Disposal Plan for the control and disposal of fluids and residual wastes in accordance with 25 Pa. Code § 78.55. The Control and Disposal Plan shall identify the control and disposal methods and practices utilized to prevent pollutants from directly or indirectly reaching waters of the Commonwealth during the impoundment, production, processing and transportation of pollutants, including identification of the permitted processing or disposal facilities where residual wastes will be processed or disposed, in accordance with 25 Pa. Code §§ 78.55 and 91.34.

Prior to transport of the residual wastewater off site, chemical analysis and characterization of the waste shall be conducted and provided to the processing or disposal facility intended for acceptance of the waste in accordance with 25 Pa. Code § 287.54.

RECEIVED
APR 02 2013
OIL & GAS
NCRO

The operator shall run a complete angular deviation survey of the intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after drilling is completed along with other regularly required reports. The deviation report shall include a well location plat and vertical section of the borehole as drilled.

This permit expires **03/21/2014** unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig Lobb

Regional Oil and Gas Program Manager

RICHARD SWANK	208 W 3RD ST STE 101 WILLIAMSPORT, PA 17701	570-974-2615
Oil & Gas Inspector	Address	Phone Number

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes: $4050 S-NC
Check No. 0000026568 - $39400.00
PNOI - 3/26/12

OGO # 15547
Client Id 72933
Bond # 5133
C: 2/5/13 3/20/13
INV: 3-21-2013
APS # 802991 Auth Id 961944

Objection Date - Do not issue before: 1/30/13
Date Approved: 3/21/13
Special Cond. E
Site Id 766104

API #'s37- 081-21123 and -

Watershed Name: Grays Run
Designation: ☒ HQ ☐ EV

PF Id 760732 SF Id 1097324

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator: Seneca Resources Corp.	DEP ID#: 72933	Well API # (if available): 37- - - -	Well Farm Name: DCNR 100 98H	Well #: 51139
Address: 51 Zents Blvd.		LAT 41°26 19.184 / LONG - 77°01 48.73 " NAD 83	Project Number	Serial #
City: Brookville	State: PA	Zip: 15825	Municipality Name/ City, Borough, Township: Lewis Township	County: Lycoming
Phone: 814-220-1511	Fax: 814-849-4795	Email: keplerd@srcx.com	USGS 7.5 min. quadrangle map: TROUT RUN, PA	Section: 6

☐ Check if this is a new address

24/7 Emergency Phone contact number: 800-526-2608-mention SRC

911 address of well site (if available): 1341 Sugarcamp Mountain Road,

Freshwater Impoundment Name/ Identification: none

Centralized Impoundment Name/ Identification: none

Well Pad (cluster) Name/Identification: DCNR 100 Pad T

Borrow Area Name/Identification: NA

Surface Elev: 1889

Deepest Formation to be penetrated: Marcellus

Anticipated TVD: 9030

Target Formation(s) proposed for production: Marcellus

Anticipated Target Top/Bottom TVD: 8826 9039

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 15836 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled**, if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☐ Other (specify)

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☐ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☐ Unconventional

Total Application Fee
$ 4050

Bond Agreement Id
5133

RECEIVED
FEB 04 2013
Environmental Protection
Northwest Regional Office

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

3/22/13

pafish IW

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☒ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed Grays Run.	☒	☐
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX12-081-0138	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership & Control form 8000-FM-OOGM0118		

Signature of Applicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
Signature of Person Authorized to Submit Application	*(Print or Type)*	Name of Signer: DOUG A. KEPLER Title: Vice President Environmental Engineering	Date 1/15/2013
Application Preparer/Contact: BARB REINARD			Phone: 814-220-1511

List the following: surface landowner; surface landowners and water purveyors with water supplies within 3,000 feet; municipality where the well will be drilled; adjacent municipality; municipalities within 3,000 feet of the vertical well bore; gas storage operator if within 3,000 feet. Mark the boxes, "X," which show the parties' interests. Use additional forms if you need more space. You are required to notify each of these parties. **Notification: Signature below name indicates the party's acknowledgement of receipt of the well location plat and serves as proof of notification**		Surface Landowner	Gas Storage Operator	Surface Landowners & Water Purveyors with water supplies <3000'	Municipalities	Notification Note the means and attach proof. Certified Mail Dates Sent	Return Receipt	Address Affidavit	Written Consent
Print Name: Commonwealth of PA Signature	Address: Bureau of Forestry Ted Borawski, PO Box 8552 Harrisburg, PA 17105-8552	X				1-15-13	1-18-13		
Print Name: Lewis Township Signature	Address: 69 Main St., PO Box 118 Trout Run, PA 17771				X	1-15-13	1-22-13		
Print Name: Hepburn Township Signature	Address: 2702 PLeasant Valley Road Cogan STation, PA 17728				X	1-15-13	1-26-13		
Print Name: Cascade Township Signature	Address: 1456 Kellysburg Road Trout Run, PA 17771				X	1-15-13	1-24-13		
Print Name: McIntyre Township Signature	Address: 10975 Route 14 Ralston, PA 17763-9800				X	1-15-13	1-22-13		

Record of Written Consent

Written Consent: Signature below indicates the party's approval of the well location, or indicates written consent and waives the 15-day objection period where applicable.

Check applicable box

			Surface Owner	Water Well within 500 feet	Building within 500 feet
Print and Sign Name:	**Address:**	**Date**	☐	☐	☐
Print and Sign Name:	**Address:**	**Date:**	☐	☐	☐
Print and Sign Name:	**Address:**	**Date:**	☐	☐	☐
Print and Sign Name:	**Address:**	**Date:**	☐	☐	☐

8000-PM-OOGM0001b 4/2012
Record of Notification / Written Consent

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL
Record of Notification

Farm Name - Well #	
DCNR 100 98H	51139
Applicant Name	DEP ID#
Seneca Resources Corp	372933
DEP USE ONLY	APS #

List the following: surface landowner; surface landowners and water purveyors with water supplies within 3,000 feet; municipality where the well will be drilled; adjacent municipality; municipalities within 3,000 feet of the vertical well bore; gas storage operator if within 3,000 feet. Mark the boxes, "X," which show the parties' interests. Use additional forms if you need more space. You are required to notify each of these parties.

Notification: Signature below name indicates the party's acknowledgement of receipt of the well location plat and serves as proof of notification

		Surface Landowner	Gas Storage Operator	Surface Landowners & Water Purveyors with water supplies <3000'	Municipalities	Notification (Note the means and attach proof.) Certified Mail Dates: Sent	Certified Mail Dates: Return Receipt	Address Affidavit	Written Consent
Print Name: Cogan House Township Signature	Address: 4609 Pennsylvania Rt 184 Trout Run, PA 17771-3185				X	1-15-13	1-22-13		
Print Name: Gamble Township Signature	Address: 17 Beech Valley Road Trout Run, PA 17771				X	1-15-13	1-22-13		
Print Name: Lycoming Township Signature	Address: 328 Dauber Road Cogan Station, PA 17728				X	1-15-13	2-1-13		
Print Name: Jeffrey & MaryJo Tucker/Murphy Signature	Address: 200 West McKinley Ave. Myerstown, PA 17067			X		1-15-13	1-22-13		
Print Name: Signature	Address:								

Record of Written Consent

Written Consent: Signature below indicates the party's approval of the well location, or indicates written consent and waives the 15-day objection period where applicable.

Check applicable box

			Surface Owner	Water Well within 500 feet	Building within 500 feet
Print and Sign Name:	**Address:**	**Date**	☐	☐	☐
Print and Sign Name:	**Address:**	**Date:**	☐	☐	☐
Print and Sign Name:	**Address:**	**Date:**	☐	☐	☐
Print and Sign Name:	**Address:**	**Date:**	☐	☐	☐
Print and Sign Name:	**Address:**	**Date:**	☐	☐	☐

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

USE ONLY	Permit # 081-21123	C: 3/20/13
	Project #:	

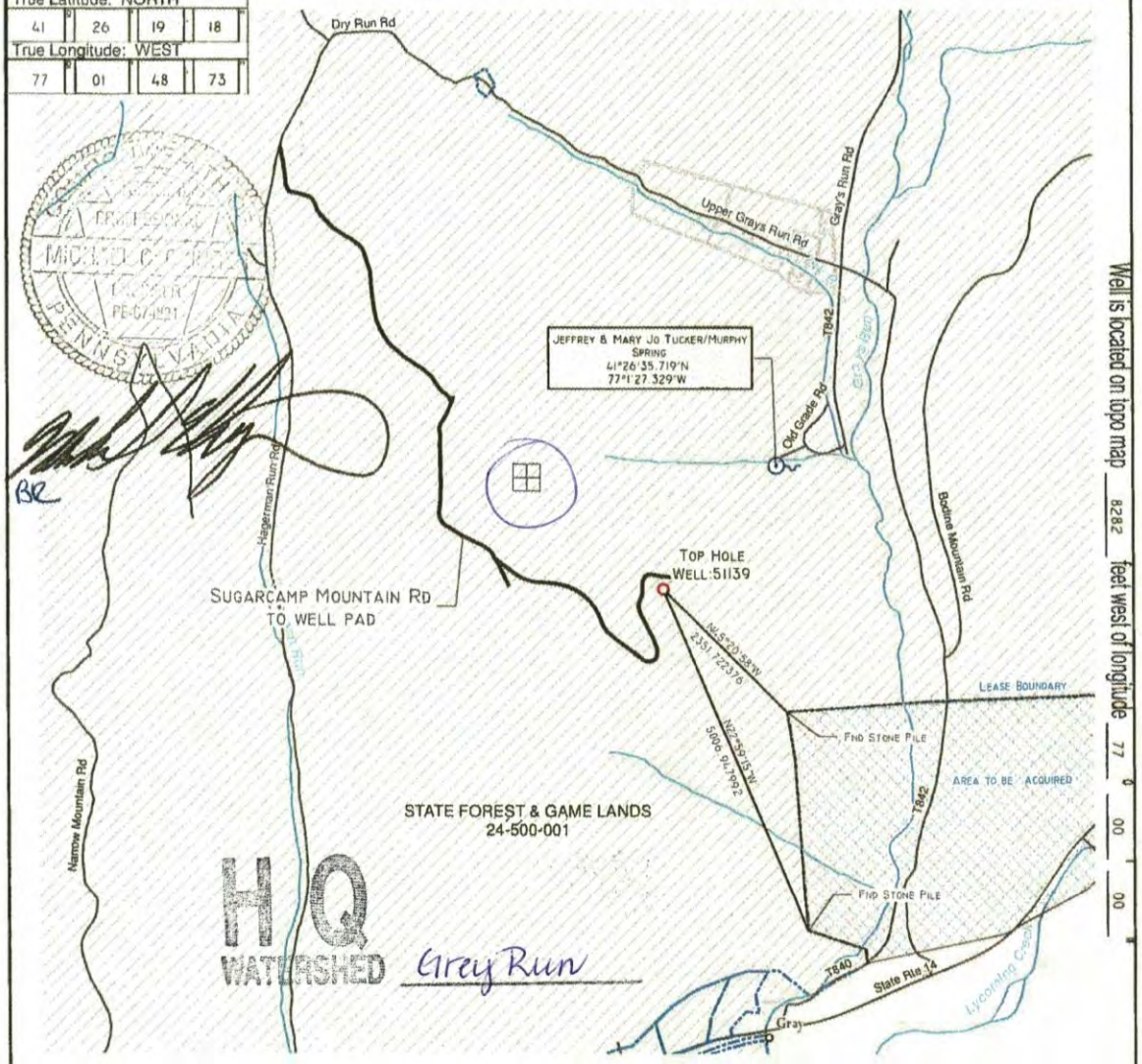
Denotes location of top of well on topo map.

True Latitude: NORTH
41° 26' 19" 18"

True Longitude: WEST
77° 01' 48" 73"

Well is located on topo map 7145 feet south of latitude 41 ° 27 ' 30 "

Well is located on topo map 8282 feet west of longitude 77 ° 00 ' 00 "



Applicant / Well Operator Name:	DEP ID #:	Well (Farm) Name:	Well #:	Serial #:
SENECA RESOURCES CORP	72933	DCNR 100 98H	51139	

Address:	County:	Municipality:	Well Type:
51 ZENTS BLVD BROOKVILLE, PA 15825	LYCOMING	LEWIS TOWNSHIP	GAS

911 address of well site:	USGS 7½' Quadrangle Map Name:	Map Section:	Surface Elevation:
1341 SUGARCAMP MOUNTAIN RD, TROUT RUN, PA 17771	TROUT RUN, PA	6	1889 ft.

Surveyor or Engineer:	Phone #:	Dwg #:	Date:	Scale:	Tract Acreage:
MICHAEL C. CLINGER	814-849-4555	51139_PAGE1_031913.MXD	3/19/2013	1" = 2000'	8,940 +/-

Lat. & Long Metadata Method:	Accuracy:	Datum:	Elevation Metadata Method:	Accuracy:	Datum:	Survey Date:
GPSDF	±3 ft.	NAD-83	TOPO	±10 ft	NGVD-29	9/7/2010

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit # 081-21123	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
Seneca Resources Corp	72933	DNCR 100 98H	51139
Address		Project Number (if previously assigned)	
51 Zents Blvd.			
City	State Zip Code	County	Municipality
Brookville	PA 15825	Lycoming	Lewis Twp
Phone	Fax	Latitude	Longitude
8148494555	8148494795	N 41 ° 26 ′ 19.38 ″	W 77 ° 01 ′ 48.73 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Loyalsock State Forest

   List the name, address and phone number of the person responsible for management of the public resource.

   Richard A. Glinski, 6735 Route 220, Dushore, PA 18614 570-946-4049

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☒ Yes ☐ No

   If yes, provide PNDI Search Number 20120326346088 or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   PA Fish and Boat Commission

   Has the potential conflict been resolved? ☒ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   A site specific Erosion and Sedimentation Control Plan will be followed during construction to protect the public resource. A spill Prevention and Response (PPC) Plan will be on site and followed during the drilling/completion and/or in the event of any spills.

   The public safety will be insured by restricting public access to the site during the procedures listed above.

5500-FM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DRILL DEEPER WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID: 72933	Auth ID: 961944, 978189
Watershed Name: GRAYS RUN	Quality: HQ

Permittee	OGO.#	Permit Number	Date Issued
SENECA RESOURCES CORPORATION	OGO-15547	37-081-21123-00-01	06/26/2013

Address	Farm Name & Well Number	Well Serial #
51 ZENTS BLVD	DCNR 100 98H 51139	
	Municipality: Lewis / County: Lycoming	
BROOKVILLE, PA 15825-2701	7½ ' Quadrangle Name: Trout Run	Map Section #: 6

Phone	Project #	Latitude	Longitude
(814) 220-1511		41-26-19.1800	-77-1-48.7300

Surf Elev at Site	Anticipated Total Depth	Well Type	Offset distances referenced to NE corner of map section.
1889 feet	9045 feet	GS	South 7145 feet West 8282 feet

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

The permittee shall not withdraw or use water from water sources within the Commonwealth of Pennsylvania, for well drilling and fracing activities unless the permittee does so in accordance with a Water Management Plan approved by the Department.

Permittee shall obtain a permit or Environmental Assessment approval from the Department prior to the construction of any dam, reservoir, water obstruction, and/or encroachment for which a permit or Environmental Assessment approval is required by 25 Pa. Code Chapter 105. Any dam embankment including centralized dam embankments utilized to impound freshwater or frac water associated with well fracing not requiring a permit pursuant to 25 Pa. Code Chapter 105 will be constructed in accordance with requirements of 25 Pa. Code §§ 78.56-78.63 and Department guidelines 5500-PM-OG0085 entitled, Design, construction and maintenance standards for dam embankments associated with impoundments for oil and gas wells.

Prior to fracturing the well, as part of its Preparedness, Prevention and Contingency Plan the permittee shall implement a Control and Disposal Plan for the control and disposal of fluids and residual wastes in accordance with 25 Pa. Code § 78.55. The Control and Disposal Plan shall identify the control and disposal methods and practices utilized to prevent pollutants from directly or indirectly reaching waters of the Commonwealth during the impoundment, production, processing and transportation of pollutants, including identification of the permitted processing or disposal facilities where residual wastes will be processed or disposed, in accordance with 25 Pa. Code §§ 78.55 and 91.34.

Prior to transport of the residual wastewater off site, chemical analysis and characterization of the waste shall be conducted and provided to the processing or disposal facility intended for acceptance of the waste in accordance with 25 Pa. Code § 287.54.

RECEIVED
JUL 01 2013

The operator shall run a complete angular deviation survey of the intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after drilling is completed along with other regularly required reports. The deviation report shall include a well location plat and vertical section of the borehole as drilled.

This permit expires **06/26/2014** unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig Lobb
Regional Oil and Gas Program Manager

MICHAEL PANETTIERI	600 GATEWAY DRIVE MANSFIELD, PA 16933	570-662-0832
Oil & Gas Inspector	Address	Phone Number

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

DD

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes 3445D S-NC
Check no. 1330-701,150

OGO # 15547
Client Id 72933
Bond # 5133
C: 5/22/13 mg; 6/17/13 AP
INV:
APS # 802991 Auth Id 978189

Objection Date - Do not issue before:
Date Approved: 6/19/13
Special Cond. E
Site Id 766104

API #'s37- 081-21123
and - - - - - - - - - - - -
Watershed Name: Grays Run
Designation: ☒ HQ ☐ EV

PF Id 760732 SF Id 1107069

PNDI-3/26/12

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator	DEP ID#	Well API # (if available)	Well Farm Name	Well #
Seneca Resources Corp.	72933	37-81-21123- -	DCNR 100 98H	51139

Address	LAT / LONG	NAD	Project Number	Serial #
51 Zents Blvd.	LAT 41°26' 19.18" / LONG - 77°01' 48.73"	83		

City	State	Zip	Municipality Name/ City, Borough, Township	County
Brookville	PA	15825	Lewis Township	Lycoming

Phone	Fax	Email	USGS 7.5 min. quadrangle map	Section
814-220-1511	814-849-4795	keplerd@srcx.com	TROUT RUN, PA	6

☐ Check if this is a new address

24/7 Emergency Phone contact number: 800-526-2608-mention SRC

911 address of well site (if available): 1341 Sugarcamp Mountain Road,

Freshwater Impoundment Name/ Identification	Centralized Impoundment Name/ Identification	Well Pad (cluster) Name/Identification	Borrow Area Name/Identification
none	none	DCNR 100 Pad T	NA

Surface Elev	Deepest Formation to be penetrated	Anticipated TVD
1889	Marcellus	9045

Target Formation(s) proposed for production: Marcellus

Anticipated Target Top/Bottom TVD: 8826 9039

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 17594 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☐ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☒ Other (specify)
Revision to permit

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☐ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☐ Unconventional
Total Application Fee
$ 4450.00

Bond Agreement Id 5133

RECEIVED
MAY 15 2013
Environmental Protection
Northwest Regional Office

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

7/9/13

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☒ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed Grays Run.	☒	☐
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX12-081-0138	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership & Control form 8000-FM-OOGM0118		

Signature of Applicant The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.

Signature of Person Authorized to Submit Application	(Print or Type)	Name of Signer: DOUG A. KEPLER Title: Vice President Environmental Engineering	Date 5/14/2013
DAKepler			

Application Preparer/Contact: BARB REINARD Phone: 814-220-1511

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit #	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
Seneca Resources Corp	72933	DNCR 100 98H	51139
Address		Project Number (if previously assigned)	
51 Zents Blvd.			
City	State Zip Code	County	Municipality
Brookville	PA 15825	Lycoming	Lewis Twp
Phone	Fax	Latitude	Longitude
8148494555	8148494795	N 41 ° 26 ′ 19.18 ″	W 77 ° 01 ′ 48.73 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Loyalsock State Forest

   List the name, address and phone number of the person responsible for management of the public resource.

   Richard A. Glinski, 6735 Route 220, Dushore, PA 18614 570-946-4049

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☒ Yes ☐ No

   If yes, provide PNDI Search Number 20120326346088 or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   PA Fish and Boat Commission

   Has the potential conflict been resolved? ☒ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   A site specific Erosion and Sedimentation Control Plan will be followed during construction to protect the public resource. A spill Prevention and Response (PPC) Plan will be on site and followed during the drilling/completion and/or in the event of any spills.

   The public safety will be insured by restricting public access to the site during the procedures listed above.

The operator shall run a complete angular deviation survey of the intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after drilling is completed along with other regularly required reports. The deviation report shall include a well location plat and vertical section of the borehole as drilled.

This permit expires **06/26/2014** unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig Lobb

Regional Oil and Gas Program Manager

MICHAEL PANETTIERI	600 GATEWAY DRIVE MANSFIELD, PA 16933	570-662-0832
Oil & Gas Inspector	Address	Phone Number

8000-PM-OOGM0001b 4/2012

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes: S-NC; Check No. 1357-$4550; Prod - 3/26/12

OGO # 15547
Client Id 72933
Bond # 5133
C: 7/12/13 CG: 7/24/13
INV:
APS # 802891 Auth Id 985439
Site Id 746104

Objection Date - Do not issue before:
Date Approved: 7/24/13

API #'s37- 081-21123
and -

Watershed Name: ANTIES/LYCOMING
Designation: ☒ HQ ☐ EV

Special Cond.

PF Id 760732
SF Id 1107069

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator: Seneca Resources Corp.	DEP ID#: 72933	Well API # (if available): 37-81-21123-0-01	Well Farm Name: DCNR 100 98H	Well #: 51139
Address: 51 Zents Blvd.		LAT: 41°26' 19.09" LONG: 77°01' 48.73" NAD 83	Project Number	Serial #
City: Brookville	State: PA	Zip: 15825	Municipality Name/ City, Borough, Township: Lewis Township	County: Lycoming
Phone: 814-220-1511	Fax: 814-849-4795	Email: keplerd@srcx.com	USGS 7.5 min. quadrangle map: TROUT RUN, PA	Section: 6

☐ Check if this is a new address

24/7 Emergency Phone contact number: 800-526-2608-mention SRC

911 address of well site (if available): 1341 Sugarcamp Mountain Road,

Freshwater Impoundment Name/ Identification: none

Centralized Impoundment Name/ Identification: none

Well Pad (cluster) Name/Identification: DCNR 100 Pad T

Borrow Area Name/Identification: NA

Surface Elev: 1889

Deepest Formation to be penetrated: Marcellus

Anticipated TVD: 9052

Target Formation(s) proposed for production: Marcellus

Anticipated Target Top/Bottom TVD: 8826 9039

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 18421 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE
Check applicable.
Application is to:
☐ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☒ Other (specify)
Revision to permit

TYPE OF WELL
Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☐ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE
Check applicable.
☒ Marcellus I
☐ Unconventional

Total Application Fee
$ 4550.00

Bond Agreement Id
5133

RECEIVED
JUL 08 2013
Environmental Protection
Northwest Regional Office

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

8/27/13

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☒ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed Grays Run.	☒	☐
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX12-081-0138	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership & Control form 8000-FM-OOGM0118		

Signature of Applicant — The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.

Signature of Person Authorized to Submit Application	(Print or Type)	Name of Signer: DOUG A. KEPLER Title: Vice President Environmental Engineering	Date 7/5/2013
DAKepler			

Application Preparer/Contact: BARB REINARD

Phone: 814-220-1511

RECEIVED
JUL 08 2013
Environmental Protection
Northwest Regional Office

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF FORESTRY

January 2, 2013

Mr. Doug Kepler
Seneca Resources
51 Zents Blvd.
Brookville, PA 715825

SENT VIA ELECTRONIC MAIL KeplerD@srcx.com

Re: Department Review and Approval for Construction of Well Drilling Pad T, on State Forest Tract 100
State Forest Tract 100 8,891 acres; Lease Date – February 10, 2009
Loyalsock State Forest – Forest District 20
Lewis Township, Lycoming County, PA

Dear Mr. Kepler:

The Bureau of Forestry, as manager for all State Forest lands in Pennsylvania, has reviewed and approved Seneca Resources request for the construction of well drilling Pad T, and associated features within State Forest Tract 100. Seneca Resources is recognized as Lessee of Record for State Forest Tract 100 under an oil and gas lease issued by the Department on February 10, 2009. This letter supersedes and corrects the previous approval letter written November 11, 2012 which cited an approval for an impoundment.

A search of the Pennsylvania Natural Diversity Inventory (PNDI) records on March 26, 2012 indicated that there may be potential impacts to special concern species and resources within the project area. Further review was required by the Pennsylvania Fish and Boat Commission (PFBC) to resolve potential impact to timber rattlesnakes. A Timber Rattlesnake Habitat Assessment was performed by Wildlife Specialists, LLC in March 28, 2012. Based on the assessment map, potential denning and gestation habitat is not located within the 300' buffer of the disturbed area. PFBC reviewed the report concluded that the proposed project will not impact the timber rattlesnake provided strict erosion and sedimentation practices are maintained.

No other Impacts were noted on the PNDI environmental review. A wetland report conducted by Rettew Associates, Inc on March 6 did not delineate any wetlands, waterbodies, or watercourses within the area of investigation. The Loyalsock District Forester approved this project, November 9, 2012.

The Bureau of Forestry hereby approves the above captioned well pad and associated features and Seneca Resources is free to plan its construction of the subject drill pad in coordination with the Loyalsock District Forester and his staff as outlined on the attached Erosion & Sedimentation Control Plan dated October 10, 2012. The District requests that all stumps be removed from the pad sites and upon development completion, the well pad shall be returned to the original contours to the greatest extent possible.

The District Forester requests that restoration measures should include tree and shrub plantings on the extensive cut and fill slopes. Additional controls will be put into the collection swales to isolate the underground storage basin in the event of spill on the drill pad. All field logistics and timber charges should be coordinated with Mr. Joe Dotzel of the Lycoming State Forest office (570.946.4049). Should you require additional information, please free to contact me via electronic mail (garprice@pa.gov) or telephone (717.783.7940). I look forward to hearing from you in the future.

Sincerely,

Garry L Price
Licensed Professional Geologist
Marcellus Shale Program
Bureau of Forestry

Cc: Subsurface Programs (via email)
Lycoming State Forest (via email)
Seneca Resources (via email)

5500-FM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID: 213205	Auth ID: 821700
Watershed Name: E. Fork Sinnemahoning Creek	Quality HQ

Permittee	OGO.#	Permit Number	Date Issued
PENNSYLVANIA GENERAL ENERGY COMPANY, L.L.C.	OGO-63025	37-105-21651-	03/15/2010

Address	Farm Name & Well Number	Well Serial #
120 MARKET ST	PINE HILL PAD A 2413	
	Municipality: Wharton / County: Potter	
WARREN, PA 16365	7½ ' Quadrangle Name: Conrad	Map Section #: 3

Phone	Project #	Latitude	Longitude
(814) 723-3230		41-36-53.2781	-77-52-35.0550

Surf Elev at Site	Anticipated Total Depth	Well Type	Offset distances referenced to NE corner of map section.
1548 feet	6100 feet	GS	South 3740 feet West 460 feet

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

The permittee shall not withdraw or use water from water sources within the Commonwealth of Pennsylvania, for well fracing activities, unless the permittee does so in accordance with a Water Management Plan approved by the Department.

Permittee shall obtain a permit or Environmental Assessment approval from the Department prior to the construction of any dam, reservoir, water obstruction, and/or encroachment for which a permit or Environmental Assessment approval is required by 25 Pa. Code Chapter 105. Any dam embankment including centralized dam embankments utilized to impound freshwater or frac water associated with well fracing not requiring a permit pursuant to 25 Pa. Code Chapter 105 will be constructed in accordance with requirements of 25 Pa. Code §§ 78.56-78.63 and Department guidelines 5500-PM-OG0085 entitled, Design, construction and maintenance standards for dam embankments associated with impoundments for oil and gas wells.

Prior to fracturing the well, as part of its Preparedness, Prevention and Contingency Plan the permittee shall implement a Control and Disposal Plan for the control and disposal of fluids and residual wastes in accordance with 25 Pa. Code § 78.55. The Control and Disposal Plan shall identify the control and disposal methods and practices utilized to prevent pollutants from directly or indirectly reaching waters of the Commonwealth during the impoundment, production, processing and transportation of pollutants, including identification of the permitted processing or disposal facilities where residual wastes will be processed or disposed, in accordance with 25 Pa. Code §§ 78.55 and 91.34.

Prior to transport of the residual wastewater off site, chemical analysis and characterization of the waste shall be conducted and provided to the processing or disposal facility intended for acceptance of the waste in accordance with 25 Pa. Code § 287.54.

RECEIVED
MAR 22 2010
OIL & GAS

The operator shall run a complete angular deviation survey of the intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after well drilling together with other regularly required reports.

This permit expires **03/15/2011** unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig Lobb

Regional Oil and Gas Program Manager

Michael Panettieri
Oil & Gas Inspector

600 Gateway Drive
Mansfield, PA 16933

570-662-0832
Telephone

5500-PM-OG0001 Rev. 10/2009

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

DEP USE ONLY	
AUTH #	NC
Check # 19592	Amount $ 2,850.00

#3000 + 250 = #3250

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

DEP USE ONLY

Notes: M	OGO # 63025	Objection Date - Do not issue before: 2/17/10	Well Permit # 105-21651
	Bond # 9307		Special Cond. A B C D (E) F
	C: 2/2/10 dek G: 2/17/10 DK	Date Approved: 2/25/10 SS	Watershed Name: EAST FORK SINNEMAHONING CREEK
	INV: 3-15-10 BR		Designation: (HQ) EV CREEK

Please read instructions before you begin filling in this form.

Applicant (Operator) Name	DEP Client ID#	Phone	FAX	Check if new address. ☐
Pennsylvania General Energy Company L.L.C.	213205	(814) 723-3230	(814) 723-4746	
Mailing Address (Street or PO Box)	**City**	**State**	**Zip +4**	**Country (if not USA)**
120 Market Street	Warren	Pa	16365	

(Well) Farm Name	Well #	Serial #
Pine Hill Pad A	2413	

County	Municipality	Project # (from DEP)
POTTER	WHARTON	

If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, ***or for a well site that was previously permitted but not drilled,*** check this box ☐ and enter the permit or registration number here:

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any "hit" must include accepted mitigation plan from applicable agency.

PERMIT TYPE
Check applicable.
Application is to:
- ☒ Drill a new well
- ☐ Deepen a well
- ☐ Redrill a well
- ☐ Alter a well
- ☐ E&S Control Module
- ☐ Other (specify)

TYPE OF WELL
Check one.
- ☒ Gas
- ☐ Oil
- ☐ Comb. (gas & oil)
- ☐ Injection, recovery
- ☐ Injection, disposal
- ☐ Coalbed Methane
- ☐ Gas Storage
- ☐ Other (specify)

APPLICATION FEE
Check applicable.
- ☒ Marcellus Well: Non-Vertical
- ☐ Marcellus Well: Vertical
- ☐ Non-Marcellus Well: Non-Vertical
- ☐ Non-Marcellus Well: Vertical
- ☐ $200 (Home Use Well)
- ☐ $500 E&S Fee
- ☐ $ 0 (Rehab orphan)
- ☐ Vertical: Length ____ ft.
- ☐ Marcellus: Length ____ ft.
- ☒ Non-Vertical: Length 11506 ft.

Total Application Fee $ 3250

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
2. Will the well penetrate a **workable coal seam**? If "No," include justification and supporting documentation.	☐	☒
3. If the well will penetrate a **workable coal seam**, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells).	☐	☒
a. If "No," is the required exception request attached? (Check here if re-working an existing well: ☐ N/A)	☐	☐
4. Will the well be drilled at a location where the **coal** has been removed?	☐	☒
5. Will the well be drilled through an **active (operating or projected) coalmine**, or within 1,000 feet of the boundary?	☐	☒
a. If "Yes," print the names of: Mine: Operator:		
6. Will the well penetrate or be within 2,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
7. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
8. Will the well site be within 100 feet (measured horizontally) of a **stream, spring or body of water** identified on the most current 7½' topographic map?	☐	☒
a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached?	☐	☐
9. Will the well site be within 100 feet of a **wetland** or in a **wetland**?	☐	☒
a. Is the well site within 100 feet of a wetland greater than one acre in size? If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached?	☐ ☐	☐ ☐
10. Will the well be drilled within 200 feet (horizontally) from any existing **building** or an existing **water supply**?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached?	☐	☐

RECEIVED
FEB 01 2010
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

	Yes	No
11. Will the well be located where it may impact a public resource as outlined in the "**Coordination of a Well Location with Public Resources**" form 5500-PM-OG0076? If yes, attach a competed copy of the form.	☒	☐
12. Is the well site in a **Special Protection** High Quality (HQ) or Exceptional Value (EV) watershed?	☒	☐
13. Is this well part of a development where you need an **Earth Disturbance Permit** for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. _____	☐	☒

DEP USE ONLY
Date Stamps/Notes
Auth 221700
Site 730257
Clnt 213205
APS 712112
Acct 672308
PF 727181
SF 1007659

Signature of Applicant

The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.

Signature of Person Authorized to Submit Application	(Print or Type)	Name of Signer: DOUGLAS E. KUNTZ Title: President & CEO	Date 1/28/10

Application Preparer/Contact: CHAUNCEY TAYLOR Phone: (814) 723-3230

5500-PM-OG0002 Rev 8/2008

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL LOCATION PLAT

DEP USE ONLY	Auth. ID #	2/17/10 G JR
	Permit # 115-21651	
	Project #	C

Top Hole Location
NAD 27 (±0.1")

Denotes location of well on topo map.

True Latitude: NORTH
41° 36' 53.04"

True Longitude: WEST
77° 52' 36.07"

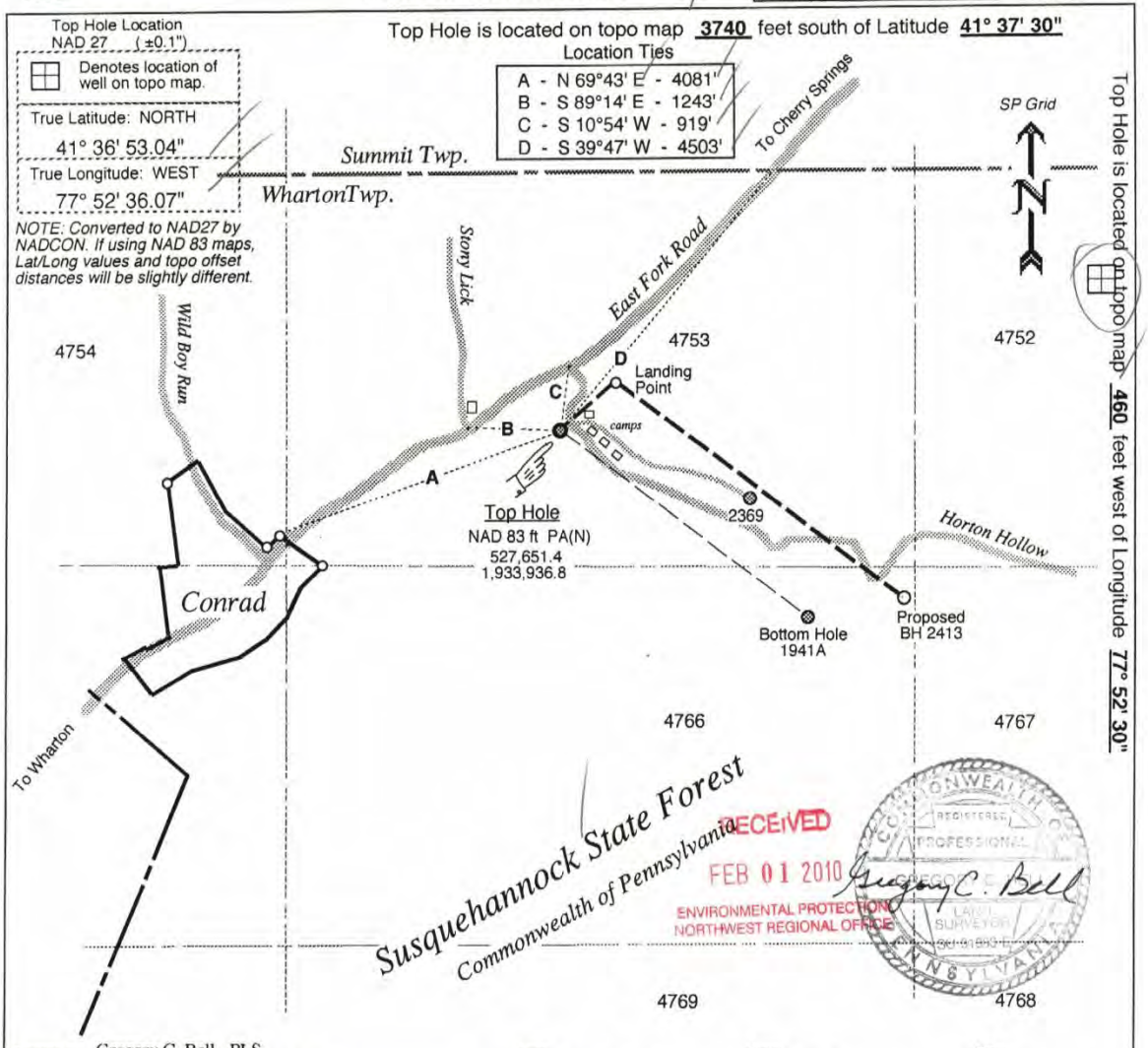
NOTE: Converted to NAD27 by NADCON. If using NAD 83 maps, Lat/Long values and topo offset distances will be slightly different.

Top Hole is located on topo map **3740** feet south of Latitude **41° 37' 30"**

Location Ties

A - N 69°43' E - 4081'
B - S 89°14' E - 1243'
C - S 10°54' W - 919'
D - S 39°47' W - 4503'

Top Hole is located on topo map **460** feet west of Longitude **77° 52' 30"**



RECEIVED
FEB 01 2010
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

Gregory C. Bell

Surveyor or Engineer	Date	Scale	Tract Acreage
Gregory C. Bell, PLS Heritage Surveys (814) 225-3484	Jan. 18, 2010	1" = 2000'	

Lat & Long Metadata			Elevation Metadata			Survey Date
Method TOPCON L2 diff. GPS	Accuracy 1 ± ft.	Datum NAD 27	Method : L2 diff. GPS	Accuracy : 2 ± ft.	Datum NAD 27	1/18/2010

Applicant / Well Operator Name	DEP ID #	Well (Farm) Name	Well #	Serial #
Pennsylvania General Energy Co., LLC	213205	**Pine Hill - PAD A**	**2413**	

Address	County - Code	Municipality	Well Type
120 Market Street, Warren, PA 16365	Potter - 53	Wharton Twp.	Gas

Surface Landowner	USGS 7.5' Quadrangle Map Name	DEP Map #	Map Section	Surface Elevation ft.
Commonwealth of PA. - **Susquehannock State Forest**	Conrad	622	3	1548

Target Formation(s)	Angle & Course of Deviation (Drilling)	Anticipated Total Depth (ft.)
Marcellus Shale	S 64°11' E - 5240' (Net) SP Grid	TVD 6100 TMD 11506

Surface Owner or Water Purveyor with a Water Supply within 1000 ft.	Approximate Course and Distance to Water Supply	Owner, Lessee, or Operator of Workable Coal Seam	Name of Coal Seam Owned, Leased, or Operated
none			

WATERSHED EAST FORK SINNEMAHONING CREEK

5500-PM-OG0076, 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit #	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number
Pennsylvania General Energy Co. L.L.C	213205	Pine Hill Pad A 2413
Address		Project Number (if previously assigned)
120 Market St.		
City / State / Zip Code		County / Municipality
Warren / Pa. / 16365		Potter / Wharton
Phone	Fax	Latitude / Longitude
(814) 723-3230	(814) 723-4746	N 41° 36′ 53.04″ / W 77° 52′ 36.07″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Susquehannock State Forest

   List the name, address and phone number of the person responsible for management of the public resource.

   Christian Nicholas, District 15 Forester, 3150 E. Second St., Coudersport, Pa. 16915

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☐ Yes ☒ No

   If yes, provide PNDI Search Number_____ or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   Has the potential conflict been resolved? ☐ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   Standard E & S controls and BMP's will be utilized for this well.

RECEIVED
FEB 01 2010
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

-FM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

DEP USE ONLY	
Permittee's eFACTS ID: 251430	Auth ID: NC-797090
Watershed Name	Quality

RCELLUS

ittee
ADARKO E&P COMPANY LP

OGO.#
OGO-65860

Permit Number
37-027-21529-00

Date Issued
07/21/2009

Farm Name & Well Number
COP TRACT 259 B-1001H

Well Serial #

lress
BOX 1330

Municipality
Burnside

County
Centre

USTON, TX 77251-1330

7½ ' Quadrangle Name
Snow Shoe NW

Map Section #
9

ne
2) 636-1233

Project #

Latitude
41-7-51.0600

Longitude
-77-53-20.5600

' Elev at Site
21 feet

Anticipated Total Depth
8407 feet

Well Type
GS

Offset distances referenced to NE corner of map section.
South 13049 feet West 3868 feet

s permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil
l Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to
conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.
s permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable
and regulations.
tification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24
urs prior to commencement of drilling activities.
e permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas
on presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity
verned by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil
l gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of
stewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the
thods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent
ludes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act
pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other
wers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by
Department.
is permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered
the Department.

pecial Permit Conditions:

e Operator shall run a complete angular deviation and directional survey of this intentionally deviated well. The deviation rvey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) ys after completion of well drilling together with other regularly required reports.

ior to setting casing/tubing in or producing from the Marcellus shale lateral, the vertical portion of the hole, if it extends low the Kick-Off Point (KOP), must be plugged back to the KOP according to the requirements of §§ 78.91 through 78.95. e procedure used to plug this section of the well will be submitted with or as part of the Well Record and Completion eport.

ATER PLAN CONDITIONS ATTACHED.

is permit expires **07/21/2010** unless drilling is commenced on or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

BRUCE E JANKURA
Oil & Gas Inspector

186 ENTERPRISE DR
PHILIPSBURG, PA 16866
Address

(814) 342-8134
Phone Number

RECEIVED
JUL 27 2009
OIL & GAS

5500-PM-OG0001 Rev. 4/2009

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

DEP USE ONLY
AUTH # NC-197090
Check # 01 10375908 Amount $ 3,150

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

DEP USE ONLY

Notes			
	OGO # 65860	Objection Date - Do not issue before: 5-8-09	Well Permit # 027-21529-00
	Bond # 10886		Special Cond. A B C D E F
	C: chchRF G: EAD	Date Approved: 7-17-09	Watershed Name:
	INV:		Designation: HQ EV

Please read instructions before you begin filling in this form.

Applicant (Operator) Name	DEP Client ID#	Phone	FAX	Check if new address.
Anadarko E & P Company LP	251430	832-636-1233	832-636-5081	☐

Mailing Address (Street or PO Box)	City	State	Zip +4	Country (if not USA)
P.O. Box 1330	Houston	TX	77251-1330	

(Well) Farm Name	Well #	Serial #
C.O.P. Tract 259	B-1001H	

County	Municipality	Project # (from DEP)
CENTRE 14	BURNSIDE TWP (01) 906	

If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, ***or for a well site that was previously permitted but not drilled,*** check this box ☐ and enter the permit or registration number here:

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any "hit" must include accepted mitigation plan from applicable agency.

PERMIT TYPE
Check applicable.
Application is to:
☒ Drill a new well
☐ Deepen a well
☐ Redrill a well
☐ Alter a well
☐ E&S Control Module
☐ Other (specify)

Marcellus

TYPE OF WELL
Check one.
☒ Gas
☐ Oil
☐ Comb. (gas & oil)
☐ Injection, recovery
☐ Disposal
☐ Coalbed Methane
☐ Gas Storage
☐ Other (specify)

APPLICATION FEE
Check applicable.
☐ $ 350 (Gas; Non-Marcellus; Comb.; Coal Meth; Storage)
☐ $ 250 (Oil; Inj– Rec)
☐ $ 150 (Injection – Waste Disposal)
☐ $ 100 (Redrill, Drill Deeper, Alter a Well, or Change Use)
☐ $500 E&S Fee
☐ $ 0 (Rehab orphan)
☒ Horizontal
☒ Marcellus: Length 11203 ft.
Total Application Fee $ 3150.00 OK

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
2. Will the well penetrate a **workable coal seam**? If "No," include justification and supporting documentation.	☐	☒
3. If the well will penetrate a **workable coal seam**, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells).	☐	☐
a. If "No," is the required exception request attached? (Check here if re-working an existing well: ☐ N/A)	☐	☐
4. Will the well be drilled at a location where the **coal** has been removed?	☐	☒
5. Will the well be drilled through an **active (operating or projected) coalmine**, or within 1,000 feet of the boundary?	☐	☒
a. If "Yes," print the names of: Mine: Operator:		
6. Will the well penetrate or be within 2,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
7. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
8. Will the well site be within 100 feet (measured horizontally) of a **stream, spring or body of water** identified on the most current 7½' topographic map?	☐	☒
a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached?	☐	☐
9. Will the well site be within 100 feet of a **wetland** or in a **wetland**?	☐	☒
a. Is the well site within 100 feet of a wetland greater than one acre in size?	☐	☐
If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached?	☐	☐
10. Will the well be drilled within 200 feet (horizontally) from any existing **building** or an existing **water supply**?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached?	☐	☐
11. Will the well be located where it may impact a public resource as outlined in the **"Coordination of a Well Location with Public Resources"** form 5500-PM-OG0076? If yes, attach a competed copy of the form.	☒	☐
12. Is the well site in a **Special Protection** High Quality (HQ) or Exceptional Value (EV) watershed?	☐	☒
13. Is this well part of a development where you need an **Earth Disturbance Permit** for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. _____	☐	☒

DEP USE ONLY
Date Stamps/Notes
Auth 197090
Site 722552
Clnt 251430
APS 696133
Acct 659866

RECEIVED
JUN 18 2009
DEP SOUTHWEST REGION
OIL & GAS

RECEIVED
JUL 27 2009
OIL & GAS

Signature of Applicant The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.

Signature of Person Authorized to Submit Application	(Print or Type)	Name of Signer: PATRICIA JAENECKE Title: SR. REGULATORY ANALYST	Date
Patricia Jaenecke			6/16/2009

Application Preparer/Contact: PATRICIA JAENECKE Phone: 832-636-1233

15 DAYS - 8-1-09

Pennsylvania Department of Conservation and Natural Resources

Rachel Carson State Office Building
P.O. Box 8552
Harrisburg, PA 17105-8552
May 8, 2009

Bureau of Forestry

717-783-7940

RECEIVED
JUL 27 2009
OIL & GAS

Ms. Lisa M. Riley
Senior Landman – Surface Land
Anadarko Petroleum Company
1201 Lake Robbins Drive
The Woodlands, TX 77380

Re: Department Approval of Anadarko E&P Company's Two (2) Proposed Well Locations on Sproul State Forest Lands known as Tract 259
Co-Lessee of Record: Anadarko E&P Company, LP
State Forest Tract 259 A – 1,280 acres; Well #'s 1001 H and 1002 H
Sproul State Forest, District #10
Burnside Township, Centre County Pennsylvania

Dear Ms. Riley:

The Bureau of Forestry, as manager for all Commonwealth State Forest lands in Pennsylvania, has reviewed the above-captioned two (2) new gas well locations which have been proposed by Anadarko E&P Company, LP to be drilled on State Forest lands known as State Tract 259 (Centre County). Anadarko is recognized as a Co-Lessee of Record for State Forest Tract 259 under an oil and gas lease issued by the Department on January 20, 1981.

The Bureau of Forestry hereby **approves** the two (2) above-referenced well locations, pad sites and required access roads. These wells shall be referred to as **Tract 259 #1001H and Tract 259 #1002H** for administrative purposes and should be permitted as such. The following describes the Bureau's review and approval status for the two (2) proposed well locations:

DCNR Tract 259	Tract 259 # 1001 H	**Approved w/ Condition – Requires PA F&BC Clearance**	***Waived Spacing – 1320'***
DCNR Tract 259	Tract 259 # 1002 H	**Approved as Staked**	***Waived Spacing – 1320'***

Please note, the Bureau of Forestry has waived the minimum spacing requirement of forty (40) acres, or 1,320 feet, between well locations (wells and/or pad sites) on Tract 259 for wells #1001H and #1002H as provided for in Section 11.2 of the lease agreement. Additionally, clearance from the PA Fish & Boat Commission for the one (1) potential impact as detailed on *PNDI Search ID: 20090407187310* needs to be obtained and forwarded to my attention before earth moving activities can commence. Before moving onto the above-approved well locations, please contact Assistant District Forester Rich Kugel (570-923-6011) to notify him of the commencement of operations on the respective tracts.

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

Lastly, please forward copies of all well logs and well test data to my attention along with turned to line reports as required by the lease agreement. All data will be kept confidential for the time period specified in the lease agreement. Timely submission of the requested well data will help to avoid any delay with future well location approvals.

Should you require additional information or comment, please feel free to contact me via electronic mail (nabennett@state.pa.us) or telephone (717-783-7940). I look forward to hearing from you in the very near future.

Sincerely,

Nathan S. Bennett
Senior Geologic Scientist
Minerals Section, Bureau of Forestry

Enclosures: Two (2) Original, Executed Landowner Consent Forms
DCNR Rattlesnake Brochure (submitted via email on 8May09)

Cc: Ted Borawski, Minerals Section
Mike Lester, Asst. State Forester
Rich Kugel, Asst. District Forester, FD #10 (via email)

RECEIVED
JUL 27 2009
OIL & GAS

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

5500-PM-OG0076 12/2003

RECEIVED
JUN 18 2009
DEP SOUTHWEST REGION
OIL & GAS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit #	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
Anadarko E&P Company LP	251430	COP Tract 259	B-1001H
Address		Project Number (if previously assigned)	
P. O. Box 1330			
City	State / Zip Code	County	Municipality
Houston	TX 77251-1330	Centre (14)	Burnside Twp (01)
Phone	Fax	Latitude	Longitude
8326361233	8326365081	N 41 ° 07 ′ 51.25 ″	W 77 ° 53 ′ 20.36 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Commonwealth of Pennsylvania, Department of Conservation and Natural Resources

   List the name, address and phone number of the person responsible for management of the public resource.

   Ted Borawski, P. O. Box 8552, 400 Market St., Harrisburg, PA 17105-8552 717-787-2869

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☒ Yes ☐ No

   If yes, provide PNDI Search Number 20090407187310 or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   Pennsylvania Fish and Boat Commission

   Has the potential conflict been resolved? ☒ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

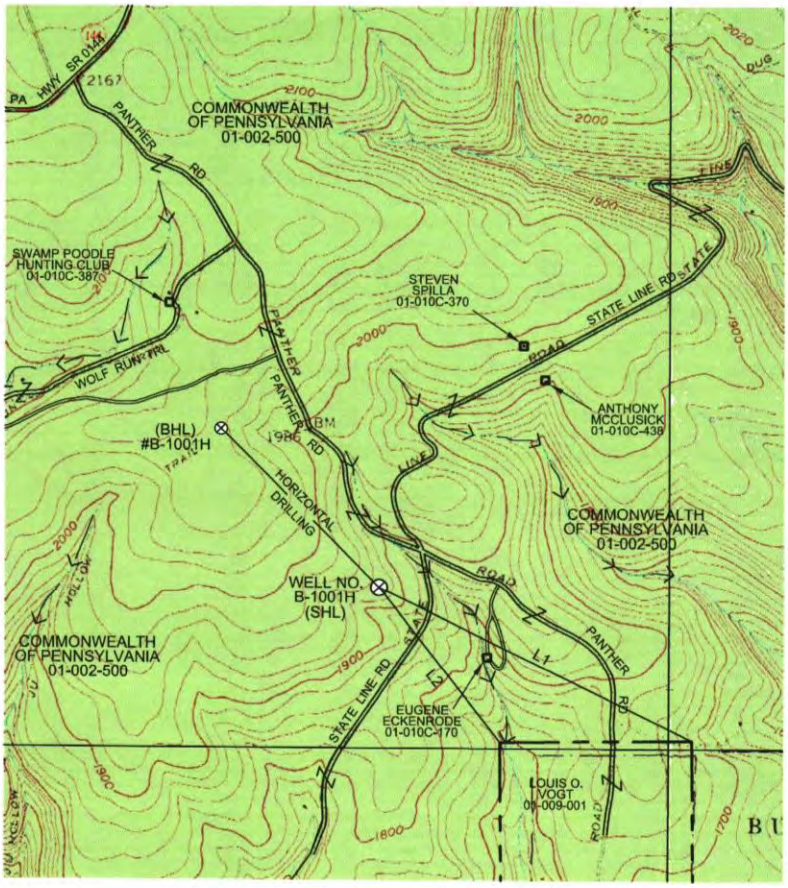
6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   The Operator will use the designed E&S Control Plan and best management practices as described by DEP. Cooperation with the Commonwealth of PA personnel will be established & maintained during operations.

RECEIVED
JUL 27 2009
OIL & GAS

APPLICATION ADDENDUM FOR MARCELLUS SHALE GAS WELL DEVELOPMENT

SECTION 'A' - LOCATION MAP



LEGEND	
⊗	Proposed Gas Well
⊞	Topo Map Location
◉	Spring or Water Well
	Lease Boundary
	Surface Boundary
L#	Well Reference
	Exist. Well Tie
	Stream Flow
	Wetlands
(SHL)	Surface Hole Location
(BHL)	Bottom Hole Location
(LP)	Landing Point
TMD	Total Measured Depth
TVD	True Vertical Depth

0 1000' 2000' 4000'

GRAPHIC SCALE

TAG	BEARING	DIST.
L1	S 64°06' E	4664'
L2	S 38°12' E	2626'

Bottom Hole Location (BHL)
LAT (N) 41°08'11.99"
LONG (W) 77°53'48.33"

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

RECEIVED
JUL 27 2009
OIL & GAS

Surface Hole Location
True Latitude: NORTH
41 ° 07 ' 51.06"
True Longitude: WEST
77 ° 53 ' 20.56"

Applicant / Well Operator Name: ANADARKO E&P COMPANY LP	DEP ID#: 251430	Well(Farm) Name: C. O. P. TRACT 259	Well #: B-1001H	Serial #:
Address: P. O. BOX 1330, HOUSTON, TEXAS 77251		County (Code): CENTRE(14)	Municipality: BURNSIDE TWP (01)	Lat & Long Datum: NAD27
Surface Landowner / Lessor: COMMONWEALTH OF PENNSYLVANIA		USGS 7½ Quadrangle Map Name: SNOW SHOE NW, PA	Map Section: 9	Surface Elevation: 1921 ft.

5500-PM-OG0001A Rev. 11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

Scan

DEP USE ONLY	
Permittee's eFACTS ID: 42238	Auth ID: NC-932181
Watershed Name: LITTLE DEER CREEK	Quality: HQ

MARCELLUS

Permittee	OGO.#	Permit Number	Date Issued
ENERGY CORPORATION OF AMERICA	OGO-33798	37-033-27206-00	07/20/2012

Address	Farm Name & Well Number	Well Serial #
1380 ROUTE 286 HWY E STE 221	COP TR 324 A 2MH-S	
INDIANA, PA 15701-1473	Municipality: Girard / County: Clearfield	
	7½' Quadrangle Name: The Knobs	Map Section #: 8

Phone	Project #	Latitude	Longitude
(724) 463-8400		41-9-44.5890	-78-18-50.4980

Surf Elev at Site	Anticipated Total Depth	Well Type	Offset distances referenced to NE corner of map section.
2119 feet	7350 feet	GS	South 1557 feet West 6172 feet

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

Prior to setting casing/tubing in or producing from the Marcellus shale lateral, the vertical portion of the hole, if it extends below the Kick-Off Point (KOP), must be plugged back to the KOP according to the requirements of §§ 78.91 through 78.95. The procedure used to plug this section of the well will be submitted with or as part of the Well Record and Completion Report.

The Operator shall run a complete angular deviation and directional survey of this intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after completion of well drilling together with other regularly required reports.

NOTE: APPROVED ALTERNATE METHOD OF CASING.

WATER PLAN CONDITIONS ATTACHED.

RECEIVED
JUL 25 2012
OIL & GAS
NORO

This permit expires **07/20/2013** unless drilling is commenced on or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

RICHARD SWANK	208 W 3RD ST STE 101 WILLIAMSPORT, PA 17701	(570) 974-2615
Oil & Gas Inspector	Address	Phone Number

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PNDI HIT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes	OGO # 33798	Objection Date - Do not issue before: 7-4-12	API #s37- 033-27206-00
	Client Id 42238	Date Approved: 7-19-12	and - ; - ; - ; - ; -
	Bond # 5305		Watershed Name: Little Deer Creek
	C: LR LLRP G:	Special Cond.	Designation: ☒ HQ ☐ EV
	INV:		
	APS # 784178 Auth Id 932181	Site Id 762857	PF Id 753833 SF Id 1080629

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator: Energy Corporation of America	DEP ID#: 42238	Well API # (if available): 37- - -	Well Farm Name: COP Tr. 324 A		Well #: 2MH-S
Address: 1380 Rte. 286 Hwy E, Suite 221		LAT 41°9'44.589 LONG - 78°18'50.498	NAD 83	Project Number	Serial #
City: Indiana JUL 19 2012	State: PA	Zip: 15701	Municipality Name/ City, Borough, Township: Girard Township	County: Clearfield 17922	
Phone: 724-463-8400 DEP SOUTHWEST REGION OIL & GAS	Fax: 724-463-9750		Email: DCSupcoe@energycorporationo	USGS 7.5 min. quadrangle map: The Knobs 0919	Section: 8
☐ Check if this is a new address			24/7 Emergency Phone contact number: 724-463-8400	911 address of well site (if available): 1036 Ames Road, Frenchville, PA	
Freshwater Impoundment Name/ Identification: COP	Centralized Impoundment Name/ Identification: None		Well Pad (cluster) Name/Identification: COP Tr. 324 A Pad	Borrow Area Name/Identification: None	
Surface Elev: 2118.85	Deepest Formation to be penetrated: Marcellus		Anticipated TVD: 7350		
Target Formation(s) proposed for production: Marcellus			Anticipated Target Top/Bottom TVD: 7300/7420		

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Re-permit expired permit
☒ Deepen well
☐ Redrill wellbore
☐ Alter well
☐ Other (specify)

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☐ Vertical
☐ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☐ Unconventional
Total Application Fee $ 3550. VR
CK 327415

Bond Agreement Id: 5305

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 13106 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known: _____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification. NC

JUN 21 2012

COORDINATION WITH REGULATIONS AND OTHER PERMITS

	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2). DEP SOUTHWEST REGION OIL & GAS	☐	☒
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☐	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet,or the vertical well bore be within 300 feet,from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

45 DAYS = 8/4/12 8/7/12

Marcellus

8000-PM-OOGM0001b 4/2012

033-27206-00

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used bya water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☒ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed Little Deer Creek.	☒	☐
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX11-033-0038	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership &Control form 8000-FM-OOGM0118		

Signature of Applicant The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information including all related submissions, is true and accurate to the best of their knowledge.

Signature of Person Authorized to Submit Application	(Print or Type)	Name of Signer: BARBARA UTHE Title: Permitting Department	Date
Barbara Uthe			6/20/12

Application Preparer/Contact: Phone:

JUL 19 2012
DEP SOUTHWEST REGION
OIL & GAS

JUN 21 2012
DEP SOUTHWEST REGION
OIL & GAS

CHECKLIST FOR ADMINISTRATIVE COMPLETENESS REVIEW
OF INCOMING DRILLING PERMIT APPLICATIONS (6/22/12 lr)

COP Tr 324A 2 MHS

AUTH NUMBER: NC-932181

FARM NAME/WELL NUMBER:

YES	NO	N/A	
☑	☐	☐	**Appropriate permit application fee submitted & Bond Agreement listed.**
☑	☐	☐	**Application has been signed by an authorized person.** If not an officer, check for an Authorization letter. If none is found, call and request one.
☑	☐	☐	**Check applicant's address.** If different than what is listed in eFacts, contact the applicant. Request a Change of Address letter.
☐	☐	☐	**Check answers to Items 1 thru 12.**

a. Item 1: If yes, this indicates the well is a Conservation Well. Make notation in Coal Module block.
b. Item 2: If yes, OG-57 and E&S Plan must be attached; xmit to WQS w/ copies to Super and Geo.
c. Item 3: If yes, Operator must be listed on page 3.
d. Item 5 and/or 5.1: If yes, OG-58 or consent must be attached; xmit to OGI w/copies to Super and Geo
e. Item 6: If yes, OG-76 must be attached; clearance letters are Geo responsibility.
f. Item 10: If yes, highlight to point out to Geo (ALSO FOR ITEMS 5 AND 6)
g. Item 12: Current Ownership & Control Form OOGM118 must be attached.
h. Other: If an OG-24 is attached, xmit to OGI w/copies to Super and Geo.
i. Other: The only squares that can be blank are the API, Project #, and Serial #, and the 2 lines starting with "Check if new address"; all other information must be completed from Well Information down.

OIC missing? (hold off for now - Meadville not requiring)

☐	☐	☐	**Application Page 3:** Check Farm Name, Well #, & applicant name to see if they are listed and the same as shown on page 1. a. Check each name listed against a signed Certified Mail receipt. All listed must have a signed receipt, signed the bottom of page 3, or have a notarized affidavit. b. Ensure blocks are checked for each name listed. Note: All Surface Landowners and Surface Landowners & Water Purveyors with Water Supplies and Municipalities must also appear on the plat.
☑	☐	☐	**Non-Coal Justification or Coal Module:** Is a Non-Coal Justification required and attached? yes ☐ no ☐ N/A ☐ write API at top
			If a Coal Module required and attached? yes ☐ no ☐ N/A ☐ write API at top
☐	☐	☐	**Coal Module (if applicable):**
			Item 2: If no, is exception request attached? yes ☐ no ☐ N/A ☐ write API at top
			Item 2c: If yes, is approved OG-57 attached? yes ☐ no ☐ N/A ☐ write API at top
			Page 2: Check each name listed against a signed Certified Mail receipt. Each name listed must have a signed receipt, a signature at the bottom of page 2, or have a notarized affidavit. Ensure blocks are checked for each name listed. Coal Owners, Lessees and Operators must also appear on plat.
☐	☐	☐	**PNDI Search:** PNDI must be no older than one (1) year old from the date the application is received. The operator must include (a) clearance letter(s) for any Threatened or Endangered Species conflicts, (b) proof of mailing to appropriate agency for Special Concerns Species or Resource, or (c) signed Avoidance Measure.
☐	☐	☐	**Plat:** Check that all information is filled out: a. **Every item** (Well name, #, County, Municipality, Operator Name, ID# & Add, Lat & Long, Target Formations, Quadrangle, Map Section, Elevation, TVD, # and footage of laterals, etc.) **must** be on the plat and **EXACTLY** as listed on Page 1; all data must be NAD83 and surveyor's seal is req'd. b. Page 2 is required for all applications; page 3 is required for non-conventional; page 4 required for horizontal. All pages must be on Commonwealth forms; Pg 3 also requires a seal. c. Unconventional permit application: Marcellus, Rhinestreet, Middlesex, Burket, Geneseo, and Utica. d. Municipalities and Water Purveyors/Suppliers listed and notified via Page 3. Compare Coal too.

no proof enclosed.

Metadata method Marcellus?

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit # 033-27206	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
Energy Corporation of America	42238	COP Tr. 324 A	2MH-S
Address		Project Number (if previously assigned)	
1380 Rte. 286 Hwy E, Suite 221			
City / State / Zip Code		County	Municipality
Indiana / PA / 15701		Clearfield	Girard Twp
Phone	Fax	Latitude	Longitude
724-463-8400	724-463-9750	N 41 ° 09 ′ 44.58 ″	W 78 ° 18 ′ 50.49 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   Moshannon St Forest

   List the name, address and phone number of the person responsible for management of the public resource.

   Jason Cotton (Oil & Gas Forester) Moshannon State Forest, 3372 State Park Road, Penfield, PA 15849

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☒ Yes ☐ No

   If yes, provide PNDI Search Number 20120524356309 or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   PA Fish and Boat Commission

   Has the potential conflict been resolved? ☒ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

   Please see attachment

JUN 21 2012

DEP, SOUTHWEST REGION
OIL & GAS

Form 5500 - PM - 060076 Attachment

PENNSYLVANIA FISH & BOAT COMMISSION
Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620

Guidelines for Timber Rattlesnake Habitat Creation

(revised 3-5-2010)
Food Plots – Gas Well Openings – Access Roads – Pipelines

Timber rattlesnakes (*Crotalus horridus*) are declining across their range, mostly due to habitat destruction/alteration, wanton killing, and poaching. The Pennsylvania Fish & Boat Commission (PFBC) is the state agency charged with the protection of Pennsylvania's reptiles, and therefore, since the early 1980's has been involved in collecting information about the timber rattlesnake and its habitats in Pennsylvania. The PFBC is aware of numerous forest openings, access roads, and pipelines on private, State Forest, and State Game Lands across the state, that are used by gravid (pregnant) timber rattlesnakes on an annual basis. Gravid females use these sites mainly to bask for gestation (embryonic development) purposes. Through years of monitoring we have noted characteristics that will be helpful in guiding the future construction of effective timber rattlesnake gestation habitat. This memorandum describes these characteristics and makes recommendations for creation of critical timber rattlesnake habitat.

Life History

Timber rattlesnakes inhabit the forested, mountainous regions of Pennsylvania. Their active season is mid-April through mid-October. They prefer upland forested areas where they forage for small mammals (e.g., mice, and chipmunks). Talus and/or scree slopes, rocky ledges, outcrops, and boulder fields generally with southerly exposures contain the entrances to over-wintering dens. Dens usually have rocky crevices, or other features that provide access to ancestral underground chambers to which the snakes return yearly for hibernation. These sites generally have rocky habitat containing a semi-open canopy close by that is used by gravid females for gestation. Timber rattlesnakes begin emerging (egress) from their dens in mid to late April. Adult males may travel up to 3 to 5 miles away from the den before returning in the fall, unlike non-gravid females, which move approximately 1 to 3 miles from the den, and gravid females, which stay close to the den (100-400m). Timber rattlesnakes begin traveling towards their den sites in September and enter their dens (ingress) for winter dormancy in late September through October.

Distribution

The current range of the timber rattlesnake encompasses 31 states from Vermont and New Hampshire south to northern Florida, west to eastern Texas and then north through eastern Oklahoma, Kansas, and Nebraska, through Iowa into southeastern Minnesota. From southwestern Wisconsin the range retreats south, away from the Great Lakes, through western and southern Illinois and southern Indiana and Ohio.

In Pennsylvania the Allegheny Plateau and the Appalachians are encountered and the range goes north through New York back to southern Vermont and New Hampshire. Prior to European settlement, the range of the timber rattlesnake is thought to have spanned most of Pennsylvania. The current range of the timber rattlesnake is restricted to the more rugged, least accessible, and less populated regions of the Commonwealth. Today, timber rattlesnakes occur in forested, mountainous regions that encompass mainly the central and northeast region of Pennsylvania (e.g., Ridge and Valley Province, Laurel Highlands, Allegheny Plateau, and the Pocono Plateau).

Threats and Conservation

Given the slow maturity, low fecundity, and the many threats posed by the overexploitation of its habitat, the timber rattlesnake is vulnerable to decline. Presently, experts believe that the timber rattlesnake is

JUN 21 2012

DEP, SOUTHWEST REGION
OIL & GAS

declining across its range, and in Pennsylvania particularly in the peripheral areas of its range. The decline of the timber rattlesnake is attributed mainly to human activities related to habitat alteration, highways, illegal/wanton killing, and poaching. To date, the timber rattlesnake is protected in over half of the states where it occurs. In Pennsylvania, it is currently listed as a candidate species (an animal that could achieve threatened or endangered status in the future). The timber rattlesnake is legally protected in Pennsylvania and the Pennsylvania Fish and Boat Commission's Natural Diversity Section comments statewide on development projects that have potential to adversely impact timber rattlesnake populations. The Natural Diversity Section is also involved with research projects on monitoring, inventory, and den viability that are being conducted on Pennsylvania timber rattlesnakes.

Critical Habitats

The PFBC considers two types of habitat used by timber rattlesnakes as extremely vital and thus refers to them as "Critical Habitat": over-wintering dens and gestation sites. The loss of either of these habitats will adversely impact the timber rattlesnake. Studies have shown that snakes cannot be successfully relocated and the loss of a den through destruction usually results in the loss of that particular den population, which may be critical to the local population (Reinert and Rupert 1999*). The key to understanding why a den exists in a specific location is the underground microclimate. Although attempts to predict specific den locations by researchers have proven difficult, temperature, humidity, and a water source appear to be critical to den site selection for timber rattlesnakes (H. Reinert, pers. comm..). **Efforts to create den habitat have not proven to be successful.** Recent telemetry studies have been useful in determining specific den location selection of timber rattlesnakes (H. Reinert and PFBC, pers. comm.). Dens are often located in obscure habitats, which on the surface appear no different than any other location on a particular mountain. (See Den Habitat Photos illustrating this point showing how few rocks or none may be present.) Generally, they are located in and around rocky habitat, not necessarily extremely rocky habitat, but on a slope, under tree canopy, and usually not in large rock outcrops. Because dens are difficult to locate without telemetry and there is such a short window of time to locate them, it is critical to protect the potential den habitat (rock areas) located on slopes having an exposure ranging from southeast to west (135° to 270°). **Simply put, in order to protect den sites, slopes in this degree range should be avoided.**

The other type of timber rattlesnake critical habitat is the gestation site. This is an area where gravid female rattlesnakes congregate for several months (June-September) for the sole purpose of gestating young and birthing. Gravid females require a higher body temperature for embryonic development than the other snakes in the local population, which spends most of the summer months foraging under the forest canopy. **Gestation habitat *can* be created** to improve the viability of the den populations over the long term. Well clearings, pipelines, and their associated access roads provide opportunities to create excellent gestation habitat, as detailed below.

Habitat Creation

Placement and Engineering of Access Roads

Based on the information we have concerning dens, it is best to avoid construction in rocky areas on slopes having an exposure ranging from southeast to west (135° to 270°). It is important to avoid any slope with that exposure, because some den entrances occur in relatively small ledges or simply a small opening or hole occurring on the ground under semi-open canopy that is used to access the underground over-wintering den. Despite our best efforts to route access roads through areas which appear devoid of rocks, large rocks will still be unearthed during the excavation of a road. **We recommend the large rocks be pushed to the north or east side of the roads and left lying flat in the open area between the tree line and the traveled portion of the road.** This manipulation of the rocks will optimize solar exposure and provide attractive basking habitat for gravid females. We recommend that these access roads be gated and locked, thus preventing many people from accessing the site and indirectly protecting the gestating snakes from excessive human disturbance. (See Access Road photos showing this habitat.)

JUN 21 2012

DEP, SOUTHWEST REGION
OIL & GAS

Alternatively, if high use of these roads is expected during the summer months, then the margins should be completely cleared of all rocks, logs, and debris in order to *discourage* their use as gestation sites by rattlesnakes.

Habitat Creation in Clearings

There are opportunities at food plots, gas well clearings, and pipelines to create excellent gestation habitat by utilizing the larger rock slabs, which were unearthed during the excavation of the opening. Forest openings created in more remote areas or in areas only accessible by gated access roads should be the areas targeted for the creation of rattlesnake gestation habitat. The lack of disturbance is necessary, because rattlesnakes imprint to these locations and will arrive at the gestation rocks in late May or early June and remain there, without feeding, until early September. If the snakes are consistently disturbed they may abandon the location.

The important factor in creating excellent gestation habitat is the rock placement in a position so the rocks receive a daily minimum of 5 to 7 hours of direct sunlight. Rock placement is important. If it is done correctly, it enables the females the opportunity to bask and good rock placement also affords the snakes the opportunity to retreat to shade during intense sun which occurs in the middle of the day. The rocks absorb and hold the high heat during the day and make it possible for the gravid female to thermoregulate during the 18 hours a day the rock is not in the sun. **Large flat slabs (minimum of 4' x 6') should be placed on the north or east side of the well openings and food plots approximately 5 to 10 yards out into the opening from the existing tree line.**

Shade for the rattlesnakes can be provided by diverse vegetative cover, or by additional layers of rock. Seeding between the forest edge and the newly placed rocks should be avoided if possible in order to allow for colonization of local vegetation. Additionally, the required shade can be provided by placing the large flat rocks flat on the ground, approximately 5 to 10 yards from the tree line, leaving approximately two (2) feet between the slabs. A second layer of slabs can then be placed on top of the first layer covering the two (2) foot open space separating the base slabs and also leaving spacing between the top layer of rocks. Additional rows of rocks may be added, based on availability, but all rows of rocks should consist of not more than two layers. Any additional layers should be avoided because they prevent the base slab from warming to the required temperature needed by the snakes during the hours of the day without sun. In this type of structure the snakes will utilize the base slab and the shade created between the base slabs by the top layer of slabs. (See Forest Opening and Pipeline Edge photos showing this habitat.)

Monitoring

It is important to notify the Pennsylvania Fish and Boat Commission, Natural Diversity Section, 450 Robinson Lane, Bellefonte, PA 16823, (814)359-5237 of the location coordinates of all sites where habitat construction was performed in order for the PFBC to monitor the timber rattlesnake use of the created site over time. Once established, certain rocks within the created habitat area will be used annually by the females from one or multiple den populations and will aid in increasing the viability of that particular population.

Through proper management, habitat creation, maintenance, research, and the continuing cooperative efforts of land managers, private landowners, and industry, the timber rattlesnake will continue to be a part of our forests and a reminder of our wilderness heritage. Thank you for your cooperation in this conservation effort.

*Reinert, H. K. and R. R. Rupert, Jr. 1999. Impacts of translocation on behavior and survival of Timber Rattlesnakes, *Crotalus horridus*. Journal of Herpetology 33:45-61.

JUN 21 2012

DEP, SOUTHWEST REGION
OIL & GAS

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes $4050 SNC
Check No. 001965G9 - $26350
DMO1 - 12/20/12

OGO # 63815
Client Id 237104
Bond # 10012
C: 3/19/13 MS: 3/25/13 AM
INV: 4-3-13
APS # 804840 Auth Id 768012

Objection Date - Do not issue before: 3/12/13
Date Approved: 4/5/13 BM
Special Cond. E Vert Plugback
Site Id 760180

API #'s37- 117-21624
and -
Watershed Name:
Designation: ☐ HQ ☐ EV
PF Id 762404
SF Id V - 1101186 H - 1101187

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator: Talisman Energy USA Inc.	DEP ID#: 237104	Well API # (if available): 37- - - -	Well Farm Name: DCNR 594		Well #: 02-203-01
Address: 50 Pennwood Place		LAT: 41°37' 34.59" / LONG: 77°07' 31.95"	NAD 83	Project Number	Serial #
City: Warrendale	State: PA	Zip: 15086	Municipality Name/ City, Borough, Township: Liberty Township	County: Tioga	
Phone: 724-814-5300	Fax: 724-814-5301	Email: lmontes@talismanusa.com		USGS 7.5 min. quadrangle map: Cherry Flats	Section: 9

☐ Check if this is a new address

24/7 Emergency Phone contact number: 607-857-6807

911 address of well site (if available): To Be Determined

Freshwater Impoundment Name/ Identification: Unknown

Centralized Impoundment Name/ Identification: Unknown

Well Pad (cluster) Name/Identification: Unknown

Borrow Area Name/Identification: Unknown

Surface Elev: 2246

Deepest Formation to be penetrated: ~~Marcellus~~ Onondaga

Anticipated TVD: 7866

Target Formation(s) proposed for production: Marcellus

Anticipated Target Top/Bottom TVD: 7536 7716

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 15794 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____ (see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☐ Other (specify)

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☒ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☒ Unconventional
Total Application Fee
$ 4,050.00

Bond Agreement Id 10012

RECEIVED
MAR 12 2013
Environmental Protection
Northwest Regional Office

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☒	
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☒	☐
b. Does the location fall within an area covered by a spacing order?	☐	☐
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

APO 4/4/13

5/2/13

LIBERTY TWP

a. If Yes, print the names of: Storage Field: Operator:

4. Is the proposed well location within the permitted area of a **landfill**? ☐ ☒

8000-PM-OOGM0001b 4/2012

pennsylvania

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

PERMIT APPLICATION TO DRILL AND OPERATE AN UNCONVENTIONAL WELL

DEP USE ONLY

Notes	OGO #	Objection Date - Do not issue before:	API #s37-__-_____-__-__;
	Client Id	Date Approved:	and -__-__; -__-__; -__-__; -__-__; -__-__
	Bond #		Watershed Name: Designation: ☐ HQ ☐ EV
	C: G:	Special Cond.	
	INV: APS # / Auth Id	Site Id / PF Id / SF Id	

Please read instructions before you begin filling in this form.

WELL INFORMATION

Well Operator	DEP ID#	Well API # (if available)	Well Farm Name	Well #
Talisman Energy USA Inc.	237104	37- - - -	DCNR 594	02-203-01

Address	LAT / LONG	NAD	Project Number	Serial #
50 Pennwood Place	LAT 41°37' 34.59" / LONG - 77°07' 31.95"	83		

City	State	Zip	Municipality Name/ City, Borough, Township	County	Section
Warrendale	PA	15086	Liberty Township	Tioga	9

Phone	Fax	Email	USGS 7.5 min. quadrangle map
724-814-5300	724-814-5301	lmontes@talismanusa.com	Cherry Flats

☐ Check if this is a new address

24/7 Emergency Phone contact number: 607-857-6807

911 address of well site (if available): To Be Determined

Freshwater Impoundment Name/ Identification	Centralized Impoundment Name/ Identification	Well Pad (cluster) Name/Identification	Borrow Area Name/Identification
Unknown	Unknown	Unknown	Unknown

Surface Elev	Deepest Formation to be penetrated:	Anticipated TVD
2246	Onondaga	7866

Target Formation(s) proposed for production: Marcellus

Anticipated Target Top/Bottom TVD: 7536 7716

Number of wellbore laterals proposed under this application 1

Total feet of wellbore to be drilled under this application 15794 Ft.

If applying for a permit to rework an existing well not registered or permitted, check this box ☐ and **enter date drilled,** if known:_____(see instructions)

PNDI Attached: ☒ Any threatened or endangered "hit" must include a copy of the clearance letter from the applicable agency(ies).

Application submitted as: Coal well: ☐ Attach Coal Module
CBM well ☐ Attach Coal Module
Non coal well ☒ Attach justification.

PERMIT TYPE Check applicable.
Application is to:
☒ Drill a new well
☐ Re-permit expired permit
☐ Deepen well
☐ Redrill wellbore
☐ Alter well
☐ Other (specify)

TYPE OF WELL Check applicable.
☒ Gas
☐ Oil
☐ Comb. (gas & oil/condensate)
☐ Other (specify)

Configuration
☒ Vertical
☒ Horizontal
☐ Deviated
☐ Multiple laterals

APPLICATION FEE Check applicable.
☒ Marcellus I
☒ Unconventional
Total Application Fee
$ 4,050.00

Bond Agreement Id
10012

RECEIVED
APR 04 2013
Environmental Protection
Northwest Regional Office

COORDINATION WITH REGULATIONS AND OTHER PERMITS	Yes	No
1. Will the well be subject to the **Oil and Gas Conservation Law**? If "No," go to 2).	☒	☐
a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary?	☒	☐
b. Does the location fall within an area covered by a spacing order?	☐	☒
c. If the well will be multilateral, identify the wellbores on the sketch on page 3 of the plat that will be completed as conservation and non-conservation.		
2. Will either the edge of the disturbed area of any portion of the well site of the unconventional well be within 100 feet, or the vertical well bore be within 300 feet, from the edge of any solid blue lined **stream, spring or body of water** identified on the most current 7½' topographic quadrangle map or wetland greater than one acre in size or in a wetland?	☐	☒
If yes, is a waiver request (form 5500-FM-OG0057) and site-specific E&S control plan attached?	☐	☐

3. Will the vertical wellbore penetrate or be within 3,000 feet of an active **gas storage reservoir** boundary?	☐	☒
a. If Yes, print the names of: Storage Field: Operator:		
4. Is the proposed well location within the permitted area of a **landfill**?	☐	☒
5. Will the vertical wellbore of the unconventional well be drilled within 500 feet from any existing building or an existing water supply?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
5.1. Will the vertical wellbore of the unconventional well be drilled within 1,000 feet from any existing water well, surface water intake, reservoir or other water supply extraction point used by a water purveyor?	☐	☒
a. If "Yes," is written consent from the owner attached?	☐	☐
b. If written consent is not attached, is a variance request (form 8000-FM-OOGM0058) attached?	☐	☐
6. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a competed copy of the form and clearance letters from applicable agencies.	☒	☐
7. Will any portion of the well site be in a Special Protection High Quality ☐ (HQ) or Exceptional Value ☐ (EV) watershed? Provide name of special protection watershed _____.	☐	☒
8. Is this well part of a development which requires an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, list the number of the ESCGP approval if the permit has been issued. ESX12-117-0040 - April 18, 2012	☒	☐
9. Is waste, including drill cuttings, from the drilling of this well to be disposed of on this well site?	☐	☒
10. Will the well or well site be located within a defined 100 year floodplain or where the floodplain is undefined, within 100 feet of the top of the bank of a perennial stream or within 50 feet of the top of the bank of an intermittent stream.	☐	☒
a. If yes, is a waiver request attached that will protect the Waters of the Commonwealth?	☐	☐
11. Is the well to be located within a H_2S area pursuant to §78.77a?	☐	☒
12. Attach a current Ownership & Control form 8000-FM-OOGM0118		

Signature of Applicant	The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.		
Signature of Person Authorized to Submit Application	*(Print or Type)*	Name of Signer: JASON DE WOLFE Title: Team Lead, Water Mgmt & Surface Land	Date 2-20-13
			Phone: 724-814-5442

Application Preparer/Contact: LIANA MONTES

LIBERTY TWP 59

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

Page 2 Notifications

DEP ONLY | Project #:

DEP Statewide toll-free phone number for reporting cases of water contamination which may be associated with

8000-PM-OOGM0002 4/2012

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS MANAGEMENT

WELL LOCATION PLAT

Page 1 Surface Location

DEP USE ONLY		
Auth ID #:		ACO
Permit #:	11721624	C: 4/4/13
Project #:		

Surface hole is located on topo map 14717 feet south of latitude 41° 40' 00" (NAD 83)

Surface hole is located on topo map 147 feet west of longitude 77° 07' 30" (NAD 83)

Denotes location of well on topo map.

Denotes surface location of well on plat

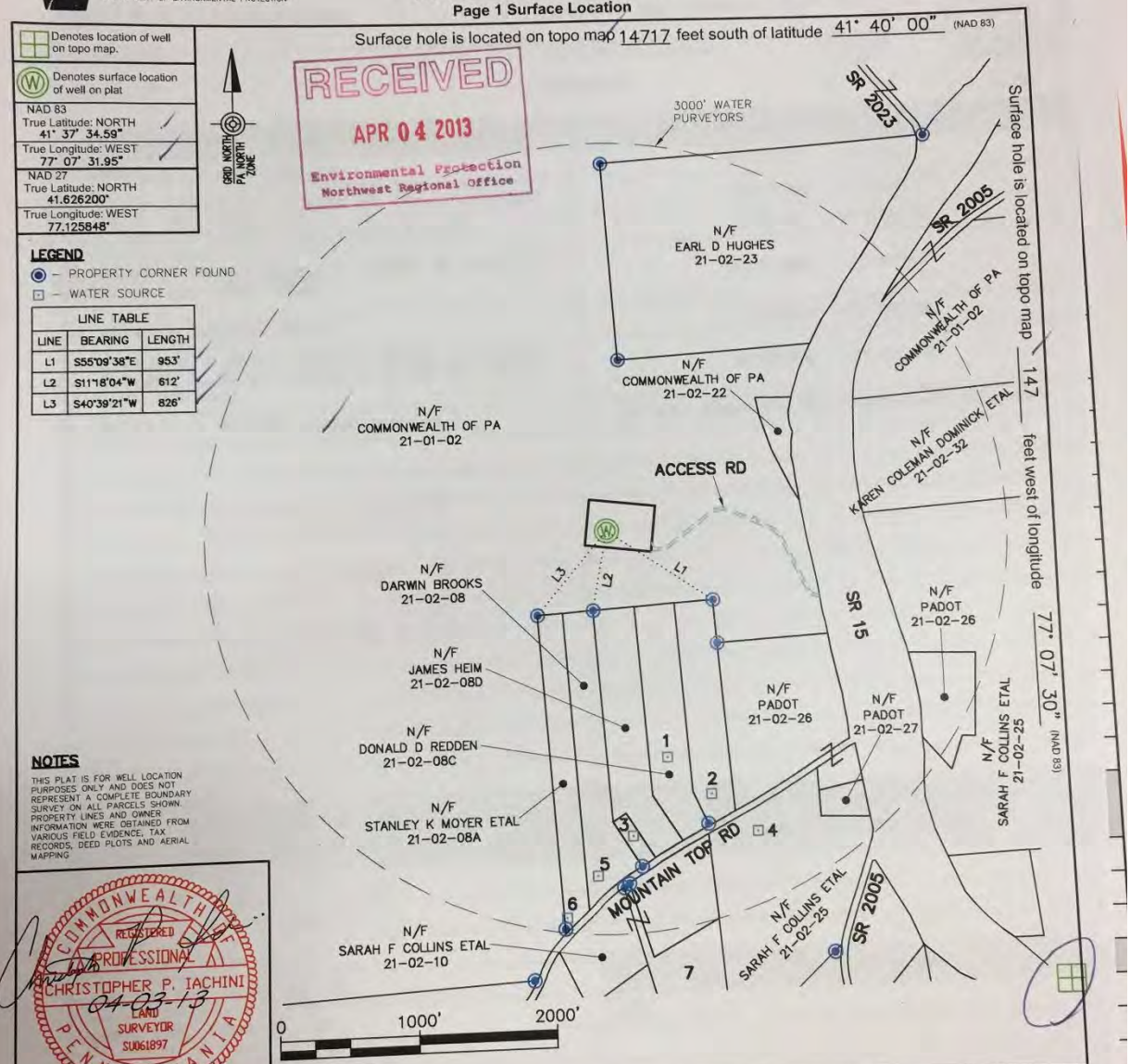
NAD 83 True Latitude: NORTH	41° 37' 34.59"
True Longitude: WEST	77° 07' 31.95"
NAD 27 True Latitude: NORTH	41.626200°
True Longitude: WEST	77.125848°

GRID NORTH PA NORTH ZONE

RECEIVED
APR 04 2013
Environmental Protection
Northwest Regional Office

LEGEND
- ◉ – PROPERTY CORNER FOUND
- ⊡ – WATER SOURCE

LINE TABLE		
LINE	BEARING	LENGTH
L1	S55°09'38"E	953'
L2	S11°18'04"W	612'
L3	S40°39'21"W	826'



NOTES

THIS PLAT IS FOR WELL LOCATION PURPOSES ONLY AND DOES NOT REPRESENT A COMPLETE BOUNDARY SURVEY ON ALL PARCELS SHOWN. PROPERTY LINES AND OWNER INFORMATION WERE OBTAINED FROM VARIOUS FIELD EVIDENCE, TAX RECORDS, DEED PLOTS AND AERIAL MAPPING

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
CHRISTOPHER P. IACHINI
04-03-13
LAND SURVEYOR
SU061897

Drawn By: BAS

Applicant / Well Operator Name: TALISMAN ENERGY USA INC.	DEP ID #:	Well (Farm) Name: DCNR 594		Well #: 02-203-01	Serial #:
Address: 50 PENNWOOD PLACE, WARRENDALE, PA. 15086		County: TIOGA	Municipality (Host): LIBERTY TWP.		Well Type: GAS
911 address of well site: TBD		USGS 7½' Quadrangle Map Name: CHERRY FLATS		Map Section: 9	Surface Elevation: 2246 ft.
Surveyor or CHRISTOPHER P. IACHINI	Phone #: 570-323-6603	Dwg #: 6436-006-035	Date: ~~FEB. 08, 2013~~	Revised: APR. 03, 2013	Scale: 1" = 1000'	Tract Acreage: 19782±
Engineer: LARSON DESIGN GROUP						Survey Date: DEC. 26, 2012
Lat. & Long. Metadata Method: TRIMBLE MAPPING GPS	Accuracy: 3'±(PPS) ft.	Datum: NAD 83	Elevation Metadata Method: PAMAP LIDAR	Accuracy: 2'± ft.	Datum: NAVD 88	

5500-PM-OG0076 12/2003

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

DEP USE ONLY	
APS #	Site #
Permit #	Auth ID #

Coordination of a Well Location with Public Resources

Well Operator	DEP ID#	Well Farm Name and Number	
Talisman Energy USA Inc.	237104	DCNR 594	02-203-01
Address		Project Number (if previously assigned)	
50 Pennwood Place			
City / State / Zip Code		County	Municipality
Warrendale / PA / 15086		Tioga	Liberty
Phone	Fax	Latitude	Longitude
7248145300	7248145301	N 41 ° 37 ′ 34.59 ″	W 77 ° 07 ′ 31.95 ″

1. Will the well be located in or within 200 feet of a publicly owned park, forest, gameland, designated wildlife area or Natural National Landmark? ☒ Yes ☐ No

2. Will the well be located within the corridor of a state or national scenic river? ☐ Yes ☒ No

   Portions of the Allegheny River and Clarion River are currently on the National Wild and Scenic Rivers list. Detailed descriptions are available on the National Scenic Rivers website: *www.nps.gov/rivers/wildriverslist.html#pa*

   Portions of three other creeks and streams in oil and gas producing areas are currently listed as Pennsylvania Scenic Rivers. These are: Pine Creek in Tioga County, Lick Run in Clinton County, and Bear Creek in Fayette County. The streams corridor maps are available on DCNR's web site: *www.dcnr.state.pa.us/brc/rivers/scenicrivers/locationmap.htm*

3. If answering "Yes" to questions 1 or 2, name the public resource(s):

   State Forest Tract 594

   List the name, address and phone number of the person responsible for management of the public resource.

   Justin L. Shafer, Assistant Forester, Tioga State Forest, One Nessmuk Lane, Wellsboro, PA 16901, 570-724-8127

   Must the administrator of the public resource approve or otherwise authorize the proposed well, well site, access road, or gathering pipeline? ☒ Yes ☐ No

   Has the approval or authorization been received? ☒ Yes ☐ No

4. Has the search of the proposed well location against the Pennsylvania Natural Diversity Inventory (PNDI), or any other evaluation, identified a potential conflict with a species of special concern? ☐ Yes ☒ No

   If yes, provide PNDI Search Number_____ or attach a copy of the PNDI Search Results.

   If a potential conflict with a species of concern was identified, give the name of the responsible agency.

   Has the potential conflict been resolved? ☐ Yes ☐ No

5. Will the well be located within 200 feet of any historical or archaeological sites listed as federal or state historic places? ☐ Yes ☒ No

6. Describe in detail the additional measures, facilities, or practices specific to this site to be employed during site construction, drilling and operation to ensure the safety of the public and to protect public resource identified above. Use additional sheets as needed.

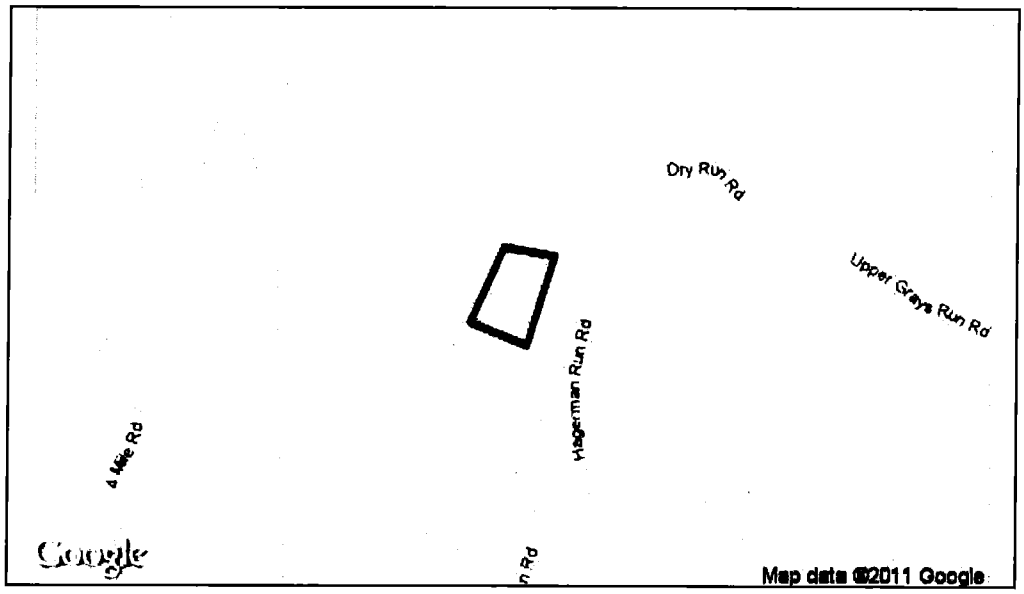
   Talisman Energy USA Inc. will be implementing the best management practices per DEP's Chapter 102 and Chapter 105 Manuals and following Talisman's Preparedness Prevention and Contingency Plan.

RECEIVED
MAR 12 2013
Environmental Protection
Northwest Regional Office

APPENDIX L
PNDIs

1. PROJECT INFORMATION

Project Name: **DCNR 100 Hagerman Compressor**
Date of review: **8/15/2011 12:54:49 PM**
Project Category: **Mining,Oil or Gas (including roads and pipelines),New Well**
Project Area: **16.8** acres
County: **Lycoming** Township/Municipality: **Lewis,Mcintyre**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17763,17771**
Decimal Degrees: **41.454403 N, -77.048792 W**
Degrees Minutes Seconds: **41° 27' 15.9" N, -77° 2' 55.7" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at

http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name:_____
Company/Business Name:_____
Address:_____
City, State, Zip:_____
Phone:(_____)_____Fax:(_____)_____
Email:_____

8. CERTIFICATION

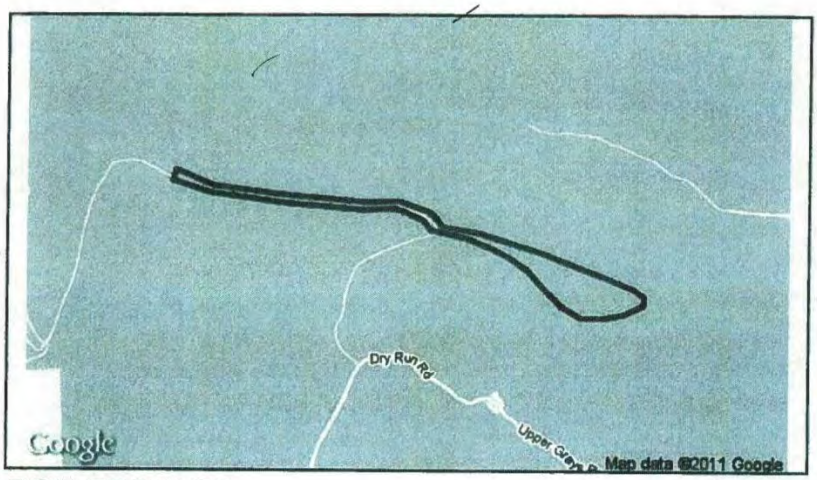
I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

_____ _____
applicant/project proponent signature date

PNDI Project Environmental Review Receipt Project Search ID: 20110615302136

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad G & Waterline**
Date of review: **6/15/2011 7:58:15 AM**
Project Category: **Mining,Oil or Gas (including roads and pipelines),New Well**
Project Area: **41.1** acres
County: **Lycoming** Township/Municipality: **Mcintyre**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17763**
Decimal Degrees: **41.464019 N, -77.047462 W**
Degrees Minutes Seconds: **41° 27' 50.5" N, -77° 2' 50.9" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

RECEIVED
MAY 25 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: MICHAEL CLINGER
Company/Business Name: SENECA RESOURCES CORPORATION
Address: 51 ZENTS BLVD.
City, State, Zip: BRADFORD, PA 16825
Phone:(814) 220-1559 Fax:(814) 849-4795
Email: clingerm@srcx.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature

7-26-2011
date

PNDI Project Environmental Review Receipt Project Search ID: 20111003319057

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad N**
Date of review: **10/3/2011 9:34:06 AM**
Project Category: **Mining,Oil or Gas (including roads and pipelines),New Well**
Project Area: **181.9** acres
County: **Lycoming** Township/Municipality: **Lewis**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17771**
Decimal Degrees: **41.431047 N, -77.054200 W**
Degrees Minutes Seconds: **41° 25' 51.8" N, -77° 3' 15.1" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

RECEIVED
JUN 05 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
____The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: MICHAEL C. CLINGER
Company/Business Name: SENECA RESOURCES CORPORATION
Address: 51 ZENTS BOULEVARD
City, State, Zip: BROOKVILLE, PA 15825
Phone:(814) 220-1559 Fax:(814) 849-4795
Email: clingerm@srcx.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature

3-28-2012
date

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

April 18, 2012

IN REPLY REFER TO
SIR# 38233

SENECA RESOURCES
GREG KIMMEL
51 ZENTS BOULEVARD
BROOKVILLE, PA 15825

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 20111003319052
DCNR 100 PAD P
LEWIS Township, LYCOMING County, Pennsylvania

RECEIVED
MAY 08 2012
ENVIRONMENTAL REVIEW
NORTHWEST REGIONAL OFFICE

Dear Mr. KIMMEL:

I have reviewed the map and material accompanying your recent correspondence, which concerns the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and Pennsylvania Fish & Boat Commission (PFBC) files, the timber rattlesnake (Crotalus horridus, PA candidate) is known from the vicinity of the proposed project site. Timber rattlesnakes occur in the forested, mountainous regions of the Commonwealth. They prefer forested areas to forage for small mammals (e.g., mice and chipmunks) and southerly-facing slopes for hibernating and other thermoregulatory activities. The timber rattlesnake is threatened by habitat loss/alteration, wanton killing, and poaching.

In October 2011, Wildlife Specialists conducted a timber rattlesnake habitat assessment of the project area and discovered potential denning habitat in close proximity to the proposed area of disturbance, although the habitat was not within the actual disturbance area. Because of this finding, I am concerned about direct and indirect effects that the proposed project could have on the local population of the timber rattlesnake. If the work is to be conducted out of the active season of the timber rattlesnake, then I do not anticipate any adverse impacts to this species of special concern. **However, if work is to be conducted from April 15-October 15, I recommend the following precautions to safeguard workers and rattlesnakes:**

1. A PFBC approved timber rattlesnake biologist who has the proper permits (Scientific Collector's Permit), and the proper skills to handle this venomous species should be on-site prior to and during construction.

2. The PFBC approved timber rattlesnake biologist should be on-site prior to and during construction activities, during the above time frame, to inspect and clear the area (including staging areas and access roads) of timber rattlesnakes and to capture and remove any rattlesnakes that may interfere with work activities. Note: After the biologist has "cleared" the area of rattlesnakes, silt fences or other timber rattlesnake exclusion fencing may be installed depending on the size of the project. If fencing is used, Curlex or similar types of control netting should not be used due to potential entrapment of snakes within this material.

3. Timber rattlesnakes observed on-site should be measured, sexed, and the habitat characterized where the snake was found. All captured snakes should be released within close proximity (under 100 meters) of the capture site if possible. Rattlesnake captures and relocations should be documented by photographs, habitat descriptions, in addition to being mapped and labeled accordingly. The biologist should submit a report to this office (Natural Diversity Section) following the completion of the project documenting all of the activity and herpetofauna encountered.

4. Workers responsible for implementing this project should be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. It is suggested a procedure be implemented for timber rattlesnake encounters and workers are to be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes is prohibited by the Commission pursuant to58 Pa. Code, section 79.6.

5. During the construction period, PFBC personnel may communicate with the on-site biologist and may visit the site area periodically to view the progression of the project and answer any questions or concerns that may arise. For safety purposes, PFBC personnel will register with the on-site manager upon entering the construction area.

Seneca Resources, in both the primary and secondary correspondence letters, offered to have a biologist on site during construction activities, showing a clear commitment to timber rattlesnake conservation in Pennsylvania.

Enclosed is the list of PFBC approved rattlesnake biologists for your convenience. If you have any questions regarding this response, please contact Dave Lieb at (814-359-5234) and refer to the SIR number at the top of this letter. Thank you for your cooperation and attention to this matter of conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

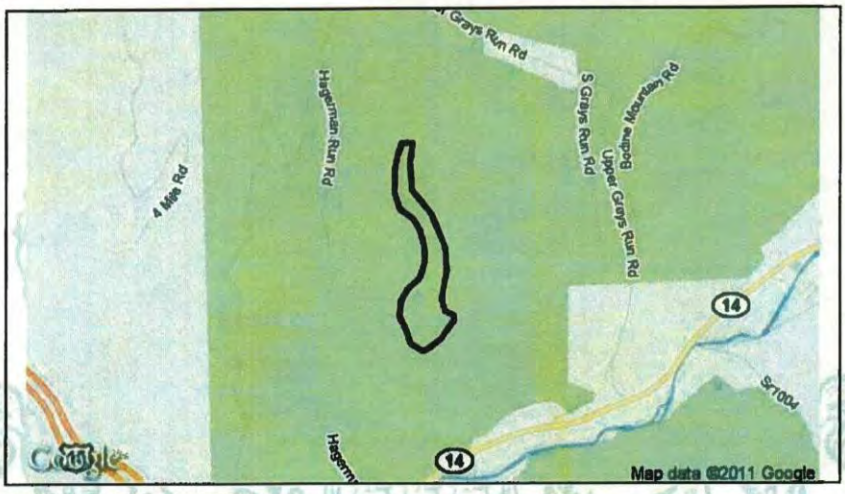
CAU/DL/kn

Enclosure (1)

PNDI Project Environmental Review Receipt Project Search ID: 20111003319052

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad P**
Date of review: **10/3/2011 9:30:49 AM**
Project Category: **Mining,Oil or Gas (including roads and pipelines),New Well**
Project Area: **108.8** acres
County: **Lycoming** Township/Municipality: **Lewis**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17771**
Decimal Degrees: **41.441407 N, -77.036347 W**
Degrees Minutes Seconds: **41° 26' 29.1" N, -77° 2' 10.9" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

RECEIVED
MAY 08 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

✓ **SIGNED** copy of this Project Environmental Review Receipt
✓ Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
✓ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
✓ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
✓ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
✓ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
✓ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams
✓ The DEP permit(s) required for this project

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Greg Kimmel
Company/Business Name: Seneca Resources Corp.
Address: 51 Zents Blvd
City, State, Zip: Brookville, PA 15825
Phone:(814) 849-4555 Fax:(814) 849-4795
Email: kimmelg@srex.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

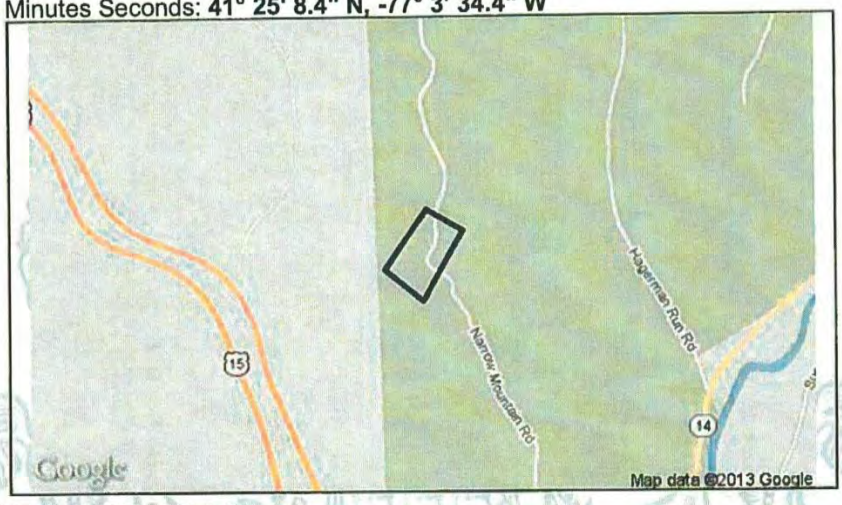
applicant/project proponent signature

4/24/12
date

PNDI Project Environmental Review Receipt Project Search ID: 20130314395278

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad R**
Date of review: **3/14/2013 2:38:17 PM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **18.1** acres
County: **Lycoming** Township/Municipality: **Lewis**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17771**
Decimal Degrees: **41.419012 N, -77.059564 W**
Degrees Minutes Seconds: **41° 25' 8.4" N, -77° 3' 34.4" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Received
APR 29 2013
Environmental Protection
Northcentral Regional Office

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jurisdictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

✓ **SIGNED** copy of this Project Environmental Review Receipt
✓ Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
✓ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
✓ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
✓ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
✓ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
✓ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Greg Kimmel
Company/Business Name: Seneca Resources Corp.
Address: 51 Zents Blvd
City, State, Zip: Brookville, PA 15825
Phone:(814) 849-4555 Fax:(814) 849-4795
Email: kimmelg@srcx.com

8. CERTIFICATION

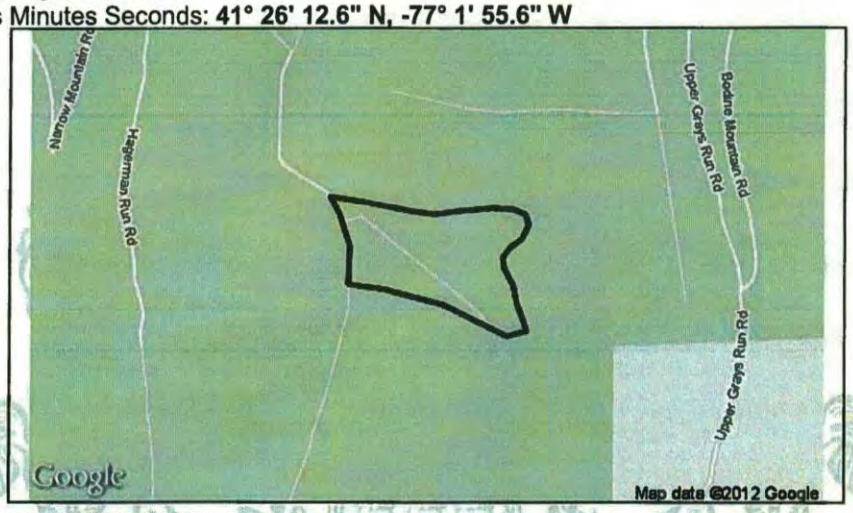
I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature — 3/14/13 date

PNDI Project Environmental Review Receipt Project Search ID: 20120326346088

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad T**
Date of review: **3/26/2012 8:11:58 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **83.8** acres
County: **Lycoming** Township/Municipality: **Lewis**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17771**
Decimal Degrees: **41.436838 N, -77.032098 W**
Degrees Minutes Seconds: **41° 26' 12.6" N, -77° 1' 55.6" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

✓ **SIGNED** copy of this Project Environmental Review Receipt
✓ Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
✓ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
✓ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
✓ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
✓ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
✓ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: GREG KIMMEL
Company/Business Name: SENECA RESOURCES CORP.
Address: 51 ZENTS BLVD
City, State, Zip: BROOKVILLE, PA 15825
Phone:(814) 849-4535 Fax:(814) 849-4795
Email: KIMMELG@SRCX.COM

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

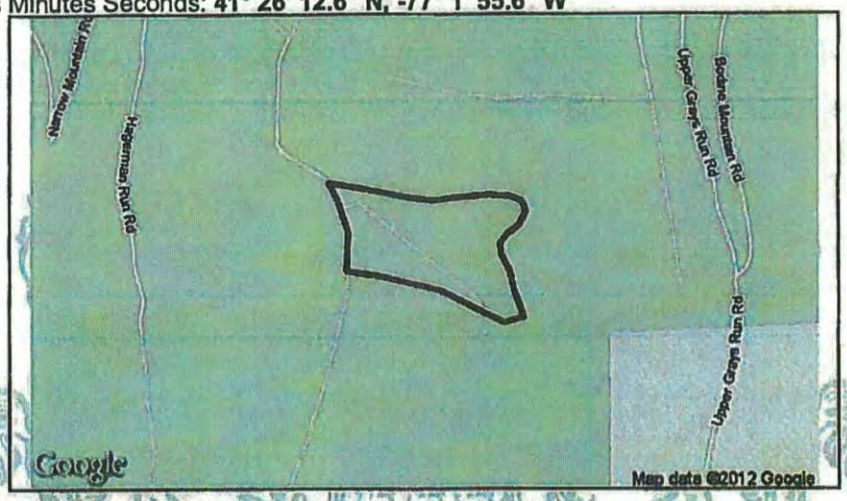
applicant/project proponent signature

4/19/12
date

PNDI Project Environmental Review Receipt Project Search ID: 20120326346088

1. PROJECT INFORMATION

Project Name: **DCNR 100 Pad T**
Date of review: **3/26/2012 8:11:58 AM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **83.8** acres
County: **Lycoming** Township/Municipality: **Lewis**
Quadrangle Name: **TROUT RUN** ~ ZIP Code: **17771**
Decimal Degrees: **41.436838 N, -77.032098 W**
Degrees Minutes Seconds: **41° 26' 12.6" N, -77° 1' 55.6" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jurisdictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

✓ **SIGNED** copy of this Project Environmental Review Receipt
✓ Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
✓ Project location information (name of USGS Quadrangle, Township/Municipality, and County)
✓ USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
✓ A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
✓ Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
✓ Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist). If wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: GREG KIMMEL
Company/Business Name: SENECA RESOURCES CORP.
Address: 51 ZENTS BLVD
City, State, Zip: BROOKVILLE PA 15825
Phone:(814) 849-4595 Fax:(814) 849-4795
Email: KIMMELG@SRCX.COM

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature

4/19/12
date

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

February 22, 2012

IN REPLY REFER TO
SIR# 38075

SENECA RESOURCES
GREG KIMMEL
51 ZENTS BOULEVARD
BROOKVILLE, PA 15825

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 20111003319057
DCNR 100 PADS N & R
LEWIS Township, LYCOMING County, Pennsylvania

Dear Mr. KIMMEL:

I have reviewed the map and material accompanying your recent correspondence, which concerns the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and Pennsylvania Fish & Boat Commission (PFBC) files, the timber rattlesnake (Crotalus horridus, PA candidate) is known from the vicinity of the proposed project site. Timber rattlesnakes occur in the forested, mountainous regions of the Commonwealth. They prefer forested areas to forage for small mammals (e.g., mice and chipmunks) and southerly-facing slopes for hibernating and other thermoregulatory activities. The timber rattlesnake is threatened by habitat loss/alteration, wanton killing, and poaching.

We are concerned about direct and indirect effects that the proposed project could have on the local population of the timber rattlesnake. You sent the results of a timber rattlesnake habitat assessment conducted on the project area in 2011. Although potential critical habitat was identified in the vicinity of the project, there will be no direct impacts to this habitat. Therefore, if the work is to be conducted out of the active season of the timber rattlesnake, then I do not anticipate any adverse impacts to this species of special concern. **However, if work is to be conducted from April 15-October 15, then I will ask you to take the following precautions to safeguard workers and rattlesnakes:**

1. A PFBC approved timber rattlesnake biologist who has the proper permits (Scientific Collector's Permit), and the proper skills to handle this venomous species will be on-site prior to and during construction.

2. The PFBC approved timber rattlesnake biologist will be on-site prior to and during construction activities, during the above time frame, to inspect and clear the area (including staging areas and access roads) of timber rattlesnakes and to capture and remove any rattlesnakes that may interfere with work activities. Note: After the biologist has "cleared" the area of rattlesnakes, silt fences or other timber rattlesnake exclusion fencing may be installed depending on the size of the project. If fencing is used, Curlex or similar types of control netting should not be used due to potential entrapment of snakes within this material.

3. Timber rattlesnakes observed on-site are to be measured, sexed, and the habitat characterized where the snake was found. All captured snakes should be released within close proximity (under 100 meters) of the capture site if possible. Rattlesnake captures and relocations are to be documented by photographs, habitat descriptions, in addition to being mapped and labeled accordingly. The biologist is to submit a report to this office (Natural Diversity Section) following the completion of the project documenting all of the activity and herpetofauna encountered.

4. Workers responsible for implementing this project should be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. It is suggested a procedure be implemented for timber rattlesnake encounters and workers are to be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes is prohibited by the Commission pursuant to Chapter 79.6. subsection 2102 (b) of the fishing and boating regulations.

Enclosed is the list of PFBC approved rattlesnake biologists for your convenience.

If you have any questions regarding this response, please contact Kathy Gipe at 814-359-5186 and refer to the SIR number at the top of this letter. Thank you for your cooperation and attention to this matter of endangered species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/mr

Enclosure (1)

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

February 22, 2012

IN REPLY REFER TO
SIR# 38075

SENECA RESOURCES
GREG KIMMEL
51 ZENTS BOULEVARD
BROOKVILLE, PA 15825

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 20111003319057
DCNR 100 PADS N & R
LEWIS Township, LYCOMING County, Pennsylvania

Dear Mr. KIMMEL:

I have reviewed the map and material accompanying your recent correspondence, which concerns the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and Pennsylvania Fish & Boat Commission (PFBC) files, the timber rattlesnake (Crotalus horridus, PA candidate) is known from the vicinity of the proposed project site. Timber rattlesnakes occur in the forested, mountainous regions of the Commonwealth. They prefer forested areas to forage for small mammals (e.g., mice and chipmunks) and southerly-facing slopes for hibernating and other thermoregulatory activities. The timber rattlesnake is threatened by habitat loss/alteration, wanton killing, and poaching.

We are concerned about direct and indirect effects that the proposed project could have on the local population of the timber rattlesnake. You sent the results of a timber rattlesnake habitat assessment conducted on the project area in 2011. Although potential critical habitat was identified in the vicinity of the project, there will be no direct impacts to this habitat. Therefore, if the work is to be conducted out of the active season of the timber rattlesnake, then I do not anticipate any adverse impacts to this species of special concern. **However, if work is to be conducted from April 15-October 15, then I will ask you to take the following precautions to safeguard workers and rattlesnakes:**

1. A PFBC approved timber rattlesnake biologist who has the proper permits (Scientific Collector's Permit), and the proper skills to handle this venomous species will be on-site prior to and during construction.

2. The PFBC approved timber rattlesnake biologist will be on-site prior to and during construction activities, during the above time frame, to inspect and clear the area (including staging areas and access roads) of timber rattlesnakes and to capture and remove any rattlesnakes that may interfere with work activities. Note: After the biologist has "cleared" the area of rattlesnakes, silt fences or other timber rattlesnake exclusion fencing may be installed depending on the size of the project. If fencing is used, Curlex or similar types of control netting should not be used due to potential entrapment of snakes within this material.

3. Timber rattlesnakes observed on-site are to be measured, sexed, and the habitat characterized where the snake was found. All captured snakes should be released within close proximity (under 100 meters) of the capture site if possible. Rattlesnake captures and relocations are to be documented by photographs, habitat descriptions, in addition to being mapped and labeled accordingly. The biologist is to submit a report to this office (Natural Diversity Section) following the completion of the project documenting all of the activity and herpetofauna encountered.

4. Workers responsible for implementing this project should be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. It is suggested a procedure be implemented for timber rattlesnake encounters and workers are to be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes is prohibited by the Commission pursuant to Chapter 79.6. subsection 2102 (b) of the fishing and boating regulations.

Enclosed is the list of PFBC approved rattlesnake biologists for your convenience.

If you have any questions regarding this response, please contact Kathy Gipe at 814-359-5186 and refer to the SIR number at the top of this letter. Thank you for your cooperation and attention to this matter of endangered species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/mr

Enclosure (1)

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

April 27, 2012

IN REPLY REFER TO SIR # 38538

GREG KIMMEL
SENECA RESOURCES
51 ZENTS BOULEVARD
BROOKVILLE, PA 15825

RE: Secondary Species Impact Review (SIR) – Timber Rattlesnake
PNDI Search No. 20120326346088
DCNR 100 PAD T
LEWIS Township/Borough, LYCOMING County, Pennsylvania

Dear Mr. KIMMEL:

I have examined the materials accompanying your recent correspondence, which shows the location for the proposed above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and the Pennsylvania Fish & Boat Commission (PFBC) files and databases, the **Timber rattlesnake** (***Crotalus horridus*, PA candidate**) is known from the vicinity of the project site.

A Timber Rattlesnake habitat assessment of the project area was conducted on March 28, 2012 by Wildlife Specialists. That assessment identified several areas of potential Timber Rattlesnake denning and gestation habitat. On April 9, 2012, Seneca Resources provided PFBC with a detailed map of the proposed project including the location of all areas that will be disturbed. Based on that map, it is clear that all disturbed areas will be > 300 feet from potential timber rattlesnake denning and gestation habitat. As a result, I conclude that the proposed project will not impact the timber rattlesnake and should be allowed to proceed as planned. Therefore, provided that best management practices are employed and strict erosion and sedimentation measures are maintained, I do not foresee the proposed project resulting in adverse impacts to the timber rattlesnake or any other rare or protected species under PFBC jurisdiction.

Note that this office performed no field inspection of the project area. Consequently, comments in this letter are not meant to address other issues or concerns that might arise concerning matters under Pennsylvania Fish and Boat Commission jurisdiction or that of other authorities. If you have any questions regarding this response, please contact Dave Lieb at 814-359-5234 and **refer to the SIR number at the top of this letter**. Thank you for your cooperation and attention to this matter of timber rattlesnake conservation.

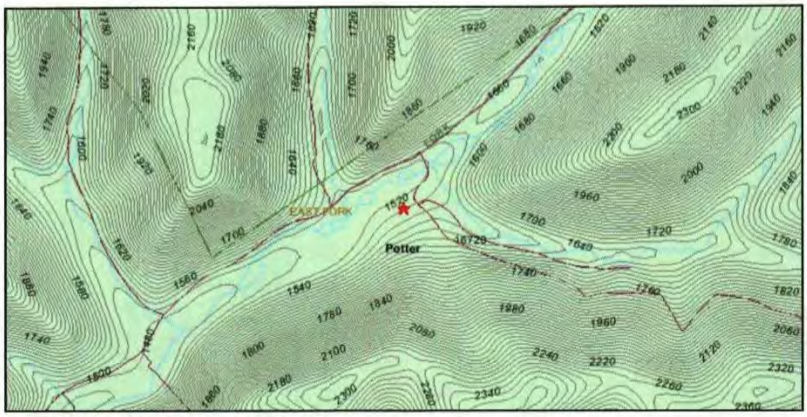
Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

PNDI Project Environmental Review Receipt Project Search ID: 20100118224781

1. PROJECT INFORMATION

Project Name: **2413 Pine Hill**
Date of review: **1/18/2010 4:51:12 PM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **N/A**
County: **Potter** Township/Municipality: **East Fork**
Quadrangle Name: **CONRAD**
ZIP Code: **16720**
Decimal Degrees: **41.614733 N, --77.876686 W**
Degrees Minutes Seconds: **41° 36' 53.04" N, -77° 52' 36.07" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

RECEIVED
FEB 01 2010
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name:_____
Company/Business Name:_____
Address:_____
City, State, Zip:_____
Phone:(_____)_____Fax:(_____)_____
Email:_____

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

_____ _____
applicant/project proponent signature date

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5239 Fax: (814) 359-5175

June 11, 2009

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

IN REPLY REFER TO
SIR# 31686

RECEIVED
JUL 27 2009
OIL & GAS

CODY SALMON
BERAN ENVIRONMENTAL SERVICES
2322 W SUNBURY RD
BOYERS, PA 16020

RE: Species Impact Review (SIR) – Rare, Candidate, Threatened and Endangered Species
PNDI Search No. 20090407187310
C.O.P. TRACT 259 1001H WELL
BURNSIDE Township, CENTRE County, Pennsylvania

Dear Mr. Salmon:

I have reviewed the map accompanying your recent correspondence, which concerns the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and Pennsylvania Fish & Boat Commission (PFBC) files, the timber rattlesnake (*Crotalus horridus*, PA candidate) is known from the vicinity of the proposed project site. Timber rattlesnakes occur in the forested, mountainous regions of the Commonwealth. They prefer forested areas to forage for small mammals (e.g., mice and chipmunks) and scree and/or talus southerly facing rocky slopes for hibernating and other thermoregulatory activities. The timber rattlesnake is threatened by habitat alteration, wanton killing, and poaching.

There have been observations of timber rattlesnakes nearby, but not in the immediate vicinity of the project area. **Therefore, we do not anticipate any direct adverse impacts to the timber rattlesnake from the proposed project.** However, the project areas could be used as foraging habitat for transient snakes and this warrants some concern about rattlesnake-human conflicts. Although the nature of the timber rattlesnake is rather docile, it can be dangerous if threatened, cornered or handled improperly. Therefore, the workers should be mindful of the presence of the snakes in the area. Rattlesnakes are attracted to open, rocky areas for basking and forested areas with thick deciduous leaf litter that tend to support high populations of rodents. To discourage rattlesnakes from entering the work area, silt fencing could be installed. We also recommend that the workers responsible for implementing this project be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. These workers should also be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes without a proper permit is prohibited by the Commission pursuant to Chapter 79.6, subsection 2102 (b) of the Fishing and Boating Regulations. If any timber rattlesnakes are observed on-site, please notify this office.

Note that this office performed no field inspection of the project area. Consequently, comments in this letter are not meant to address other issues or concerns that might arise concerning matters under Pennsylvania Fish and Boat Commission jurisdiction or that of other authorities. If you have any

questions regarding this response, please contact Jim Chestney at 814-359-5239 and **refer to the SIR number at the top of this letter**. Thank you for your cooperation and attention to this matter of endangered species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/JEC/mr

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

RECEIVED
JUL 27 2009
OIL & GAS

PNDI Project Environmental Review Receipt
Project Search ID: 20090407187310
Project Name: C.O.P. Tract 259 #1001H
Date: 4/7/2009 12:08:38 PM

RECEIVED
JUL 2 7 2009
OIL & GAS

Project Location

Location Accuracy

Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Receipt is solely responsible for the project location and thus the correctness of the Project Review Receipt content.

1 Potential Impacts

Under the Following Agencies' Jurisdiction:
Pennsylvania Fish and Boat Commission

Project Name: C.O.P. Tract 259 #1001H
On Behalf Of: Self
Project Search ID: 20090407187310
Date: 4/7/2009 12:08:31 PM
# of Potential Impacts: 1
Jurisdictional Agency:
Pennsylvania Fish and Boat Commission
Project Category: Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field
Project Location
Decimal Degrees: 41.130903 N, -77.888989 W
Degrees Minutes Seconds: 41° 07' 51.25" N, 77° 53' 20.36" W
Lambert: 30580.53262348, 776361.82890881 ft
ZIP Code: 16845
County: Centre
Township/Municipality: BURNSIDE
USGS 7.5 Minute Quadrangle ID: 523
Quadrangle Name: SNOW SHOE NW
Project Area: N/A

 APPLICANT INITIALS: BN

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

PNDI Project Environmental Review Receipt
Project Search ID: 20090407187310
Project Name: C.O.P. Tract 259 #1001H
Date: 4/7/2009 12:08:38 PM

Pennsylvania Natural Diversity Inventory (PNDI) records indicate there are potential impacts on special concern species and resources within the project area. If the project is pursued, the jurisdictional agency/agencies indicated require that the instructions below regarding potential impacts and/or avoidance measures be followed in their entirety.

These determinations were based on the project-specific information you provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the information you provided does not accurately reflect this project, or if project plans change, DEP and the jurisdictional agencies require that another PNDI review be conducted.

This response represents the most up-to-date summary of the PNDI data files and is good for one(1) year from the date of this PNDI Project Environmental Review Receipt.

1 potential impact
The Applicant should MAIL/FAX a copy of this Project Environmental Review Receipt, a cover letter with project narrative, acreage to be impacted, how construction/maintenance activity is to be accomplished, township/municipality and county where project is located, and a USGS 7.5 minute quadrangle with project boundary and quad name marked on the map.

Natural Diversity Section
Pennsylvania Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane
Bellefonte, PA 16823

Please mail only one (1) copy of the project review request. Do not email the project information. Allow 30 days for completion of the project review from the date of PFBC receipt of the project review request.

Based on the project-specific information you provided, no impacts to federally listed, proposed, or candidate species are anticipated. Therefore, no further consultation under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required with the U.S. Fish and Wildlife Service. Because no take of federally listed species is anticipated, none is authorized. For a list of species that could occur in your project area (but have not been documented in PNDI), please see the county lists of threatened, endangered, and candidate species. A field visit or survey may reveal previously undocumented populations of one or more threatened or endangered species with a project area. If it is determined that any federally listed species occur in your project area, the U.S. Fish and Wildlife Service requires that you initiate consultation to identify and resolve any conflicts. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

DISCLAIMER

The PNDI environmental review website is a preliminary environmental screening tool. It is not a substitute for information obtained from a field survey of the project area conducted by a biologist. Such surveys may reveal previously undocumented populations of species of special concern. In addition, the PNDI only contains information about species occurrences that have actually been reported to the Pennsylvania Natural Heritage Program.

TERMS OF USE

Upon signing into the PNDI environmental review website, and as a condition of using it, you agreed to certain terms of use. These are as follows:

The web site is intended solely for the purpose of screening projects for

 APPLICANT INITIALS: BN

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

potential impacts on resources of special concern in accordance with the instructions provided on the web site. Use of the web site for any other purpose or in any other way is prohibited and subject to criminal prosecution under federal and state law, including but not limited to the following: Computer Fraud and Abuse Act of 1986, as amended, 18 U.S.C. Â§ 1030; Pennsylvania Crimes Code, Â§ 4911 (tampering with public records or information), Â§ 7611 (unlawful use of computer and other computer crimes), Â§ 7612 (disruption of service), Â§ 7613 (computer theft), Â§ 7614 (unlawful duplication), and Â§ 7615 (computer trespass).

The PNHP reserves the right at any time and without notice to modify or suspend the web site and to terminate or restrict access to it.

The terms of use may be revised from time to time. By continuing to use the web site after changes to the terms have been posted, the user has agreed to accept such changes.

This review is based on the project information that was entered. The jurisdictional agencies and DEP require that the review be redone if the project area, location, or the type of project changes. If additional information on species of special concern becomes available, this review may be reconsidered by the jurisdictional agency.

PRIVACY and SECURITY

This web site operates on a Commonwealth of Pennsylvania computer system. It maintains a record of each environmental review search result as well as contact information for the project applicant. These records are maintained for internal tracking purposes. Information collected in this application will be made available only to the jurisdictional agencies and to the Department of Environmental Protection, except if required for law enforcement purposesâ€"see paragraph below.

This system is monitored to ensure proper operation, to verify the functioning of applicable security features, and for other like purposes. Anyone using this system consents to such monitoring and is advised that if such monitoring reveals evidence of possible criminal activity, system personnel may provide the evidence to law enforcement officials. See Terms of Use.

In order for this project to be considered for subsequent review, a signed and initialed copy of this receipt is required by the agency or agencies indicated. DEP requires that a signed and initialed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted in applications for permits requiring PNDI review. See DEP PNDI policy at www.naturalheritage.state.pa.us or visit the following websites for further information.

Regional Offices
Http://www.dep.state.pa.us/dep/deputate/fieldops/map.pdf

District Mining Operations
Http://www.dep.state.pa.us/dep/deputate/minres/Districts/homepage/Default.htm

Oil and Gas Management
Http://www.dep.state.pa.us/dep/deputate/minres/OILGAS/CustomerNeeds.htm

Print this Project Review Receipt using your Internet browser's print function and keep it as a record of your search.

Signature: Bernie Nefe

Date: 4-30-09

Project applicant on whose behalf this search was conducted:

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

 APPLICANT INITIALS: BW

PNDI Project Environmental Review Receipt
Project Search ID: 20090407187310
Project Name: C.O.P. Tract 259 #1001H
Date: 4/7/2009 12:08:38 PM

Division of Environmental Services
450 Robinson Lane
Bellefonte, PA 16823

APPLICANT

Contact Name: Bertha Nefe
Address: P.O. Box 1330
City, State, Zip: Houston, TX 77251
Phone: 832-636-3362
Email: bertha.nefe@anadarko.com

PERSON CONDUCTING SEARCH (if not applicant)

Contact Name: _____
Address: _____
City, State, Zip: _____
Phone: _____
Email: _____

The following contact information is for the agencies involved in this Pennsylvania Natural Diversity Inventory environmental review process. Please read this entire receipt carefully as it contains instructions for how to contact these agencies for further review of this particular project.

Natural Diversity Section
Pennsylvania Fish and Boat Commission

RECEIVED
JUN 18 2009
DEP, SOUTHWEST REGION
OIL & GAS

 APPLICANT INITIALS: BN

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

March 30, 2012

IN REPLY REFER TO
SIR # 38387

JAY RUSSELL
BERAN ENVIRONMENTAL SERVICES
2322 W SUNBURY RD
BOYERS, PA 16020

RE: Secondary Species Impact Review (SIR) – Timber Rattlesnake
PNDI Search No. 20120312343567
COP TRACT 284 PAD A
GALLAGHER, and GRUGAN Townships, CLINTON County, Pennsylvania

Dear Mr. Russell:

I have reviewed the map accompanying your recent correspondence, which concerns the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and Pennsylvania Fish & Boat Commission (PFBC) files, the **timber rattlesnake (*Crotalus horridus*, PA candidate)** is known from the vicinity of the proposed project site. Timber rattlesnakes occur in the forested, mountainous regions of the Commonwealth. They prefer forested areas to forage for small mammals (e.g., mice and chipmunks) and southerly-facing slopes for hibernating and other thermoregulatory activities. The timber rattlesnake is threatened by habitat loss/alteration, wanton killing, and poaching.

Although there have been observations of timber rattlesnakes in the immediate vicinity of the project area, we do not anticipate any direct adverse impacts to the timber rattlesnake from the proposed project. Your project area, however, is used as foraging habitat by timber rattlesnakes. This warrants some concern about rattlesnake-human conflicts. Although the nature of the timber rattlesnake is rather docile, it can be dangerous if cornered or handled. Rattlesnakes are attracted to open, rocky, or log-strewn areas for basking. We recommend that the workers responsible for implementing this project be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. **These workers should also be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes without a proper permit is prohibited by the Commission pursuant to 58 Pa. Code Section 79.6. If any timber rattlesnakes are observed on-site, please notify this office.**

Note that this office performed no field inspection of the project area. Consequently, comments in this letter are not meant to address other issues or concerns that might arise concerning matters under Pennsylvania Fish and Boat Commission jurisdiction or that of other authorities. If you have any

questions regarding this response, please contact Jim Chestney at 717-776-5236 and refer to the SIR number at the top of this letter. Thank you for your cooperation and attention to this matter of endangered species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/JEC/kn

1. PROJECT INFORMATION

Project Name: **COP Tract 284 Pad A**
Date of review: **3/12/2012 4:08:53 PM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **24.0** acres
County: **Clinton** Township/Municipality: **Gallagher,Grugan**
Quadrangle Name: **GLEN UNION** ~ ZIP Code: **17745**
Decimal Degrees: **41.341247 N, -77.574902 W**
Degrees Minutes Seconds: **41° 20' 28.5" N, -77° 34' 29.6" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Eric D. Dougherty
Company/Business Name: Berani Environmental Services, Inc.
Address: 2322 West Sunbury Road
City, State, Zip: Bayers PA 16020
Phone:(724) 735-2766 x13 Fax:(724) 735-9992
Email: edougherty@berenvironmental.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Eric D. Dougherty 3/12/12
applicant/project proponent signature date

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

June 27, 2012

IN REPLY REFER TO
SIR # 38998

TRAVIS WENDEL
ENERGY CORPORATION OF AMERICA
1380 ROUTE 286 HWY E.
SUITE 221
INDIANA, PA 15701

JUN 28 2012

DEP SOUTHWEST REGION
OIL & GAS

RE: Secondary Species Impact Review (SIR) – Timber Rattlesnake
PNDI Search No. 20120524356307, 20120524356309, 20120524356314, 20120524356318, 20120524356321, 20120524356322, 20120524356323, 20120524356324, 20120524356325, 20120524356326
COP 324 A #1-10
GIRARD Township, CLEARFIELD County, Pennsylvania

Dear Mr. Wendel:

I have reviewed the map accompanying your recent correspondence, which concerns the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and Pennsylvania Fish & Boat Commission (PFBC) files, the **timber rattlesnake (*Crotalus horridus*, PA candidate)** is known from the vicinity of the proposed project site. Timber rattlesnakes occur in the forested, mountainous regions of the Commonwealth. They prefer forested areas to forage for small mammals (e.g., mice and chipmunks) and southerly-facing slopes for hibernating and other thermoregulatory activities. The timber rattlesnake is threatened by habitat loss/alteration, wanton killing, and poaching.

Although there have been observations of timber rattlesnakes in the immediate vicinity of the project area, we do not anticipate any direct adverse impacts to the timber rattlesnake from the proposed project. Your project area, however, is used as foraging habitat by timber rattlesnakes. This warrants some concern about rattlesnake-human conflicts. Although the nature of the timber rattlesnake is rather docile, it can be dangerous if cornered or handled. Rattlesnakes are attracted to open, rocky, or log-strewn areas for basking. We recommend that the workers responsible for implementing this project be advised that timber rattlesnakes may be encountered and that avoidance is the best means of minimizing risks to personal safety. **These workers should also be advised that the timber rattlesnake is a state protected species and is not to be harmed. Killing of timber rattlesnakes without a proper permit is prohibited by the Commission pursuant to 58 Pa. Code Section 79.6.** If any timber rattlesnakes are observed on-site, please notify this office.

Due to the remote location of this well site and proximity to local rattlesnake populations, if large rocks are available during the construction process, this site would be a good choice for creation of gestation

habitat following the PFBC guidelines for Timber Rattlesnake Habitat Creation enclosed. Upon the completion of new gestation habitat, please notify the Natural Diversity Section, so we may monitor the new habitat use over time. If you have any questions or need further technical guidance, please contact us.

Note that this office performed no field inspection of the project area. Consequently, comments in this letter are not meant to address other issues or concerns that might arise concerning matters under Pennsylvania Fish and Boat Commission jurisdiction or that of other authorities. If you have any questions regarding this response, please contact Jim Chestney at 717-236-5236 and refer to the SIR number at the top of this letter. Thank you for your cooperation and attention to this matter of endangered species conservation and habitat protection.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/JEC/kn

Enclosures (1)
PFBC TR Habitat Creation Guidelines

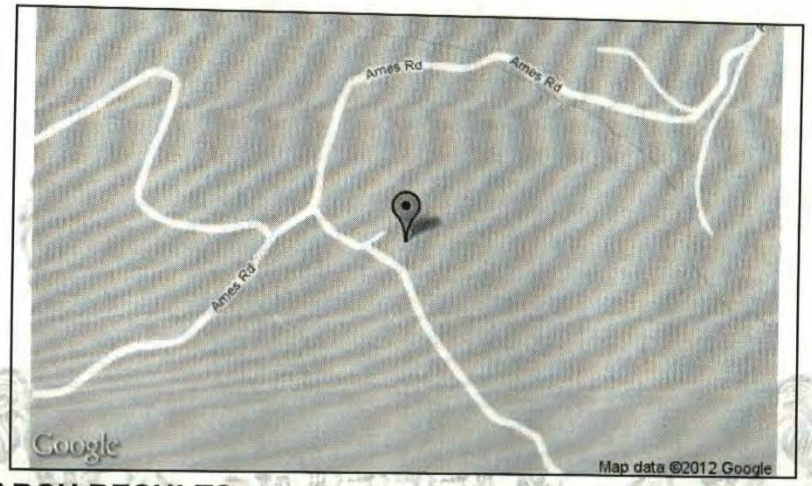
JUN 28 2012

DEP SOUTHWEST REGION
OIL &

PNDI Project Environmental Review Receipt Project Search ID: 20120524356309

1. PROJECT INFORMATION

Project Name: **COP 324 A #2MH Renewal**
Date of review: **5/24/2012 3:35:14 PM**
Project Category: **Mining,Oil or Gas (including roads and pipelines),New Well**
Project Area: **N/A**
County: **Clearfield** Township/Municipality: **Girard**
Quadrangle Name: **THE KNOBS** ~ ZIP Code: **16836**
Decimal Degrees: **41.162383 N, -78.314025 W**
Degrees Minutes Seconds: **41° 9' 44.6" N, -78° 18' 50.5" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

JUN 21 2012

DEP SOUTHWEST REGION
OIL & GAS

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: Further review of this project is necessary to resolve the potential impacts(s). Please send project information to this agency for review (see WHAT TO SEND).

PFBC Species: (Note: The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)
Scientific Name: Sensitive Species**
Common Name:
Current Status: Special Concern Species*
Proposed Status: Special Concern Species*

JUN 21 2012
DEP SOUTHWEST REGION
OIL & GAS

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Amy SALYARDS
Company/Business Name: The Production Company
Address: PO Box 467
City, State, Zip: Ligonier Pa 15658
Phone:(724)238-2239 Fax:(724)238 3310
Email:

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Amy N Salyards 4-23-2012
applicant/project proponent signature date

JUN 12 2012

DEP, SOUTHWEST REGION
OIL & GAS

** Sensitive Species - Species identified by the jurisdictinal agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, send the following information to the agency(s) seeking this information (see AGENCY CONTACT INFORMATION).

Check-list of *Minimum* Materials to be submitted:

____**SIGNED** copy of this Project Environmental Review Receipt
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____Project location information (name of USGS Quadrangle, Township/Municipality, and County)
____USGS 7.5-minute Quadrangle with project boundary clearly indicated, and quad name on the map

The inclusion of the following information may expedite the review process.
____A basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

JUN 21 2012

DEP SOUTHWEST REGION
OIL & GAS

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Travis Wendel
Company/Business Name: Energy Corporation of America
Address: 1380 Rt 286 Hwy E Ste 221
City, State, Zip: Indiana, PA 15701
Phone:(724) 463 8400 Fax:(724) 463-9750
Email: twendel@energycorporationofamerica.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature

5-24-12
date

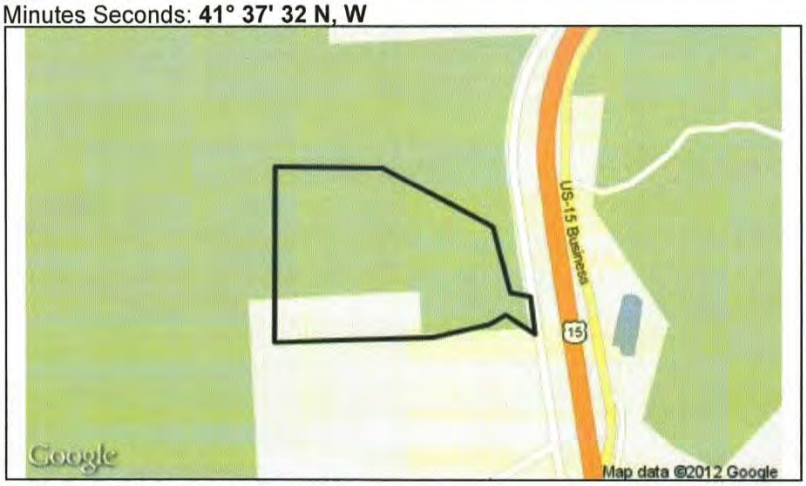
JUN 21 2012

DEP SOUTHWEST REGION
OIL & GAS

PNDI Project Environmental Review Receipt Project Search ID: 20121220384014

1. PROJECT INFORMATION

Project Name: **DCNR 594 (02-203)**
Date of review: **12/20/2012 4:10:14 PM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **48.8** acres
County: **Tioga** Township/Municipality: **Liberty Twp**
Quadrangle Name: **NAUVOO** ~ ZIP Code: **16912**
Decimal Degrees: **41.625724 N, -77.123079 W**
Degrees Minutes Seconds: **41° 37' 32 N, W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

RECEIVED
MAR 12 2013
Environmental Protection
Northwest Regional Office

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Brent S. Herman
Company/Business Name: Larson Design Group
Address: 1000 Commerce Park Drive, Suite 201
City, State, Zip: Williamsport, PA 17701
Phone:(570) 323-6603 ext. 321 Fax:(570) 323-9902
Email: bsh@larsondesigngroup.com

8. CERTIFICATION

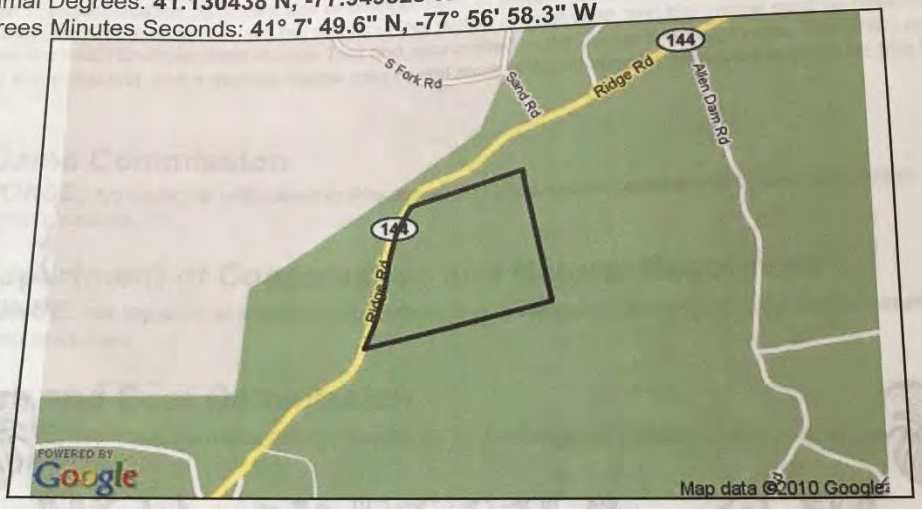
I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Brent S. Herman *12/20/12*
applicant/project proponent signature date

PNDI Project Environmental Review Receipt

1. PROJECT INFORMATION

Project Name: **COP Tract 706 Pad 10**
Date of review: **5/11/2010 4:15:07 PM**
Project Category: **Energy Storage, Production, and Transfer,Energy Production (generation),Oil or Gas - new wells, expansion of well field**
Project Area: **104.0** acres
County: **Centre** Township/Municipality: **Burnside**
Quadrangle Name: **SNOW SHOE NW** ~ ZIP Code: **16845**
Decimal Degrees: **41.130438 N, -77.949525 W**
Degrees Minutes Seconds: **41° 7' 49.6" N, -77° 56' 58.3" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

JUL 30 2

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for one year** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt, a completed PNDI form and a USGS 7.5 minute quadrangle map with the project boundaries delineated on the map. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

JUL 30 2010

DEP, SOUTHWEST REGION
OIL & GAS

PNDI Project

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in [illegible] species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Endangered Species Section
315 South Allen Street, Suite 322, State College, PA. 16801-4851
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name: Ross Simpson
Company/Business Name: EXCO Resources, (PA), Inc.
Address: 3000 Ericsson Drive, Suite 200
City, State, Zip: Warrendale, PA 15086
Phone:(724) 720-2574 Fax:(724) 720-2500
Email: rsimpson@excoresources.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

Ross A Simpson — applicant/project proponent signature

7/20/10 — date

JUL 3 0 201

APPENDIX M
Tribal Consultation

Tribal consultation is currently being conducted by the National Park Service for these conversions. Responses from the tribes have not been received as of 12/12/2019.

APPENDIX N
2011 and 2013 Forest Management Annual Audits

SmartWood Headquarters
65 Millet St. Suite 201
Richmond, VT 05477 USA
Tel: 802-434-5491
Fax: 802-434-3116
www.smartwood.org

Audit Managed by:
United States Regional Office
801 Highway 3 North, Suite 200
Northfield, MN 55057
Tel: 507-663-1115
Fax: 507-663-7111
Contact person: Kara Wires, Forestry Technical Coordinator
Email: kwires@ra.org

ACCREDITED
FSC-ACC-004

© 1996 Forest Stewardship Council A.C.

FM-06 January 2009

Rainforest Alliance
SmartWood Program

Forest Management
2011 Annual audit
Report for:

Commonwealth of Pennsylvania, DCNR Bureau of Forestry
In
Harrisburg, PA USA

Report Finalized:	March 30, 2011
Audit Dates:	August 3-6, 2010
Audit Team:	Robert R. Bryan, Team Leader/Ecologist Christopher A. Nowak, Forester Stephen C. Grado, Social Assessor
Certificate code(s):	SW-FM/COC-003821
Certificate issued:	1/1/2009
Organization Contact:	Chad R. Voorhees
Address:	Forest Resource Planner RCSOB 400 Market St. P.O. Box 8552 Harrisburg, PA 17105-8552

TABLE OF CONTENTS

1. INTRODUCTION 3

2. AUDIT FINDINGS AND RESULTS 3

2.1. AUDIT CONCLUSION 3
2.2. CHANGES IN THE FOREST MANAGEMENT OF THE FME AND THE ASSOCIATED EFFECTS ON CONFORMANCE WITH THE STANDARD. 5
2.3. STAKEHOLDER ISSUES 5
2.4. CONFORMANCE WITH APPLICABLE CORRECTIVE ACTION REQUESTS 17
2.5. NEW CORRECTIVE ACTIONS ISSUED AS A RESULT OF THIS AUDIT 20
2.6. AUDIT OBSERVATIONS 26

3. AUDIT PROCESS 29

3.1. AUDITORS AND QUALIFICATIONS: 29
3.2. AUDIT SCHEDULE 30
3.3. SAMPLING METHODOLOGY: 31
3.4. STAKEHOLDER CONSULTATION PROCESS 31
3.5. CHANGES TO CERTIFICATION STANDARDS 32

APPENDIX I: List of visited sites (confidential) 34

APPENDIX II: List of stakeholders consulted (confidential) 37

APPENDIX III: Forest management standard conformance (confidential) 76

APPENDIX IV: Chain-of-Custody Conformance (confidential) 111

APPENDIX V: FSC Annual Audit Reporting Form: (confidential) 116

APPENDIX VI: SmartWood Database Update Form 118

Standard Conversions

1 mbf = 5.1 m^3
1 cord = 2.55 m^3
1 gallon (US) = 3.78541 liters

1 inch = 2.54 cm
1 foot = 0.3048 m
1 yard = 0.9144 m
1 mile = 1.60934 km
1 acre = 0.404687 hectares

1 pound = 0.4536 kg
1 US ton = 907.185 kg
1 UK ton = 1016.047 kg

1. INTRODUCTION

The purpose of this report is to document annual audit conformance of **Commonwealth of Pennsylvania, DCNR Bureau of Forestry** (**BOF**; also referred to as the Forest Management Enterprise, or FME in this report). The report presents the findings of SmartWood auditors who have evaluated company systems and performance against FSC forest management standards and policies. Section 2 of this report provides the audit conclusions and any necessary follow-up actions by the company through corrective action requests.

SmartWood audit reports include information which will become public information. Sections 1-3 will be posted on SmartWood's website according to FSC requirements. All appendices will remain confidential.

Dispute resolution: If SmartWood clients encounter organizations or individuals having concerns or comments about Rainforest Alliance / SmartWood and our services, these parties are strongly encouraged to contact SmartWood regional or Headquarters offices directly (see contact information on report cover). Formal complaints or concerns should be sent in writing.

2. AUDIT FINDINGS AND RESULTS

2.1. Audit conclusion

Based on Company's conformance with FSC and SmartWood requirements, the audit team makes the following recommendation:	
☒	**Certification requirements met, certificate maintenance recommended** Upon acceptance of CAR(s) issued below
☐	**Certification requirements not met:**
Additional comments**:**	
Issues identified as controversial or hard to evaluate.	This annual audit included a detailed review of the Marcellus Gas Leasing program on State Forest Lands (SFL). Because of potential environmental and social impacts, Marcellus gas drilling and associated activities (e.g., road construction, truck traffic, water withdrawals, pipeline corridors, and transport of hazardous materials), this has been a high-profile issue statewide and on SFL. Beginning in 2008 the BOF has leased 137,970 acres, or 6.5% of the SFL, for Marcellus gas extraction. The majority of the lease area is located in the ~~–~~Big Woods" section of the SFL in the North/Central section of the state. The BOF has invested significant amounts of personnel time and money to address the leasing for, and expansion of activity in, Marcellus shale gas development over the past few years. Each District has at least one forestry person dedicated to monitoring gas well pad installation and development. Dozens of personnel are involved in well pad siting, including an in-house team of geologists (presently four people, with two more geologists to be hired by the BOF in the near future), with BOF activities ranging from examination of site-specific assessment of ecological conditions to landscape-level impact on recreation.

	The BOF needs to ensure that the FSC Standard is being met only for activities that occur within the scope of the certificate. Because the FSC standard is a forest certification standard, including the impacts of gas leasing activities, presented an auditing challenge as the areas in question have been converted to non-forest use. The approach used by the audit team was to consider the impacts of the activity on the surrounding forest, including but not limited to resulting from direct loss of forest cover, forest fragmentation, increased potential for invasive plan species, impacts to species and habitats of management concern, stream flow and water quality concerns. Conformance with legal requirements, public outreach, stakeholder input, dispute resolution, economic effects, and effects on the BOF to complete activities associated with its core mission were also considered. Additionally, the auditing approach was that once it has been determined that forest is being converted (for utility easements, gas well pads, communication towers, etc.) the land is no longer being managed for forestry and the FSC standard is no longer applicable for the actual conversion activities (the actual clearing of the forest). In addition, areas that were considered to be outside the scope of the FSC standard and not included in the audit included truck traffic on roads outside of the forest that are used by gas companies operating on both the SFL and those on private lands (access roads only used by drilling companies operating on SFL lands would be considered within the scope of the certificate); water withdrawals outside of the SFL, and potential subsurface impacts (e.g., pollution of aquifers from leakage of gas or hydrofracturing fluids). During the audit SmartWood interviewed a large number of stakeholders, including environmental groups, recreation users, academics, and personnel from public agencies that enforce and monitor environmental regulations, including the Department of Environmental Protection, Pennsylvania Game Commission, and the Susquehanna River Basin Commission, as well as BOF employees. A summary of stakeholder comments and SmartWood responses is included in Section 2.3. The responses summarize the audit findings for many of the potential environmental and social issues identified. Gas and oil development is occurring on forestland where the Commonwealth of Pennsylvania owns the subsurface rights (the areas leased as mentioned above) and also on forestland where the Commonwealth does not own the subsurface rights. For the areas subject to the leases (where the subsurface rights are owned by the Commonwealth), PA DCNR has substantial control over activities to ensure conformance with the FSC standards and requirements. For lands where the Commonwealth does not own the subsurface rights, it is not clear, in all situations, whether PA DCNR has enough control over activities to ensure conformance with FSC standards and requirements. PA DCNR needs to evaluate the certified landbase and determine in which situations they maintain enough control to ensure conformance with the FSC standards. For ~~s~~severed lands" where they cannot ensure conformance, these lands will need to be excised. (Note: The entire

	leased area does not need to be excised. Only the areas that are directly impacted by oil and gas activities (i.e. converted to non-forest use) need to be excised.) PA DCNR needs to provide SmartWood with the protocol used in making this determination and the results of this evaluation. See **OBS 06/11**.

2.2. Changes in the forest management of the FME and the associated effects on conformance with the standard.

BOF has instituted minor changes in its management systems to address minor Corrective Action Requests (CARs) issued in calendar year 2009 (2010 audit year), including clarification of whole tree harvest policies, systems to address containment of spills and leaks from timber harvesting equipment. Details of these changes are included in Section 2.4.

BOF has corrected its High Conservation Value Forest (HCVF) assessment in response to CAR 04/10. The revised HCVF designation is approximately 220,803 acres. This is explained in greater detail in Sections 2.4 and 2.5.

The rapid increase in drilling for Marcellus shale gas on new leases (2008 and later) and on older gas leases has resulted in a number of new policies, assessments, and management activity to address the gas leasing program. Because of this increase, a review of the impact of gas drilling activities on the forest was a major focus of the current annual FSC audit.

Land acquisitions and exchanges resulted in a net increase of 3,085 acres of land managed by the BOF. The total area covered by the certificate is 2,147,259 acres (868,984 ha).

BOF has had net decrease in employees due to a reduction in seasonal staffing. However, new full-time positions have been added to deal with the increased work load resulting from the Marcellus gas lease activity.

2.3. Stakeholder issues

The audit team received many comments on the Marcellus gas issue as well as general comments on the FME's forest management. Stakeholder comments and SmartWood's response are summarized in the table below.

Stakeholder comment	SmartWood response
General Comments	
Penn State University (PSU) faculty has received research funding in recreation- and silviculture-related areas. For example, there is a long-term project to improve BOF forest management planning and interject GIS and harvest planning concepts into their FMPs. For PSU classes, there are academic field trips whereby BOF staff contributes to class lectures. One professor uses state lands such as Alan Seger Natural Area and Bear Meadows for outdoor classrooms. BOF local foresters have hosted field tours on PA DCNR lands for the regional SAF	None required.

Stakeholder comment	SmartWood response
Chapter. The PA DCNR hires PSU graduates. Regarding mineral extraction issues, many of the deans and directors from various universities have participated in two tours of gas well sites. The BOF has a reputation as one of the premier natural resources agencies in the U.S. and has been looked at as a forward looking organization with very professional and motivated leadership. Many people consider them a cutting edge organization as they implement planning programs (i.e., public and private forest lands) and in their use of management sciences on the state forest. Their field staff live in local communities and participate as both employees and citizens. The BOF works well with the public; gathering input, conveying information, and building relationships. Much of what was learned about forest regeneration on the state forest lands can be attributed to their staff that helps to manage these areas. They cautiously make good decisions and use science to guide their work (e.g., application of SILVAH and Penn State Oak Regeneration Guidelines). The BOF is not just focused on trees. They have high regard for other plants and animals; as witnessed by the work performed by their Ecological Services unit.	
An individual recommended topics in the past for meetings with the BOF which were used for meeting presentations. There is a concern that there used to be 4 meetings a year, and now they are down to 1 or 2 at the most. Several stakeholders have served on the PA DCNR Recreation Advisory Committee and have found it to be beneficial.	The BOF is under pressure from budgetary concerns to reduce the number of meetings. Additionally, several meetings have been poorly attended. Stakeholders and advisory committee members can always schedule special meetings for any issues of concern and have, in fact, done so. The auditors have determined there is no nonconformance with the applicable FSC standards.
A recreation-related business is involved with boating, biking, and hiking recreation. This operation provides rest rooms, changing stations, and a parking lot. There are a number of issues with the BOF. First, without notification, they upgraded a canoe landing. At the Blackwell boat launch, the BOF put in loose rocks where the public needs to walk and it is very unstable. They have not fixed this, despite calls to do so. In addition, the BOF took down a parking sign to access the river and then put a big rock in the	With increased pressure to perform their jobs, cut backs in the work force, and the additional attention given to increased oil and gas drilling, the BOF may be cutting back in areas such as recreation management. While the audit team did not uncover direct evidence of this during its visit, the team recommends that his situation and BOF's management of other recreational sites and activities be continually monitored future audits. See **OBS 02/11**.

Stakeholder comment	SmartWood response
middle of the road to prevent cars from entering the area. Now a raft cannot get around the rock to access the creek. The biggest issue for him is water levels, without which he can't operate. Some years are better than others. Water quality would become an issue, if the creek was despoiled, it would ruin his business. A stakeholder stated that the BOF has been slow to recognize their responsibility to provide outdoor recreation opportunities. However, some progress has been made in recent years.	 See above comment.
Forest industry stakeholders were very supportive of timber sale contracts with spill containment requirements, and if certification driven, that is good. They also support related requirements, like logger safety training evidence. However, logging contracts need to be consistent with contracts or agreements for other work. For example, harvesting for logs creates a large economic impact and requires logger training; however, clearing for Rights of Way, the BOF does not require trained loggers. This is a safety issue and the loss of work for trained loggers in the state. There needs to be consistency in permits, agreements, and contracts on safety, insurance, and training requirements.	The BOF needs to ensure that the FSC Standard is being met only for activities that occur within the scope of the certificate. The FSC Standard applies only to forest management. Once it has been determined that land is being cleared for utility easements (Rights of Way) or clearing for other non-forest uses (e.g., gas well pads, communication towers, etc.) the land is no longer being managed for forestry and the FSC standard is no longer applicable; only impacts to the surrounding forest land is considered to be applicable. Therefore, there is no nonconformance with the FSC standards.
BOF need's to show what they are doing relative to FSC certification and involve their constituency. FSC certification is not well known among stakeholders and as a result, not as valued as it should be. They claim and can be said to be a market leader but they have a very poor Web site.	Among the stakeholders interviewed there was an acute awareness about FSC certification. However, this is not as prevalent among the general public. While education and public relations efforts are exceptional, the auditors found that they were lacking relative to the BOF involvement in FSC certification. It was acknowledged by the BOF that their Web site is in need of an overhaul. In fact, they are now in the process of planning on Web site improvements. However, the auditors have determined there is no nonconformance with the applicable FSC standards.
Oak regeneration is inadequate across BOF forest lands, in large part due to poor forest management.	Forest regeneration was observed to be generally well maintained and enhanced by BOF across State Forests. It was clear that BOF invests significant resources to maintain intact, enhance or restore regeneration through efforts in deer impact control (use of DMAP, manipulation of forage and browse, fencing) coupled with silvicultural interventions to control light (including use of overstory tree harvests and site preparation with herbicides and prescribed fire). Anecdotally (stakeholder interviews and general observations), efforts to regenerate oak on a variety of sites have been improved by the BOF over the last 10 years, with success (increased oak regeneration). Some of this success is attributed to training – all BOF foresters and many forest technicians have recently attended the U.S. Forest

Stakeholder comment	SmartWood response
	Service oak silviculture training session. Efforts to use prescribed fire – an important tool to promote oak regeneration through control of interfering plants and change in soil dynamics – have been expanded and supported by recent passage of PA's Prescribed Burning Practices Act (House Bill 262, passed in July 2009). BOF prescribe burned ~200 acres in 2010, with >500 acres planned for 2011. The audit team has found the BOF's regeneration efforts to be consistent with the FSC Appalachian Standard, Criterion 6.3.
BOF Districts do not appear to be monitoring how they are following their tactical plans (harvest targets, age class distribution), and what is the process for management plan revision?	Each Forest District annually reports harvest levels and amount of timber harvests (area by silvicultural method) to the BOF Silviculture Section. These reports are analyzed, summarized, and assessed against Forest District targets. To date, harvesting achievements were described by the BOF as generally being on target. Overall evaluation of harvest levels and forest conditions will occur with the State Forest Plan revision, which is set to begin in 2012 and be completed by 2014. The audit team has found these BOF monitoring efforts to be consistent with the FSC Appalachian Standard, Criteria 8.1 and 8.2.
Over browsing by white-tailed deer is a problem on many State forests, requiring efforts to control the deer herd through concentrated hunting or costly fencing to exclude deer from select areas. Deer are currently impacting PA forest lands by browsing tree seedlings, shrubs and wildflowers beyond their capacity to reproduce, impacting the ability to sustain a healthy, fully functioning forest. In 2003, the PA Game Commission developed the Deer Management Assistance Program (DMAP), to provide assistance to landowners whose lands are impacted by deer over browsing or who have specific deer management goals that include reducing the doe herd. Permits issued through DMAP are valid only on the area they were assigned to, allowing landowners to accomplish specific deer management goals on individual areas. DMAP has worked on State Forests, as evidenced by a reduction in fencing over the past 10 years. In 2009, the PA Game Commission changed DMAP, effectively reducing the number of total deer permits issued across the State. It is expected that DMAP will be further altered and that sustainability of PA forest jeopardized while the deer herd increases.	BOF quickly responded to the late changes in 2009 DMAP policy and procedure and were able to secure nearly all desired permits for high priority areas across the State Forest system. An important element of this responsiveness was the intensive efforts to monitor and collect data on forest regeneration, a key forest health indicator. Since 2006, BOF staff have intensively surveyed forest regeneration and browsing impact across more than 2 million acres of State forestland (thousands of miles of transects and tens of thousands of plots). While DMAP decisions are based primarily on habitat condition, other factors are considered, such as hunter access and planned management activities. Not all State Forest areas that requested DMAP permits were covered this past year. Coupled with the general overall reduction in deer permits, it is expected that increased deer herd size and impact will negatively affect PA forest conditions. BOF is working with staff, scientists and the PA Game Commission to maintain the DMAP program. They will continue to monitor forest conditions as related to deer browsing, fencing efforts to regenerate areas to diverse and desirable species, and be actively providing information to inform their stakeholders, including the PA Game Commission. This year, forest conditions outside fences were generally observed to reflect lowered deer impact across the State. It is expected that increased problems with deer as a result of changes in DMAP may only begin to appear in the forest in the next few years as deer herds build. At present, BOF's efforts to regenerate forests through control of deer, with DMAP, fencing and control of forage and browse, was found by the audit team to be

Stakeholder comment	SmartWood response
	consistent with the FSC Appalachian Standard, Criteria 6.3.
One stakeholder recommended that BOF use large, long-term exclosures to collect data on tracts with no over-browsing and no vegetation management.	BOF conducted an extensive study has looked at oak regeneration within fence exclosures specific to deer effects, as well as many other aspects of oak regeneration (e.g., see Yuska et al. 2008). This information assists the BOF when determining where areas should be enrolled in the Pennsylvania Game Commission's Deer Management Assistance Program (DMAP). The BOF has had habitat analyzed inside versus outside fences by researchers on State Forest land, and other similar studies have been conducted across Pennsylvania. The BOF considers these studies as they move forward in improving data collection for monitoring habitat for deer and other wildlife. BOF has also begun a pilot project in one district (Tioga) to improve data collection and decision making. The Tioga Pilot Project monitoring protocol includes overstory conditions, herbaceous and understory vegetation, recent timber history, cover of competing vegetation, forest type, forest floor seed bank, and other information that may assist in distinguishing effects of high deer density from other major influences on forest recovery. The auditors have determined there is no nonconformance with the applicable FSC standards.
Natural conversion of certain black cherry stands to black birch seems to be increasing as a problem in north-central PA. Over the past decade, it appears that cherry seed years have been less due to failures in cherry seed crop, there are changed seedling dynamics (seedlings seem to ~~j~~just sit" once established), lowered deer impact levels have allowed other species to dominant (e.g., birch, red maple and pin cherry), and possible inappropriate silvicultural prescriptions may have exacerbated the problem. The concern for a cherry-to-birch conversion in regenerating hardwood stands may be most commonly occurring in Allegheny hardwood stands in northwestern to north-central PA.	Information on this cherry problem and cherry-birch conversion have been anecdotal information. Only recently have scientists begun to explore the problems. Interviews with dozens of State Foresters and field assessment of review of 15 regenerating areas on four State Forests in north-central PA did not support the notion of current, broad scale problems with conversion of cherry to birch. Regenerating areas were observed to be diverse with at least three major commercial species as co-dominants in each visited stand. BOF staff submitted that cherry seed supply has been low; with no discernible cause (black cherry dieback has been observed by BOF staff across PA). Apparently, cherry are recovering this year with improved vigor (crown conditions) and a large seed crop. Birch were observed to be a dominant in stands that regenerated over a decade or two ago, particularly in association with sugar maple decline. It is recognized that the increase in birch and other species such as pin cherry could be a concern, particularly if deer browsing continues to be low, but that problem does not yet appear to be omnipresent. BOF staff is aware of the concern, monitoring regeneration cuts for problems, and cooperating with scientists to learn more about the unfolding ecology associated with cherry-birch stands. At present, BOF is successfully regenerating forests with potential cherry and birch problems, and were therefore found by the audit team to be operating

Stakeholder comment	SmartWood response
	consistent with the FSC Appalachian Standard, Criteria 6.3.
One stakeholder expressed concern regarding BOF plans for exotic pests in general, but the emerald ash borer specifically.	**Emerald Ash Borer (EAB).** BOF tools for dealing with EAB, include early detection, limitation of spread, and public education and working with affected stakeholders. Examples of BOF efforts include PA genotype ash seed collection and storage, EAB detection (purple panel traps across the state), educating landowners, working to bring speakers with EAB experience to stakeholder gatherings, alerting camp leases about quarantine and risks of moving firewood, working with communities to complete risk assessments and strategies for dealing with the problem, and participating actively in research programs, and potential biological control organisms. PA Department of Agriculture and the USDA APHIS, not BOF, enforce quarantines. BOF works to educate industry about the quarantine and how to comply with it (usually involves compliance agreements. Generally ash is a minor component of most BOF timber sales. BOF works with buyers on a case by case basis to determine how it can accommodate the buyer's needs (most commonly expressed concern is that a current contract does not provide enough time to remove ash logs due to the seasonal restriction on hauling). **Hemlock Wooly Adelgid (HWA).** BOF conducts surveys along the leading edge, monitors hemlock health, releases predators and monitor the sites, conducts HWA suppression activities on DCNR State Forest and State Park lands, and cooperates with researchers studying the genetic diversity of eastern hemlock. **Gypsy Moth.** Since 1972 BOF has conducted an annual gypsy moth suppression program on state, federal, and private lands on a request/voluntary basis. The size of program based on need, requests, and funding. BOF also conducts annual defoliation surveys and egg mass surveys. The auditors have determined there is no nonconformance with the applicable FSC standards.
One stakeholder indicated, if the BOF is still doing even-management with no retention, they object to the practice in the strongest possible terms.	The FSC Appalachian standard does not require retention of live trees and other vegetation for final even-aged harvests (e.g., clearcuts, overstory removals, and other harvests that result in single-aged or two-aged stands) 10 acres or less in size. Because this is permitted by the Standard the audit team cannot require justification. The audit team has found the BOF's retention practices for even-aged regeneration harvest blocks large than 10 acres to be inconsistent with the FSC Appalachian Standard, Indicator 8.3.a.8. See **CAR**

Stakeholder comment	SmartWood response
	05/11 in Section 2.5 of this report for details.
One stakeholder objects to whole tree logging.	Whole tree harvesting is allowed by the FSC standard if soil structure, function, and fertility are not threatened and if ecologically justified (see Appalachian Standard, Indicator 6.3.c). BOF estimates that approximately 95% of the BOF's timber sales specifically do not permit whole tree harvesting (WTH). The small number of sites on which the BOF does whole tree harvesting requires approval by the State Forester. WTH is permitted in cases where the BOF needs to meet its objectives for early successional habitats for species at risk and other species, but the stands to be harvested lack the volume or quality to be harvested commercially. The BOF has found that without the use of whole tree harvesting fewer acres would be regenerated each year to early successional habitat. When WTH is used, the State' biomass having guidelines, which require retention of a percentage of the harvested material, are used. See also findings for CAR 01/10 in Section 2.4 of this report.
Past audits have noted BOF planting non-native tree species. One stakeholder strongly objects if that still is occurring, we object strongly, and we want an explanation of why it's being done.	Planting of exotic (non-native) species is allowed under the FSC standard if the species has been shown to be non-invasive, records are kept of the use, and the ecological effects are monitored (see Criterion 6.9). Over the three-year period 2006-2008, BOF planted approximately 15,000 exotic trees per year, or enough to plant about 20 acres per year at 800 trees per acre. The 2008 reassessment found a gap in the BOF's monitoring of exotic species, which was addressed during last year's annual audit. One prior planting of black alder (an invasive plant) was eradicated in the past year (see CAR 03/10). The species planted and procedures used by BOF are consistent with the FSC Standard.
One stakeholder is concerned that consistent, verified RTE species screening, documentation, review and real adaptive management has not been implemented across all districts.	DCNR is a partner in the Pennsylvania Natural Heritage Program (PNHI, formerly the Pennsylvania Natural Diversity Index) and maintains current data on rare, threatened and endangered species and natural communities. This information is reviewed before any site disturbing activities, including forest management, recreation site development (e.g., trails) and approving well locations on oil and gas leases. Potential impacts are reviewed by BOF's Ecological Services Division. Where potential impacts are not clearly addressed by standard guidelines (e.g., activity within rattlesnake foraging habitat) BOF consults with the Game Commission or Fish and Boat Commission as appropriate. The RTE review process and associated documents were reviewed with BOF during the current audit and found to be in conformance with the FSC standard.

Marcellus Gas Comments	
PA DCNR is not ready to explain to the public what impacts Marcellus drilling will have on their recreation programs. Furthermore, they need to be ready to counter any misimpressions that the public may be forming.	The BOF has extremely active education and public relations mechanisms in place for both its forest management activities and for all issues related to the oil and gas issue, including public meetings, tours, Web site, and media relations. The auditors have determined there is no nonconformance with the applicable FSC standards.
PA DCNR needs to study the environmental impacts of gas development and the subsequent impacts on recreation opportunities. The traffic on the Eagleton Road in the Sproul State Forest resembles a major city at rush hour rather than a sustainable, well managed forest.	The BOF is planning an expanded monitoring program to address environmental impacts of gas development. The BOF has funded numerous recreation-related projects over the years, and it is reasonable to assume that they will be looking at gas drilling impacts, not only on recreation, but on all aspects of their management. Some work has been done on this already and, with further funding, they will be able to increase the depth and breadth of studies to address public concerns. As noted above, the audit team recommends that recreation programs be a focus area for a future audit. This focus should include the impacts of oil and gas drilling on recreational use. Currently, the auditors have determined there is no nonconformance with the applicable FSC standards. However, the auditors recommend that the impact of traffic and other drilling activities be more closely evaluated in a future annual audit.
The BOF is not using their advisory groups properly and efficiently (e.g., witness the process for the State Forest Assessment).	The BOF is under pressure from budgetary concerns to reduce the number of meetings. Additionally, several meetings have been poorly attended. Stakeholders and advisory committee members can always schedule special meetings for any issues of concern and have, in fact, done so. The auditors have determined there is no nonconformance with the applicable FSC standards.
The BOF can use more experts for specific issues rather than addressing entire advisory groups of generalists, or in some cases exclusively working in-house.	Outside of stakeholder advisory committee processes the BOF consults with experts in other agencies, conservation groups, and academia. These efforts are expected to increase as the BOF implements its expanded monitoring program and collaborates with outside research on the impacts of O&G development. The auditors have determined there is no nonconformance with the applicable FSC standards.
The BOF needs to address whether gas drilling and certification compatible.	The PA DCNR Web site, in support of a moratorium on Marcellus development, has an analysis of the relationship of FSC certification and O&G development. It is expected that this annual audit, which has a focus on O&G development, will provide additional information, Currently, the auditors have determined there is no nonconformance with the applicable FSC standards.

Feasibility, cost estimates and liability issues related to contamination of ground water, surface waters, wetlands and land by drillers, operators and contractors are concerns. If not already in place, BOF must develop and implement insurance, bonding and related requirements, based on realistic cost estimates, to ensure the polluter pays, not the Commonwealth's taxpayers.	The BOF and O&G operators have lease agreements in place to cover performance bonds and liability from all related activities. Leases may be suspended or revoked for non-conformance with the performance requirements. The auditors have determined there is no nonconformance with the applicable FSC standards.
One stakeholder is very concerned about thousands of small leaks over a wide area. Many special interest groups and citizens are fighting for stricter rules and regulations covering mineral excavation and drilling.	The BOF has a monitoring program that focuses on holding gas companies to their contractual agreements for gas production, environmental impacts, and road use. These agreements have been met to date with few exceptions. BOF plans to hire more foresters as O&G inspectors over the next year. The auditors have determined there is no nonconformance with the applicable FSC standards.
Gas installations visible from the Pine Valley on Route 44 are viewshed violations.	The installation in question was brought to the attention of BOF staff in this District. They stated that the item in question (a drill rig) was there on a temporary basis, and will be removed from the viewshed when the drilling is complete. It was sited on the more visible location in order to avoid other more sensitive features and understanding that the viewshed would only be impacted for a short period of time. The auditors have determined there is no nonconformance with the applicable FSC standards.
The BOF has been able to meet challenges and have addressed issues in the past, such as fencing for regeneration, proper silviculture, sustainable forestry, etc. so they can meet the challenge of being FSC certified and properly addressing the gas drilling issue. They have good personnel, and they will find a way to solve their problems. But, there is concern whether BOF has or will have the personnel to do their work, given the added responsibilities associated with Marcellus gas development.	Forest management activities to date have occurred at levels needed to fulfill plans, but it is recognized that as the level of Marcellus gas development activity increase, more BOF personnel may be needed to meet administrative and management needs of both gas development and forest management. **OBS 02/11** was issued in this audit to highlight forest certification concern. BOF has an aggressive plan for personnel management that, if acted upon, should allow forest management to continue to planned levels.
DCNR cannot rely on DEP to completely and fully monitor Marcellus gas development activity. DCNR and BOF need to hire their own O&G inspectors and train them as normal for BOF and in DEP-type regulatory O&G inspections.	BOF and DEP (among others) appear strained by the level of planning, management, and monitoring required for the gas leasing program. BOF is supporting a three-year moratorium on new leases to provide time to improve its monitoring and management of the current leases and evaluate if additional leases are feasible within the goals of the State Forest System and certification. In addition, each District has at least one forestry person dedicated to monitoring gas well pad installation and development. Dozens of personnel are involved in well pad siting, including an in-house team of geologists
The state needs to charge for gas lines in the same way they do Rights of Way.	Charges for gas lines associated with a specific lease are included in the overall lease payments.

If current rates of drilling combined with the legislative mood on this issue there are sure to be problems. The legislature does not want to step up to the plate and make sure there is adequate oversight.	BOF has planned a significant increase in its O&G monitoring program and it expects to receive the funding. The auditors have determined there is no nonconformance with the applicable FSC standards.
The Bureau staff has become heavily involved in the Marcellus Gas play and is doing an excellent job of protecting their resources under the pressure to develop. There have been few negative events; but, the Bureau has been responsive. They have worked hard to protect important habitats and special places. They have done an exemplary job.	Comment noted; no response necessary.
Some will note recent gas development on state forest lands and the decision to lease drilling rights. This was a political decision and imposed on the management staff by the governor's office.	SmartWood evaluates performance of the BOF relative to the FSC Standard. The initial impetus for leasing (political or otherwise) is does not affect how performance is evaluated.
Studying each proposed round of leasing is not sufficient. Policies, procedures, standards, reporting requirements and protocols for assessment of cumulative impacts are a baseline requirement for credible management of Marcellus Shale development impacts.	SmartWood found that the BOF's cumulative impact assessment on the DCNR Web site ~~I~~mpacts of Leasing Additional State Forest Land" to be a thorough analysis that meets the intent of the FSC standard for any new leases. However, SmartWood has found insufficient detail in the cumulative impact analyses for the three recent Marcellus gas leases and it has issued. **CAR 03/11** has been issued to address this concern.
BOF should ensure environmental/ ecological assessment policies, procedures, standards, reporting requirements and protocols require full consideration of fragmentation and edge effects for roads, ROWs and all clearings. Areas which currently provide excellent interior forest habitat conditions and which remain undrilled will be degraded by edge effects from new, adjacent roads, ROWs and clearings.	The audit team has found that DCNR's approach to conserving interior forest habitat at the landscape scale is consistent with the requirements the FSC Standard. The leasing program excludes large blocks of interior forest found within the Marcellus gas shale region. The cumulative impact analysis in support of a moratorium found that of the roughly 1.5 million acres in the Marcellus region, approximately 800,000 acres should be reserved from future gas development due to the presence of ecologically sensitive areas and additional Primitive Land. Within the leased areas fragmentation has been minimized by avoiding sensitive sites (e.g., large areas of steep slopes, clusters of wetlands, and river corridors) that will maintain interior habitat blocks. Fragmentation is further minimized by directing development (well pads, roads, and pipelines) along the existing road network. Nonetheless, while the cumulative impact assessment in support of the moratorium is strong, SmartWood found the impact assessment for leases issued in 2008, 2009, and 2010 to be insufficient in regard to habitat fragmentation (see **CAR 03/11**).
BOF needs to ensure environmental/ ecological assessment policies, procedures, standards, reporting requirements and protocols include full consideration of the new infection paths for exotic invasive plants and insects. BOF needs to look at increased/accelerated spread from existing (pre-drilling) infestations on BOF lands in addition to the issue of all the new pathways/opportunities for new infections/infestations.	SmartWood has found BOF's method to address invasive exotic plants in the 2008 and later leases to meet the requirements of the FSC standard, include pre-construction baseline studies and post construction monitoring and control. However, the audit team has found that that risk is greater for older leases. See **CAR 04/11.** Relative to new infections, BOF has found that the

	pathways for infections - roads, corridors, and equipment – are the same as for traditional forest uses (logging and recreation) and that existing education, monitoring, and control programs address these risks. As with any other area of increased activity, O&G sites are targeted for increased detection and monitoring activity under the BOF's expanded monitoring program.
If BOF is truly serious about sound ecosystem management, Marcellus Shale development impacts must be addressed with compensatory mitigation. We need new and expanded Natural Areas, Wild Areas, Wild Plant Sanctuaries and other special designation areas to compensate for the areas being heavily impacted. It is very important that mitigation include reduced commercial and salvage logging also. The acreage that is cleared on a semi-permanent basis for Marcellus Shale development must be accounted for in future timber sale planning, including salvage sales.	The FSC standard does not use the term ~~c~~ompensatory mitigation," but the concept if generally addressed by Criterion 6.10.c. FSC Criterion 6.10 only allows conversion to non-forest use (e.g., gas and oil development) if three requirements are met. Conversion is allowed only if it: **a. Entails a very limited portion of the management unit.** FSC US guidance (Forest Management Standard V1.0, July 2010) defines ~~v~~ery limited portion" as less than 2% of the certified forest area of the FMU over a five-year period. Using data supplied by the BOF, SmartWood estimates that the total forest conversion from Marcellus activities since the program began in 2008 has been approximately 344 from BOF leases and 1,059 acres on lands with severed subsurface rights. At this rate for a 5-year period this would amount to less than 0.2% of the FMU (the entire 2.14 million acre SFL is a single FMU) for BOF leases and leases with severed rights combined. While this is well within the limit of a ~~v~~ery limited portion", BOF conversion figures are based on estimates and not on actual measurements. See **OBS 05/11**. No land has been converted to plantations as defined by the FSC. **b. Does not occur in High Conservation Value Forest areas.** Based on BOF's corrected High Conservation Value Forest assessment (see findings for CAR 04/10 for detail), there is no conversion of HCVF to plantations or non-forest use. **c. Will enable clear, substantial, additional, secure, long-term conservation benefits across the forest management unit.** From 2005-2010 BOF has spent over $38 million to add over 44,000 acres to the SFL. Funding is from a variety of sources, including legislative bond packages, the Oil and Gas Fund, and other funds. The O&G Fund is not strictly dedicated to land conservation and has been primarily for operations and programs in recent years. However, the non-dedicated nature of the O&G fund allows flexibility in the timing and sources of revenues used for land conservation while meeting other funding needs of the DCNR. Areas protected by this re-investment include rare, threatened, and endangered species habitats, important natural plant communities, wetlands, and additions to

	Wild Areas and Natural Areas (current or potential High Conservation Value Forest areas). Other conservation benefits of these land acquisitions include water quality protection, wetland protection, wildlife habitat, timber management improvement, historic site protection, recreational opportunities, aesthetical values (viewsheds), and carbon sequestration benefits. Over 5,000 acres in near expanding population areas were protected from risk of development, and much of the other land conserved was at varying degrees of risk from low density development The audit team has found that these benefits are clear, substantial, additional, and long-term as clarified in the 6.10.c intent statement of the FSC-US Forest Management Standard. The area converted to non-forest uses is accounted for in periodic revisions to the sustainable harvest calculation. Because the area lost to gas development is estimated to be roughly 1.6% of the forest in the Marcellus gas region over life of the existing leases (40+ years), impacts on allowable harvests will be correspondingly small. The allowable harvest also accounts for salvage sales (e.g., from insect mortality) and is updated periodically to reflect additions and subtractions to the forest land base.
One stakeholder indicated their concern is protecting the state forests from gas exploration which will have a severe impact on the health of the forests. The leasing of state forest land for gas drilling is an ecological disaster for all Pennsylvania. Another wondered how oil and gas drilling on state forests can be considered an environmentally responsible forest management practice. And another indicated: ~~I~~n my opinion describing these State Forests as well managed and sustainable is wrong. Having experience of forty years of gas exploration and storage the Gas Companies talk the talk but never walk the walk. The certification should be denied.”	SmartWood has evaluated the BOF’s oil and gas program against the specific requirements of the FSC standard. The method used to audit the oil and gas leasing program in the context of a forest management program is described in Section 2.1. New Corrective Action Requests have been issued where non-conformance with the Standard was noted (see Section 2.5) and Observations were issued where the Standard was met but concerns were noted (see Section 2.6).
Many citizens get their water from wells. The big fear is methane in the water from the Marcellus Project.	DEP reports that wells on BOF lands are located far from drinking water wells. DEP reports that within 6 months of the commencement of drilling operations a landowner complains about methane, the burden of proof is on the gas company to prove that they did not cause the problem. Most companies sample wells within 2500 feet prior to drilling to provide baseline data. The auditors have determined there is no nonconformance with the applicable FSC standards.
One stakeholder wondered if a Life Cycle Analysis being performed to compare oil and gas drilling activities to forest management activities.	A ~~L~~Life Cycle Analysis” comparing with forest management with non-forest uses is not part of the FSC Standard. Rather, the approach to is a) see if the conversion meets the requirements of Criterion 6.10 as

	described above, and b) see if the impacts of the non-forest uses on the forest meet the requirements of the specific criteria and indicators that are applicable to gas leasing, as described in Section 2.1 .
One stakeholder was concerned with carbon markets and leakage (loss of net stored carbon) that could come with removing land that are associated with O&G impacts from the FSC certificate. If BOF has a percent of land certified versus specific suite of lands it could be a concern. Lowered carbon sequestration (leakage) associated with removing land from the certificate is a concern.	The FSC Standard is not a system for verifying carbon sequestration form carbon markets. If the BOF chooses to enter carbon markets, the carbon standard selected by the BOF will evaluate the system independently of which lands are in or out of the FSC certificate. As a point of clarification, the FSC Standard only requires that land be excised (removed) from the certificate if it cannot control activities on the land to the extent that it cannot assure conformance with the FSC standard. If any lands are excised, only the area converted to non-forest use needs to be excised. Loss of carbon sequestration will occur due to conversion regardless of whether or not the areas in question are excised or not. The auditors have determined there is no nonconformance with the applicable FSC standards.

2.4. Conformance with applicable corrective action requests

The section below describes the activities of the certificate holder to address each applicable corrective action issued during previous evaluations. For each CAR a finding is presented along with a description of its current status using the following categories. Failure to meet CARs will result in nonconformances being upgraded from minor to major status with conformance required within 3 months with risk of suspension or termination of the SmartWood certificate if Major CARs are not met. The following classification is used to indicate the status of the CAR:

Status Categories	Explanation
Closed	Operation has successfully met the CAR.
Open	Operation has either not met or has partially met the CAR.

☐ Check if N/A (there are no open CARs to review)

CAR 01/10		**Reference to Standard: 6.3.b.1, 6.3.c.1, 6.3.c.2.**
Non-conformance		Whole tree harvesting was being used in District 18 and very low levels of woody debris were observed by the audit team. PA has guidelines for retaining woody biomass in harvest operations, but field staff were not aware of or using guidelines for retaining woody debris on harvest sites. The information was verbally discussed by Harrisburg staff with the District but not included in the project proposal or harvest contract.
Major ☐	**Minor** ☒	
Corrective Action Request: BOF shall develop and implement procedures to ensure that adequate amounts of coarse woody debris are retained in all harvest operations consistent with the guidelines for retaining woody biomass.		
Timeline for conformance:		Prior to next annual audit
Evidence to close CAR:		BOF has taken the following steps to ensure that adequate amounts of coarse woody debris are retained in harvest operations: • Since September 2009, whole tree harvest waiver

	requests are closely reviewed by the Silviculture Section and by the Chief Forest Planning & Inventory Division. On October 1. 2010 the Chief Forest Planning & Inventory Division reviewed, on site, a sale (10-09BC05) during which the whole tree harvest option was discussed (but not ultimately requested, nor approved). • Since December 2009, the Silviculture section has issued Approval letters documenting actions needed to maintain compliance with the PADCNR documents ***Guidance for Harvesting Woody Biomass in Pennsylvania*** when waivers to whole tree harvesting prohibition have been requested and approved. Examples of approval letters were reviewed by the audit team. • An e-mail notification to districts on Feb 9 2010 drew attention of all BOF employees to the CARs and noted that changes to business practices would be required. • At the May 27, 2010 District Foresters meeting, the Planning Section Chief addressed the issue, noting that additional actions are needed to ensure biomass guidelines, noting there are several suitable potential strategies which were discussed in some detail. • When sufficient experience has been collected with the techniques used to retain adequate biomass, the formalized process will be included in the Silviculture Manual. Very few whole tree harvesting waivers are issued. Because all active operations observed during the audit were subject to contracts that were signed prior to the new procedures, the audit team was not able to verify implementation in the field. However, whole tree harvest approval letters verify that the procedures are being implemented at the administrative level.
CAR Status:	CLOSED
Follow-up Actions (if app.):	None

CAR 02/10		**Reference to Standard: 6.7.a.**
Non-conformance		Consistent with the findings in BOF's assessment, loggers contacted during the audit do not have on-site spill kits. On one active harvest area, machinery was observed leaking fluids from an axle and several older spills were observed. No attempt had been made by the logger to contain the active spill.
Major ☐	**Minor** ☒	
Corrective Action Request: BOF shall develop and implement a system to ensure contractors and other service providers adhere to state regulations regarding the containment and remediation of hazardous material spills on BOF lands.		
Timeline for conformance:		Prior to next annual audit
Evidence to close CAR:		Over the last year, BOF developed a system to ensure contractors and other service providers adhere to state regulations regarding the containment and remediation of hazardous material spills on State forest lands. This system

	includes a notice added to timber sale prospectuses and the addition of new oil spill-related language to timber sale contracts (post August 1st, 2010, all operators are required to have spill kits on all trucks suitable to handle spills up to 5 gallons and notification of DEP and BOF of any spills greater than 5 gallons), an updated weekly Sale Inspection Report (FMT-9) that includes two new check boxes dealing with spills, a detailed explanation on why the change was made (an internal Word document primarily for Timber Sale Administrators), and a listing of various spill kit costs and possible sources as a means of aiding contractors. The system was instituted only in early August 2010, just prior to the annual audit. This recent implementation should be followed up in future audits to be sure the system is working. During the audit, one logging contractor was observed to not have a spill kit on site, and on the same job, it was observed that log loading equipment had recently, regularly leaked oil along the roadside (**OBS 04/11**).
CAR Status:	CLOSED
Follow-up Actions (if app.):	**OBS 04/11**

CAR 03/10		**Reference to Standard: 6.9.a.**
Non-conformance		BOF reported that last year it planted 50 European black alder, a species on the DCNR list of invasive plants, in a gravel pit. While the likelihood of the alder spreading is low on this type of site, the planting of recognized invasive species is against BOF and FSC policies. To clarify, exotic species which have not been categorized as invasive or safe may be planted only within a program where they are monitored to determine their eventual classification.
Major ☐	**Minor** ☒	
Corrective Action Request: BOF shall provide peer-reviewed scientific evidence that the black alder is non-invasive on this site or destroy the black alder identified above.		
Timeline for conformance:		Prior to next annual audit
Evidence to close CAR:		The BOF destroyed the European black alder planted in 2008 on State Forest land. Additionally, this species is no longer grown at or supplied from Penn Nursery, BOF's primary source of forest planting materials
CAR Status:		CLOSED
Follow-up Actions (if app.):		None

CAR 04/10	**Reference to Standard: 6.10.b.**
Non-conformance	BOF converts some areas to non-forest use by developing gas wells

Major ☐	**Minor** ☒	where it owns the mineral and gas rights. Approximate 324 acres has been converted by PADCNR over the past 5 ½ years. This constitutes a ~~-v~~ery limited portion" of the 2.14 million-acre FMU. However, as of 2009 BOF has designated the entire forest as HCVF. Thus, technically the gas well conversions are occurring in HCVF. PADCNR has taken a conservative approach to designating HCVF and likely has placed more acres in HCVF than the minimum that would be required by the standard and under emerging guidance (the draft FSC-US HCVF Assessment Framework). Because conversions are only occurring in multiple use areas and do not appear to be threatening the HCVs of these areas at current rates of conversion, the risk of adverse impacts is considered to be low and thus a Minor, not a Major, CAR is warranted.
Corrective Action Request: BOF shall stop converting any HCVF to non-forest use, either by stopping forest conversion altogether or revising its HCVF designation, while still meeting the requirements of Criteria 9.1-9.4, to ensure that no conversion occurs within HCVF.		
Timeline for conformance:	Prior to next annual audit	
Evidence to close CAR:	BOF has revised its HCVF assessment to include only those specific areas with identified high conservation values. The resulting approach is more consistent current guidance on HCVF assessment provided by FSC-US. There is no longer a non-conformance to Criterion 6.10.b. However, the revised HCVF assessment was found to have conformance gaps with the requirements in the standard (see **CAR 07/11** below for details). NOTE: The way CAR 04/10 was written implied that BOF was converting HCVF. This was not the case. The auditors determined that PADCNR had taken an aggressive approach to designating HCVF and placed more acres in HCVF than the minimum that was appropriate given the requirements in the standard and under new guidance (the FSC-US HCVF Assessment Framework). At the time of this designation, the HCVF Assessment Framework was in draft form and clear guidance on interpreting and implementing the HCVF concept was just emerging. Since some lands were incorrectly designated as HCVF, conversion of actual HCVF was not occurring.	
CAR Status:	CLOSED	
Follow-up Actions (if app.):	See **CAR 07/11**	

2.5. New corrective actions issued as a result of this audit

CAR 01/11	**Reference to Standard: Appalachia 1.1.a. (FSC US Forest Management Standard 1.1.a.)**
Non-conformance	Pennsylvania's Erosion and Sediment Control regulations (Chapter 102

Major ☐	**Minor** ☒	of the Clean Stream Law) require that Erosion and Sediment (E&S) Plans be available for review and inspection by the DEP or the County Conservation District at the project site during all stages of the earth disturbance activity, yet E&S Plans were not observed to be on site for all active logging jobs.
Corrective Action Request: BOF shall ensure that forest management plans and operations comply with federal, state, county, municipal, and tribal laws, case law, and regulations.		
Timeline for conformance:		Prior to next annual audit
Evidence to close CAR:		Pending
CAR Status:		OPEN
Follow-up Actions (if app.):		

CAR 02/11		**Reference to Standard: Appalachia 4.2.a. (FSC US Forest Management Standard 4.2.a.)**
Non-conformance		A logging subcontractor was observed to not wear proper PPE (hard hat) when topping felled trees on an active harvest site. In some cases on BOF State Forestland, workers are exempt from wearing certain PPE if doing so violates religious beliefs and rules. BOF has worked with OSHA and State lawyers to develop policy and procedure with regard to religious exemptions for contractors and subcontractors working as timber harvesters on State Forests. The key element of worker with PPE religious exemption is that each worker must have written support from their religious leader as to the need for not using PPE. The subcontractor who was not wearing a hardhat did not have such a letter on file with the BOF. BOF hard hat policy was unknown to most BOF staff interviewed during the audit, and it was observed that hard hat use is inconsistent and irregular within and across Districts, particularly with staff from different BOF Divisions and Sections working in the forest.
Major ☐	**Minor** ☒	
Corrective Action Request: BOF shall ensure the use of safety equipment appropriate to each task.		
Timeline for conformance:		Prior to next annual audit
Evidence to close CAR:		Pending
CAR Status:		OPEN
Follow-up Actions (if app.):		

CAR 03/11	**Reference to Standard: Appalachia 6.1.c. (FSC US Forest Management Standard 6.1.b.)**
Non-conformance	Upon review of the State Forest Environmental Reviews (SFER) for

Major ☐	**Minor** ☒	2008, 2009 and 2010, the audit team has found the assessment for impacts to plant and wildlife habitat impacts to non-listed species and groundwater to be lacking. Impact assessments of current leases are included in the environmental review documents for individual leases (e.g., see ~~F~~FY 2009-10 Oil and Gas lease Sale Environmental Review,). For non-listed species these documents include a short paragraph describing measures that will be used to protect and manage non-listed species (e.g., see ~~F~~FY 2009-10 Oil and Gas lease Sale Environmental Review," Section 18, Habitat Diversity and Interspersion). However, the Environmental Review does not include a short-term or cumulative impact assessment of the lease on non-listed species. In particular the impact of forest loss and fragmentation (approximately 24,000 acres and 3,000 miles of forest edge (http://www.dcnr.state.pa.us/forestry/marcellus/pdfs/ProjectedForestConversion_OilGas.pdf); on species that depend on large, unfragmented blocks of forest is not addressed by the Environmental Review for current leases. Likewise the groundwater section of the Environmental Review also focuses on preventive measures and does not address short-term and cumulative impacts.
Corrective Action Request: BOF shall evaluate potential short-term environmental impacts and their cumulative effects prior to commencement of management activities.		
Timeline for conformance:	Prior to next annual audit	
Evidence to close CAR:	Pending	
CAR Status:	OPEN	
Follow-up Actions (if app.):		

CAR 04/11		**Reference to Standard: Appalachia 6.1.e.** **(FSC US Forest Management Standard 6.3.h.)**
Non-conformance		DCNR's 2008 and later Marcellus gas leasing provides the option for invasive plant species be monitored prior to approval for site development in order to collect baseline data. If invasive plants are identified after site development they must be controlled prior to site disturbance. Leases from 2008 to the present require that the lease holder monitor invasive species for five years following construction, or until invasive species are not observed on site, whichever is longer and new occurrences of invasive plants must be controlled (for example, see FY 2009-10 Gas Lease Sale Environmental Review, Section 20). However, BOF does not have similar invasive plants monitoring for pre-2008 leases and has even less control over lands with severed subsurface rights that do not have a recent negotiated land use agreement. While BOF is planning an expanded monitoring program for gas activities, the details have not been specified and the funding has not been secured.
Major ☐	**Minor** ☒	
Corrective Action Request: BOF shall monitor invasive species establishment throughout the forest with special emphasis on disturbed areas and areas where invasive species are known to exist.		
Timeline for conformance:	Prior to next annual audit	

Evidence to close CAR:	Pending
CAR Status:	OPEN
Follow-up Actions (if app.):	

CAR 05/11		**Reference to Standard: Appalachia 6.3.a.8. (FSC US Forest Management Standard 6.3.g.1., 6.3.g.2.)**
Non-conformance		The BOF ***Silviculture Manual*** specifies a minimum 10-20 square feet per acre of retention in clearcuts and overstory removal (OSR) harvests, and 20-40 square feet where 2-aged management is practiced (primarily buffer zones). The retention may be in clumps or scattered trees within the harvest block. One district visited relied primarily on clump retention, which all canopy layers and ground vegetation intact in roughly 1/10 to 1/4-acre patches. Sites at other two districts audited were characterized by scattered retention, often uniformly spaced, with no midstory or understory structure retained. The ***Silviculture Manual*** makes no reference to retention of live trees and native vegetation and opening sizes in a manner that is consistent with the characteristic natural disturbance regime in each community type (as required by indicator 6.3.a.8). Opening sizes and retention appeared to be characteristic of catastrophic disturbances, not characteristic disturbances. Interviews with field foresters indicated that the guideline in the manual and other guidance on production forestry (e.g. Silvah model outputs), not natural community disturbance patterns, guided their decisions on retention and opening sizes.
Major ☐	**Minor** ☒	
Corrective Action Request: BOF shall ensure that when even-aged or two-aged management (e.g., seed tree, regular or irregular shelterwood), or deferment cutting is employed, live trees and native vegetation are retained and opening sizes are created within the harvest unit in a proportion and configuration that is consistent with the characteristic natural disturbance regime in each community type (see Glossary), unless retention at a lower level is necessary for restoration or rehabilitation purposes. Harvest openings with no retention are limited to 10 acres.		
Timeline for conformance:		Prior to next annual audit
Evidence to close CAR:		Pending
CAR Status:		OPEN
Follow-up Actions (if app.):		

CAR 06/11		**Reference to Standard: Appalachia 8.5.a. (FSC US Forest Management Standard 8.5.a.)**
Non-conformance		Monitoring data from oil and gas development impacts to the surrounding forest has been collected by the BOF for decades, with increased monitoring efforts over the last few years associated with the expansion of gas leasing. Some monitoring information is available on the website; however, the BOF has not fully reported nor summarized for the public all of these oil and gas data.
Major ☐	**Minor** ☒	
Corrective Action Request: BOF shall develop and maintain either full monitoring results or an up-to-date summary of the most recent monitoring information on oil and gas development, covering the Indicators listed in Criterion 8.2 that will be available to the public, free or at a nominal price, upon request.		

Timeline for conformance:	Prior to next annual audit
Evidence to close CAR:	Pending
CAR Status:	OPEN
Follow-up Actions (if app.):	

CAR 07/11		**Reference to Standard: Appalachia 9.1.a. (FSC US Forest Management Standard 9.1.a., 9.1.b., 9.1.c.)**
Non-conformance		As reported in the 2010 audit report, during 2008-2009, BOF conducted the required analysis for all State Forest Lands and documented the findings. Documentation reviewed by the audit team, at that time, included: • ~~-~~High Conservation Value Identification, Management, and Monitoring Processes within the State Forest System: A Corrective Action Request Response" (HCVF EMS1.doc), which is the primary response to CAR 08/08. • HCV Maps.pdf • Screen shot of HCV4 assessment tool The 2010 audit determined that: ~~-~~The HCVF EMS1.doc analysis addresses each of the six High Conservation Values (HCV) potentially present and found that all are present on the forest. The assessment process included appropriate data sources and range of stakeholders." At that point, BOF designated the entire forest as HCVF. The auditors determined that PADCNR had taken an aggressive approach to designating HCVF and placed more acres in HCVF than was appropriate given the requirements in the standard and under new guidance (the FSC-US HCVF Assessment Framework). At the time of this designation, the HCVF Assessment Framework was in draft form and clear guidance on interpreting and implementing the HCVF concept was just emerging. The 2010 audit also identified a new potential nonconformance with Criterion 6.10 and HCVF. Under Criterion 6.10, conversion of HCVF is not allowed. Since, BOF had, in error, designated the entire forest as HCVF. CAR 04/10 was issued; however, since some lands were incorrectly designated as HCVF, conversion of actual HCVF was not occurring. CAR 04/10 has been closed in this report; for details see above for findings to close CAR 04/10. Prior to this audit, BOF provided the audit team with a corrected High Conservation Value Forest (HCVF) assessment. The corrected assessment includes 220,803 acres designed as HCVF (reduced from 2.14 million acres indicated in the 2010 report). The new HCVF designation includes all Wild Areas and Natural Areas (WNAs). The BOF has determined that the designation of WNAs correlates closely with the HCVF definitions and is consistent with their 2009 HCVF assessment. Due to their conservation value, WNAs have been designated as HCV1 (Significant concentrations of biodiversity) HCV2 (Significant large landscape level forests), and HCV3 (Rare, threatened or endangered
Major ☒	**Minor** ☐	

		ecosystems). While currently, all WNAs are designated as HCVF, there are small portions where sub-surface rights had previously been severed or leased to others. There is no conversion allowed on HCVF. Since the potential for conversion is largely outside of the control of BOF, if the sub-surface right holder decides to exercise their rights which would result in a conversion of acreage in a WNA to non-forest use, BOF would have to excise the area before it is converted (as per the FSC excision policy (20-003)) in order to remain in conformance with the FSC standard. (Note: Only the specific areas that are directly converted need to be excised.) The corrected HCVF assessment has not been formally vetted with stakeholder or otherwise formalized to reflect the recent changes. Therefore, a new CAR has been issued for BOF to formally revise their HCVF assessment. BOF must correct the HCVF assessment and ensure the HCVF designation is consistent with FSC standards and polices. Since there was a previous nonconformance with the Indicator, FSC procedures require that this be issued as a major CAR. Due to the complexity of the issue, the size of the FMU and that PA DCNR BOF manages public land, in order for BOF to complete a thorough revision to their HCVF assessment (utilizing their full, detailed planning process), BOF has six (6) months to address this CAR. Additionally, because BOF has already completed an HCVF assessment and HCVF areas are currently designated and protected, this extended time frame is appropriate.
Corrective Action Request: BOF shall revise their HCVF assessment in conformance with Indicator 9.1.a.		
Timeline for conformance:		Six (6) months from finalization of this report, September 30, 2011
Evidence to close CAR:		Pending
CAR Status:		OPEN
Follow-up Actions (if app.):		

CAR 08/11	**Reference to Standard: Appalachia 9.2.a.** **(FSC US Forest Management Standard 9.2.a, 9.2.b.)**
Non-conformance	The 2008 assessment found that BOF had conducted adequate

Major ☐	**Minor** ☒	stakeholder consultations for the areas included as HCVF at that time. Additionally, the 2010 audit found that the assessment process and consultation addressed all six HCV elements, designated and mapped areas with the identified HCVs, and met the requirements of Criteria 9.1 and 9.2. The areas that are currently included as HCVF (Wild Areas and Natural Areas) have been subject to extensive stakeholder consultation and review. However, BOF has recently corrected the HCVF assessment. BOF did not consult with stakeholders and scientist to confirm that the revised areas with HCVF attributes and resulting HCVF were properly identified, nor was there a public review process to review the changes in the HCVF assessment.

Corrective Action Request: BOF shall

a) consult with outside stakeholders and scientists to confirm that HCVF locations and their attributes have been accurately identified;

b) conduct a transparent and accessible public review of proposed HCVF attributes and HCVF areas; and

c) integrate information from stakeholder consultations and other public review into HCVF descriptions and delineations.

Timeline for conformance:	Prior to next annual audit
Evidence to close CAR:	Pending
CAR Status:	OPEN
Follow-up Actions (if app.):	

2.6. Audit observations

Observations are very minor problems or the early stages of a problem which does not of itself constitute a non-conformance, but which the auditor considers may lead to a future non-conformance if not addressed by the client. An observation may be a warning signal on a particular issue that, if not addressed, could turn into a CAR in the future (or a pre-condition or condition during a 5 year re-assessment).

OBS 01/11	**Reference Standard & Requirement: Appalachia 4.4.b.** **(FSC-US Forest Management Standard 4.4.b.)**
Through stakeholder contacts and auditor analysis of stakeholder lists provided by the Bureau of Forestry, it was determined that opportunities for public input was limited in some cases as certain individuals and groups were not made aware of program activities where public inputs were to be requested by the Bureau of Forestry.	
Observation: BOF should ensure the people and groups affected by management operations have opportunities to provide input into management planning.	

OBS 02/11	**Reference Standard & Requirement: Appalachia 5.1.a.** **(FSC-US Forest Management Standard 5.1.a.)**

The districts were observed to be well staffed in support of timber management, though some concern was raised with regard to reductions in maintenance personnel and how it is affecting/will affect non-timber forest values and services, particularly in the area of road maintenance and recreation access. Shortfalls in maintenance personnel could expand to affect other forest and natural resources management work if budgets continue to be cut, revenues shrink, and gas management activities expand. Monetary support for the BOF comes primarily from appropriated State funds, timber receipts, and gas and oil leases. Lower stumpage prices (particularly for cherry) and shifts in how gas lease dollars are used in the State budget have produced growing concerns within and outside the agency about future funding and staffing.
Observation: BOF should ensure they have the resources to support long-term forest management.

OBS 03/11	**Reference Standard & Requirement: Appalachia 6.3.b.2. (FSC-US Forest Management Standard 6.3.b.)**
The BOF protects, maintains and enhances a wide variety of habitats for native species, but some ecologically important within-stand elements are not currently being fully conserved, e.g., late-successional forest remnants and monolithic rock complexes.	
Observation: BOF should ensure that a diversity of habitats for native species is protected, maintained, and/or enhanced.	

OBS 04/11	**Reference Standard & Requirement: Appalachia 6.7.a. (FSC-US Forest Management Standard 6.7.a.)**
Recent implementation of spill policy and management systems should be followed up in future audits to be sure the system is working. During the audit, one logging contractor was observed to not have a spill kit on site, and on the same job, it was observed that log loading equipment had recently and regularly leaked oil along the roadside.	
Observation: BOF should ensure that employees and contractors have the equipment and training necessary to respond to hazardous spills.	

OBS 05/11	**Reference Standard & Requirement: Appalachia 6.10.a (FSC US Forest Management Standard 6.10.a)**
While the audit team is confident that the total amount of conversion is well below the FSC-US definition of ~~-v~~ery limited amount," the following areas of concern were noted in the conversion estimates supplied by BOF: 1. Marcellus conversion estimates reported by BOF are based on average well pad size. 2. In reviewing the data, it was not clear how accurately conversion due to roads and pipelines was accounted for in the conversion estimates, which were based on an average figure per well pad. BOF reports that conversion from older leases and other sources of conversion are minimal, but does not have accurate records.	
Observation: BOF should accurately verify that forest conversion from all sources entails a very limited portion of the forest management unit.	

OBS 06/11	**Reference Standard & Requirement: Appalachia 6.10; FSC-POL-20-003 (excision policy) (FSC US Forest Management Standard 6.10.f)**

Gas and oil development is occurring on forestland where the Commonwealth of Pennsylvania owns the subsurface rights (the areas leased as mentioned above) and also on forestland where the Commonwealth does not own the subsurface rights. For the areas subject to the leases (where the subsurface rights are owned by the Commonwealth), PA DCNR has substantial control over activities to ensure conformance with the FSC standards and requirements. For lands where the Commonwealth does not own the subsurface rights, it is not clear, in all situations, whether PA DCNR has enough control over activities to ensure conformance with FSC standards and requirements. PA DCNR needs to evaluate the certified landbase and determine in which situations they maintain enough control to ensure conformance with the FSC standards. For ~~-s~~evered lands" where they cannot ensure conformance, these lands will need to be excised. (Note: The entire leased area does not need to be excised. Only the areas that are directly impacted by oil and gas activities (i.e. converted to non-forest use) need to be excised.) PA DCNR needs to provide SmartWood with the protocol used in making this determination and the results of this evaluation.
Observation: For all conversion to non-forest uses, BOF should ensure conformance with Criterion 6.10 and all other FSC Principles and Criteria and requirements or decide to remove the area as per the FSC Excision Policy (FSC-POL-20-003), if permitted.

OBS 07/11	**Reference Standard & Requirement: Appalachia 7.1 (FSC-US Forest Management Standard 7.1)**
While the Bureau of Forestry has documentation that addresses issues related to oil and gas leasing, sections in the SFRMP are brief and do not reflect the current level of gas leasing activity. Key supplemental documents are relatively new, in draft form, and/or in development and not presently linked to the SFRMP.	
Observation: BOF should ensure management planning documents adequately address the oil and gas issue as it related to the requirements of Criterion 7.1.	

OBS 08/11	**Reference Standard & Requirement: Appalachia 8.1.a. (FSC-US Forest Management Standard 8.1.a.)**
Rapid expansion in gas development and new monitoring programs will produce monitoring reports in subsequent years, the BOF does not have monitoring reports to date on oil and gas activities. While the audit team did review data on current oil and gas program management and field inspection forms, full reports on the spectrum of oil and gas monitoring are not currently available.	
Observation: BOF should ensure there is a consistently implemented, written monitoring protocol for oil and gas activities.	

OBS 09/11	**Reference Standard & Requirement: Appalachia 8.2.d.1 (FSC US Forest Management Standard 8.2.d.1)**

Once an oil and gas project is under construction and BOF relies in part on DEP for site-specific monitoring of direct impacts from drilling operations (e.g., road sediment, spills, leaks, etc.). DEP monitoring personnel report being understaffed and they do not have the time to visit all phases of each operation, and cannot respond to all spills. Because DEP does not have the resource to visit all sites frequently, DEP relies on self-reporting from the gas companies. Thus, there are potential gaps in the monitoring of gas drilling and associated road and pipeline construction.
Observation: BOF should ensure that monitoring of the environmental impacts of site disturbing activities is suitable to the scale and intensity of the operation.

OBS 10/11	**Reference Standard & Requirement: Appalachia 8.5.a (FSC-US Forest Management Standard 8.5.a)**
As observed in the 2008 assessment: BOF's Executive Summary contains the Montreal Process's monitoring indicators as a summary of monitoring used on state forest lands. In addition, BOF's website includes the SFRMP District Forest Plans, 2007 update documents, and numerous links to annual reports of various monitoring programs. However, there is not a single annual report that compiles all of the various monitoring results. These findings led to an observation which is modified here to emphasize the need for a summary.	
Observation: BOF should consider developing an annual report that summarizes and compiles the results of the various monitoring protocols used in BOF's management, including those listed in Criterion 8.2.	

3. AUDIT PROCESS

3.1. Auditors and qualifications:

Auditor Name	Robert R. Bryan, M.S.	Auditor role	Team Leader, Ecologist
Qualifications:	M.S. Forestry, University of Vermont (1984); B.S. Botany and Environmental Studies, University of Vermont (1976). Currently president of Forest Synthesis LLC. Previously employed as Forest and Wetlands Habitat Ecologist/Forester, Maine Audubon (1995 - 2008) Licensed Maine Forester #907. Member SAF and Forest Guild. Certification Experience: FSC auditor since 2003. Lead auditor (SmartWood), including over 45 FSC Forest Management certification audits and assessments in the Northeast, Lake States, and Appalachia, and Southeast US including family forests, investment and industrial forests, managed conservation forests, and public lands. Member of FSC Northeast Standards Committee 1997-2003 and FSC-US national standards advisory committee (2007-2008), peer review of SFI industrial forest certification in Northern Maine, member of state-level forest certification policy committees.		
Auditor Name	Stephen C. Grado, Ph.D.	Auditor role	Social Assessor
Qualifications:	Steve is a Society of American Foresters (SAF) Certified Forester/Forest Certification Auditor #1155 and Fellow, a Professor of Forestry, and the George L. Switzer Professor in the Department of Forestry at Mississippi State University. He received a Ph.D. in Forest Resources in 1992, a M.S. in Forest Resources		

	and Operations Research in 1984, and a B.S. in Forest Science in 1979 at The Pennsylvania State University, State College, Pennsylvania. He also has a B.A. in Political Science from Villanova University near Philadelphia, Pennsylvania. Dr. Grado has served as a socio-economic assessor/auditor on 44 SmartWood pre-assessments (1, lead; 3, team), assessments (5 lead, 21 team), USDA Forest Service Test Evaluations (2 team, 1 with SGS), and numerous annual field audits (8 lead, 4 team; 1 with SFI). In addition, he has served as an assessor/auditor for innumerable SmartWood chain-of-custody assessments/audits, and also served as a peer reviewer of FSC certification assessment reports.		
Auditor Name	Christopher A. Nowak, Ph.D.	Auditor role	Forester
Qualifications:	Professor. Ph.D., M.S., and B.S. in Forest Resources Management from SUNY College of Environmental Science and Forestry-Syracuse; A.A.S. in Forest Technology from SUNY College of Environmental Science and Forestry-Wanakena. Experience: Professor of Forest and Natural Resources Management at SUNY College of Environmental Science and Forestry (12 years, current); 5½ years as a Research Forester at U.S. Forest Service's Forestry Sciences Laboratory, Irvine, PA; 6 years as a Research Scientist with Research Foundation of SUNY, Syracuse, NY; 2 years as a land surveyor in western NY. FSC certification experience since 1997, with work on 49 FSC Forest Management assessments or audits across the eastern hardwood region. Team leader for 38 assessments and audits covering over 4,000,000 acres from Wisconsin to Maine to Pennsylvania. Periodic assessment training with SmartWood, including a Lead Auditor Workshop in Minnesota, June 2009.		

3.2. Audit schedule

Date	Location /Main sites	Principal Activities
August 3, 2010	BOF Harrisburg, Pennsylvania office	Opening meeting (morning/early afternoon): introductions; review agenda; review work addressing outstanding CARs; presentation and discussion of Marcellus shale development on State forests.
August 3, 2010	BOF Harrisburg, Pennsylvania office	Stakeholder consultations (afternoon; one auditor)
August 3, 2010	District 7	Review BOF field performance (afternoon; one auditor).
August 4, 2010	BOF Harrisburg, Pennsylvania office	Stakeholder consultations (morning; one auditor)
August 4, 2010	District 16	Review BOF field performance (two auditors in morning/early afternoon, three auditors in late-afternoon).
August 5, 2010	BOF Williamsport, Pennsylvania office	Stakeholder consultations (one auditor, all day)
August 5, 2010	District 15	Review BOF field performance (two auditors)
August 6, 2010	District 10	Review BOF field performance (three auditors; early to late morning).
August 6, 2010	BOF Harrisburg, Pennsylvania office	Closing meeting in early- to mid-afternoon to discuss gas development and HCVF, other audit findings, information needs, and next steps with FME staff.

Total number of person days used for the audit:**18**
= number of auditors participating (**3 auditors) X** number of days spent in preparation, on site and post site visit follow-up including stakeholder consultation (**6 days/auditor).**

3.3. Sampling methodology:

SmartWood has a goal of sampling at least three SFL districts each year. For the current audit, four Districts were sampled. Because Marcellus gas drilling was a major focus of the audit, three Districts were chosen where Marcellus operations were active on State Forest Land (SFL) leases (Districts 10, 15, and 16). District 15 also provided an opportunity to evaluate regeneration methods for black cherry, which was a mentioned as a concern by a stakeholder (see Stakeholder Comments, Section 2.3). District 7 was sampled to evaluate concerns regarding a reduction in antlerless deer (DMAP) permits (see Stakeholder Comments, Section 2.3 for a discussion of this issue).

Twenty-one sites were visited during the audit.

Within each District the sampling process included a range of forest types and harvest methods. Proximity to sensitive sites (e.g. streams, vernal pools, wetlands) was also a priority in selecting sites. Active harvests were selected to evaluate current impacts to soils, water, and exiting vegetation, while closed harvests were sampled to observe longer-term impacts on resources and the amount of forest regeneration.

Activities of four oil and gas leaseholders and a variety of practices were sampled on five sites. Drilling pad construction, ongoing drilling, setup for ~~fr~~ac'ing" wells, freshwater storage ponds, gas pipeline corridors, new road construction, enlargement of existing roads, and associated best management practices were observed.

3.4. Stakeholder consultation process

The purpose of the stakeholder consultation strategy for the FME audit was threefold. It was to:

1) ensure that the public was aware of, and informed about, the audit process and its objectives;
2) assist the field audit team in identifying potential issues; and,
3) provide diverse opportunities for the public to discuss and act upon the findings of the audit.

This process is not just stakeholder notification, but wherever possible, detailed and meaningful stakeholder interaction. The process of stakeholder interaction does not stop after the field visits, or for that matter, after even a certification decision is made. SmartWood welcomes, at any time, comments on certified operations and such comments often provide a basis for field audits.

Prior to the actual audit process, SmartWood developed a public consultation stakeholder announcement. SmartWood and the FME provided the lists of stakeholders. On June 30, 2010 SmartWood sent out the initial 30-day notification via e-mail alerting stakeholders (n=1,257) to the impending FME audit to take place from August 3-6, 2010. The public announcement was sent to 216 stakeholders from SmartWood's ~~S~~takeholder Lists for all USA Forest Management Operations" and to 1,041 from its ~~F~~SC Certified Client List" (i.e., FM and CoC). In addition, SmartWood sent the announcement to the FME's stakeholder lists on June 30, 2010. The FME received the public announcement on June 30, 2010 and notified their employees.

The FME's stakeholder lists also provided a basis for the audit team to select people for interviews (i.e., in person, by telephone, through e-mail). Prior to the field visit, stakeholders were contacted by the auditors to solicit their opinions and detect any issues of importance. Interviews were held with local, regional, state, and federal stakeholders. In addition to stakeholder outreach prior to the field visit, FME personnel and other stakeholder were interviewed at BOF offices in Harrisburg and Williamsport, Pennsylvania, and in the field during the week of the visit. Some stakeholders were contacted during the field visit for interviews and contacted by telephone and e-mails up to four weeks after the audit team left Pennsylvania. Public meetings were not held, although ads were placed in local newspapers by the FME to make contact with the audit team while in Pennsylvania, or afterward.

During the audit, the Social Assessor remained in the BOF's Harrisburg, Pennsylvania offices to speak to any stakeholders, including employees. This was accomplished on Tuesday afternoon, August 3, 2010, and Wednesday morning, August 4, 2010. The Social Assessor also visited BOF's Williamsport, Pennsylvania office to accomplish a similar task on Thursday, August 5, 2010. An ad to this effect was posted in a local Williamsport paper to notify the public of this activity. During both office visits the Social Assessor also used any downtime to make telephone calls to those listed on BOF's stakeholder lists.

Stakeholder type[a]	Stakeholders notified (#)	Stakeholders consulted or providing input (#)
Academia	18	5
Advocacy Groups	13	0
County Agency	21	0
ENGOs	128	5
Federal Agencies	14	1
Forest Industry	590	2
Foresters	3	2
Forestry Consultants	4	0
General Contractors	6	0
Hunt Clubs	2	0
Local Government	6	0
Logging Contractors	3	3
Medical Industry	4	0
Oil and Gas Concerns	146	5
Other	1	0
Other Forestry Contractors	19	0
Other PA DCNR Staff	14	2
PA DCNR BOF Staff	81	52
Politicians	3	0
Private Business	15	0
Private Citizens	4	2
Recreation Business	7	2
Recreation Organizations	30	0
State Agencies	33	3
Tribal Concerns	36	0
Water Authorities, Commissions	2	1

[a]Many members of these stakeholders groups belonged to the FME's Advisory Committees.

3.5. Changes to Certification Standards

Forest stewardship	Appalachia (USA) Regional Forest Stewardship Standard, Version 4.2

standard used in audit:	
Revisions to the standard since the last audit:	☒ No changes to standard. ☐ Standard was changed (detail changes below)
Changes in standard:	
Implications for FME:	Not applicable - no new requirements

APPENDIX I: List of visited sites (confidential)

FMU or other Location	Compartment/ Area	Site description / Audit Focus and Rationale for selection
August 3, 2010		
District 7	Sale 07-2004BC04	~~"S~~and Mountain Salvage". 128-acre harvest area containing overstory removal with reserves, two-age, shelterwood and light partial cut (improvement cut referred to as a ~~"s~~election" cut). Visited Block 5 (fenced and unfenced overstory removal with reserves) and Block 8 (selection cut). Even-aged, mixed oak forest type about 75 years old. Harvested 2006 using conventional chainsaw and choker skidder from late summer to winter. Audit focus: DMAP changes and impacts, fencing and development of regeneration, riparian zone management, silvicultural interventions, reserve trees (uniform or clumped dispersal), hunting camp lease, multipurpose recreation trail.
August 4, 2010		
District 16	Marcellus shale gas well pad 815-State	In-progress, 8-acre well pad for natural gas leased and operated by Ultra Resources. Wells were in process of getting prepared for impending frac'ing. Audit focus: off pad impact to forest including main and secondary upgraded access roads (including culverts), pipeline and waterline rights-of-way, pad drainage controls (e.g., berms, back drain, settling ponds), and a hunting camp that had been moved due to truck traffic on the main forest road.
District 16	Sale 16-2005BC15	~~"C~~edar Mountain High". 123-acre harvest area. Visited Blocks 3, 4 and 5 (42-acre fenced and prescribe burned overstory removal, with burn/fencing in 2009 and recently completed timber harvest). Steep, even-aged, mixed oak forest type about 75 years old. Harvested using conventional chainsaw and choker skidder. Audit focus: main skid trail, new haul road, older haul road with recent water drainage problems including a plugged culvert, landing, large amount of cut pole timber left on the ground across the stands.
District 16	Sale 16-2007BC08	~~"O~~'Connor East". 86-acre harvest area. Visited Blocks 1 and 2 (86-acre shelterwood cut in 2009 and herbicide treated for interfering understory plants in 2006). Even-aged northern hardwoods about 80-years old with a small (5-acre) area of multi-aged, late-successional forest with 150+ year old hemlock, beech, maple and birch. Harvested using conventional chainsaw and choker skidder. Audit focus: regeneration, late successional forest management and large hemlocks as reserves, skid trail-haul road, roadside landing.
District 16	Sale 16-2007BC01	~~"O~~ld Chemwood Removal". 173-acre harvest area. Visited Blocks 3 (41-acre overstory removal in the process of being cut) and 6 and 7 (98 acre shelterwood, cut 2010 and herbicide treated to control interfering understory plants in 2007). Even-aged northern hardwoods/Allegheny hardwoods about 80 years old. Harvested using conventional chainsaw and choker skidder (one person operation). Audit focus: regeneration, forested wetland inclusion, coal mining

		impacts, skid trail and landing, use of a gas industry monitoring well pad for parking recently developed as part of the Marcellus play development.
District 16	Sale 16-2006BC05	~~G~~eneral Orders Removal". 86-acre harvest area. Visited Block 3 (39-acre overstory removal, marked and pending cut). Herbicide treated and fenced to control interfering plants and shelterwood cut in 2002. Even-aged northern hardwoods/Allegheny hardwoods about 90-years. Audit focus: advance regeneration, marking, fence management, electric transmission line right-of-way, coal mining reclamation, field debriefing of day's audit for District 16.
District 16	Marcellus shale gas well pad Tract 595	In-progress, ~10-acre well pad for natural gas leased and operated by Seneca Resources. Wells were getting frac'ed. Audit focus: off pad impact to forest including pipeline and waterline rights-of-way, pad drainage controls, waste management, water storage, and noise.
August 5, 2010		
District 15	Study 4100-NE-4152-187, Billy Lewis Road – North	Research site used for the past few years, in partnership with the U.S. Forest Service's Forestry Science Laboratory, Irvine, PA. Study of site preparation herbicide effects on understory plant dynamics. Audit focus: research investment; deer fencing; herbicides and site preparation in Allegheny Hardwoods, with specific effort to control striped maple.
District 15	Sale 15-2003BC07	~~B~~illy Lewis II". 254-acre harvest area. Visited Blocks 2 and 7 (96-acre overstory removal, cut in 2005/2006) and Block 6 (45-acre salvage single-tree selection). Herbicide treated to control interfering plants and shelterwood cut in 1997. Even-aged Allegheny hardwoods about 110 years old. Audit focus: regeneration; riparian zone management; road buffer management; and cultural resource protection (110-yr-old narrow-gage railroad grade/bed).
District 15	Sales 15-2005BC21 and 15-2008BC09	~~R~~ockin Ridge" and ~~R~~ocked Ridge". Visited Blocks 4 and 5 in both sale areas, which was a recently completed overstory removal in the first sale area, and a marked overstory removal (129 acres) in the second area. Audit focus: reserve trees; old eastern hemlock (250 to 300 years old, a few isolated individuals); regeneration; ~~ro~~yering" (mowing) as a means to control interfering plants; sugar maple and beech decline; conservation of monolithic rocks (salamander habitat) and other ecologically special within stand features.
District 15	Sale 15-2009BC18	~~B~~eech Bash". Planned biomass cut to remove sapling- to pole-sized beech and birch in preparation for regenerating a stand that has had significant mortality associated with sugar maple decline and beech bark disease. Visited Block 1, a 42-acre shelterwood. Audit focus: whole-tree harvesting; sugar maple decline and beech bark disease; ferns as interfering plants.
District 15	Horton Run Gas Well	In-progress, 5-acre well pad for natural gas currently being frac'ed. Audit focus: planning and monitoring; off pad impact to forest including main and secondary upgraded access roads (including culverts); pipeline and waterline rights-of-way; and a set of lease camps near the well pad.
District 15	Sale 15-2007BC23	~~T~~oto". 120-acre harvest area. Visited Blocks 5 and 6 (103-acre shelterwood in 9-yr-old Allegheny hardwoods in the process of being cut). Herbicide treated in 1997 to control interfering plants. Audit focus: residual stand; logger

		interview; oil spills and spill kits; erosion and sediment plans.
District 15	Sale 15-2005BC09	–Three Bears". 177-acre harvest area. Visited Blocks 8 (overstory removal) and 9 (uncut strip to be cut as part of overall 81 acre overstory removal) in 100-yr-old Allegheny hardwoods. Herbicide treated in 2003 to control interfering plants. Audit focus: regeneration; wooded wetland inclusion; reserve trees, regenerating black cherry and red maple; in-field debriefing and wrap-up for District 15.
August 6, 2010		
District 10	Sale10-2009BC05	–The Manhattan Project", ongoing 128 acre salvage clearcut with reserves in oak-hickory (Block 1). Audit focus: logger interview; new haul roads and landings; borrow pit; gas well pad development – in construction; oak mortality and gypsy moth.
District 10	Sale 10-2009BC10	–Dishpan Mortality", recently completed salvage clearcut with reserves in oak-hickory (Blocks 1 and 6). Audit focus: oak and pitch pine regeneration; bracken fern interference; shelterwood vs. clearcut; 1980s gas development (well and pipeline); new, in construction gas compressor station on drive out from job.
District 10	Lease 252, Pad A	Gas lease well pad, drilling completed and in setup stage for frac'ing. This site is subject to an older (pre 2008) lease that gives BOF less control over the operation than current leases. Audit focus: discussed process BOF uses to approve the location of well pads, pipelines and road work with a goal of minimizing environmental impact and disturbance during times of peak recreational activity; relationship with other agencies in terms of permitting and monitoring was also discussed.
District 10	Lease 653, Pad D	New gas well pad under construction adjacent to older, capped shallow gas well pad. Audit focus: reviewed BMPs on significant upgrade to an old gas pad access road, which brought the road up to log-hauling class without cost to the BOF.
District 10	Eagleton Demonstration Forest Trail	Interpretive trail through the forest with 14 designated stops. Americans with Disability Act conformance on the Trail. BOF personnel sprayed for Japanese stilt grass around the parking lot and entry. State-of-Art trail, with berms and drainage ditches seeded with native species. Turnouts for water flow place at appropriate points along the Trail.
District 10	Mordor Harvest Site	Droughty soils. Greater than 50% gypsy moth mortality. A 2010 winter salvage cut of 120 acres still ongoing. All live trees left. A lot of red maple regeneration. Skid road work not completed until finished with remaining 40 acre cut. Skid trail and landing to be limed, fertilized, mulched, and seeded. Main O&G road makes this operation financially feasible.
District 10	Mordor Harvest Site and the Eagleton Mine Camp Trial,	Trail covers 25 miles across the timber sale. All live trees to stay, marked in blue. Distinct red paint used for Trail. Viewshed along Trail was managed to create a diverse experience for recreationist. Trail was partly closed, and then opened as harvest areas were completed. Field audit concluded with a wrap-up for District 10 field findings.

APPENDIX III: Forest management standard conformance (confidential)

The table below demonstrates conformance or non-conformance with the Forest Stewardship Standard used for evaluation as required by FSC. The SmartWood Task Manager should provide guidance on which sections of the standard should be evaluated in a particular audit. SmartWood may evaluate only a subset of the criteria or principles of the standard in any one particular audit provided that the FME is evaluated against the entire standard by the end of the certificate duration. Findings of conformance or non conformance at the criterion level will be documented in the following table with a reference to an applicable CAR or OBS. The nonconformance and CAR is also summarized in a CAR table in Section 2.4. All non-conformances identified are described on the level on criterion though reference to the specific indicator shall be noted. Criteria not evaluated are identified with a NE.

Note: A major focus of the audit was related to the Marcellus Gas Leasing Program (as explained in Section 2.1). Therefore, the auditors focused on evaluating aspects of the FSC Standard that SmartWood determined to have the highest risk of impacts as a result of oil and gas development. For the Criterion selected based on likely intersection with oil and gas activity, there are findings for regular forest management activities and findings specific to the Marcellus Gas Program. While in this situation, the auditors focused on the Marcellus Gas Program, a similar process could be completed for any forest conversion or non-forest use.

P & C	Conformance: Yes/No/ NE	Findings	CAR OBS (#)
Principle 1: COMPLIANCE WITH LAWS AND FSC PRINCIPLES			
1.1	No, 1.1.a. only	For the most part, forest management plans and operations comply with federal, state, county, municipal, and tribal laws, case law, and regulations. No formal citations for non-compliance with laws or regulations were uncovered during the audit. However, Pennsylvania's Erosion and Sediment Control regulations (Chapter 102 of the Clean Stream Law) require that Erosion and Sediment (E&S) Plans be available for review and inspection by the DEP or the County Conservation District at the project site during all stages of the earth disturbance activity, yet E&S Plans were not observed to be on site for all active logging jobs **(CAR 01/11)**. As viewed through field visits, the FME's forestry operations meet or exceed both state forest practice laws and regulations and Best Management Practices (BMPs) for forestry and other protective measures for water quality that exist within the state in which operations occur. Roads were in excellent shape, Streamside Management Zones (SMZs) were properly installed and usually wider than necessary to meet state BMPs, and streams and other water areas were adequately protected to maintain or improve water quality. As a state agency, the FME is compelled to share public information, provide open records, and conduct public participation as required by law. The FME's Web site provides a key resource for getting information out to the public and for garnering inputs. In addition, the FME still produces numerous pamphlets and other documents to advise the public of attractions and activities on the forest. Public	**CAR 01/11**

		participation is solicited for all planning processes on the forest and decisions about changes in use of the forest. Examples include the public meetings held to review the last FMP and for the DMAP program. No evidence was uncovered to lead the auditors to think they were doing otherwise in regard to public outreach. Stakeholder interviews further confirmed this view See also Criteria addressed under 4.4. **Gas Lease Arena** All plans and guidelines reviewed directed the FME to fulfill its legal obligations. For example, environmental safeguards are addressed in the *O&G Guidelines* and in actual leases. E&S Plans were observed to be kept on site for the gas development areas, commonly in a temporary mail box set at the corner of access roads. The FME provided the auditors with all documented inspections and violations related to their O&G operations. Violations that have occurred have been addressed (see 6.5 for details). The FME applies state water quality BMPs applicable to the gas operations and modifies practices to control impacts when BMPs are not producing the desired results (see 6.5 for additional details). . Procedures for sharing public information, providing open records, and conducting public participation as required by law are no different for oil and gas issues, than they are for forest management. See also Criteria addressed under 4.4.	
1.2	NE		
1.3	NE		
1.4	NE		
1.5	NE		
1.6	NE		
Principle 2. TENURE AND USE RIGHTS AND RESPONSIBILITIES			
2.1	NE		
2.2	NE		
2.3	NE		
Principle 3. INDIGENOUS PEOPLES' RIGHTS			
3.1	NE		
3.2	NE		
3.3	NE		
3.4	NE		
Principle 4. COMMUNITY RELATIONS AND WORKERS' RIGHTS			
4.1	Yes, 4.1.c only	The BOF is directed to follow all local, state, and federal laws and regulations in regard to field work on all lands not excised from the certificate scope. **Gas Lease Arena** While logging contracts viewed by the auditors have a provision for training this was not included in Right of Way (ROW) agreements. The BOF needs to ensure that the FSC Standard is being met only for activities that occur within the scope of the certificate. The FSC Standard applies only to forest management. Once it has been determined that land is being cleared for utility easements (Rights of Way) or clearing for other non-forest uses (e.g., gas well pads, communication towers, etc.) the land is no longer being managed for	

		forestry and the FSC standard is no longer applicable; only impacts to the surrounding forest land is considered to be applicable. Therefore, ROWs and work on tower installations are not within the scope of certificate, the standard does not apply when forest is being converted to these and other non-forest uses (e.g., gas well pads and pipelines).	
4.2	No, 4.2.a only	The FME's hard hat policy was unknown to most FME staff interviewed during the audit, and it was observed that hard hat use is inconsistent and irregular within and across Districts, particularly with staff from different BOF Divisions and Sections working in the forest (**CAR 02/11**). Many staff hard hats were more than 10 years old (OSHA recommends a life expectancy of 3 to 5 years for plastic hard hats, and liner replacement every year). A logging subcontractor was observed to not wear proper PPE (hard hat) when topping felled trees on an active harvest site. In some cases on BOF State Forest land, some workers are exempt from wearing certain PPE if doing so violates religious beliefs and rules (J. Hecker, BOF, personal communication). BOF has worked with OSHA and State lawyers to develop policy and procedure with regard to these contractors and subcontractors working as timber harvesters on State Forests. The key element of worker exemption with PPE is that each worker must have written support from his religious lead as to the need for not using PPE. The subcontractor who was not wearing a hardhat did not have such a letter on file with the BOF (**CAR 02/11**).	**CAR 02/11**
4.3	NE		
4.4	Yes	The FME is involved in a variety of local and regional planning initiatives. These efforts include working with PA Wilds; working with county planners and municipalities who affect regional zoning and other policies; participation in watershed committees and projects [e.g., , Aquatic Community Classification multi-agency project]; participating in the development of utility (e.g., ROW design and contractual regulations), transportation, and economic development plans; working with state agencies, local governments, funders, and non-profit organizations to strategically work on seven state Conservation Landscape Initiatives; helping private landowners develop plans for managing forest resources on their property (Forest Stewardship Program) and planning and timber harvests; and cooperating and sharing knowledge with various special interest groups (e.g., TNC). In addition, the FME funds research projects through university departments that aid in appropriately facilitating local and regional planning initiatives. Interviews with FME employees, FME documentation, and several stakeholder interviews confirmed that these activities are taking place. The FME's SFRMP makes a clear statement that it encourages ongoing public input on state forest land timber management activities, harvesting levels, harvesting plans, and business processes. Opportunities for the public to provide input into forest management planning were made available by the FME through nine public meetings held throughout the state prior to the SFRMP 2007 Update, Web site entry capabilities (e.g., Contact DCNR, Log Letters, Ask a Forester), and making available addresses to send in written comments. For the SFRMP update there were FME office press releases and the use of list servers to solicit public inputs. In	**OBS 01/11**

		some cases, District Foresters conducted focus groups to gather employee and public comments. In the document –State Forest Resource Management Plan 2007 Update Process Summary of Public Comments" the public comments were summarized and the FME described how these comments were to be addressed and incorporated into forest management planning. The FME's Web site includes an extensive range of information, and is an excellent public resource. The SFRMP is on the Web site as well as links to other affiliated program and activities. FSC certification public summary audit reports are available on their Web site (http://www.dcnr.state.pa.us/forestry/certification.aspx). In addition, there are other methods available to people to provide ongoing input, including the FME's Web site listings for the Central Office Directory (http://www.dcnr.state.pa.us/ forestry/central_contact.aspx) and the District Office Directory (http://www.dcnr.state.pa.us/forestry/dcontacts.aspx). There is also a PA DCNR newsletter published and available to the public (http://www.dcnr.state.pa.us/news/resource/res2010/10-0428-resource.aspx). The FME also provides guidelines on forest and recreation management to the public as well as brochures and public use maps. Examples of these documents were provided to the auditors. The FME's Web site is due to be once again updated. In addition, the FME Resource Planning & Stewardship unit is also developing an e-mail database for all FME stakeholders to more efficiently reach out to these individuals. Individual entries will be categorized by their specific interest areas, whereby e-mail contacts will go only to those that have expressed interest in that area. However, this effort is not completed. There are numerous advisory committees whereby citizens and special interest groups can provide inputs into forest planning and management activities. These groups meet periodically. Meetings can be initiated by the FME, often by the District Foresters, or they can be requested by advisory committee members. The Citizens Natural Resource Advisory Committee (CNRAC), Recreation Advisory Committee (RAC), and Ecosystem Management Committee (EMAC) all have representation from across the Commonwealth, and include people with varied backgrounds. Committee meeting frequency ranges from committee to committee, and some committee meetings (e.g., CNRAC) are open to the public. There are also is an FME wide Communications Committee, and a Strategic Advisory Committee. These internal committees help the FME incorporate and respond to public input. During the current audit, through stakeholder auditor contacts and auditor analysis of stakeholder lists provided by the FME, it was determined that opportunities for public input was limited in some cases as certain individuals and groups were not made aware of programs and activities where public inputs were being requested by the FME **(OBS 01/11).** The FME has procedures in its Silviculture Manual, Chapter 5 addressing adjacent landowner notification of their forest management activities. When a timber sale boundary is also a FME forest boundary, the FME will make a –good faith" effort to notify	

		adjacent landowners of pending timber sales. The FME describes good faith efforts as 1) face-to-face communication, 2) a letter describing the sale and providing contact information, and 3) for unknown landowners, signage along property boundaries defining the timber sale and providing contact information. The FME's planning process typically begins six months in advance of an actual harvest operation and at least a 30 day notification will be provided. Sample notification documents (i.e., letters) for timber harvests were provided to the auditors. These were sent to camp owners and the Mid-State Trail Association about a proposed timber sale near their areas of interest. Other samples included letters and maps to three camp lessees, four adjoining landowners, and a water authority. Additionally, timber sale maps are available on the FME's public Web site. Notifications of forest activities on state forest lands also are provided to municipal watersheds, state parks, camp lessees, trail clubs, and pipelines, and electrical line concerns. Other individuals and concerns are also notified of forest activity. As stated in the SFRMP's Silvicultural/Timber Management section, if federal or state listed fauna or flora species, or habitat critical to their survival, either presently known or subsequently identified, occur within or adjacent to a proposed timber management project area, the FME's wildlife biologists or botanists are notified prior to commencement of additional work. Wildlife biologists or botanists determine what, if any, changes to the project are necessary to protect any floral or faunal species or habitat. Also stated in the SFRMP, if archeological sites, either known or subsequently identified, occur within a proposed timber management project area, the FME's Resource Planning and Information Section will be notified prior to commencement of any additional project work. The Section will coordinate assessment of the site and needed protection measures with the Pennsylvania Heritage and Museum Commission (PHMC). Through an examination of the SFRMP, public comments in the SFRMP, field visits during the audit, and through stakeholder outreach it was determined that the FME is doing a credible job addressing significant concerns related to forest management actions and further incorporating these concerns into its forest management policies and plans. Stakeholders acknowledged that not all concerns can be addressed given budget constraints and competing interests on the land base (e.g., recreation and gas drilling). However, stakeholders commented that FME and its personnel show a genuine interest in trying to address its clientele concerns (e.g., those of recreationists and adjacent landowners). It was also recognized that political influences are also a reality for any public agency. There is evidence in public documents that public input has affected policy decisions (e.g. trail building, approaches to gas development, pursuit of wind development, set aside of wild areas), as well as more localized site-specific decisions. The CNRAC summarized a history of their comments to the FME over time, and reports that there is evidence of their advice being implemented (although not all of the time). The willingness for	

		people to serve multiple terms on advisory committees could be viewed as one indication that they believe their participation has value and the FME is listening to their advice. EMAC members have stated that the FME has taken their advice and used university research to assist in forest management. All advisory groups had some members who were concerned about the reduced frequency of advisory meetings. In July 2009, BOF contacted a representative of the Eastern Delaware Nations, to request their review of the FME's land base for customary use rights and significant sites. As of this audit, the FME had not yet received a response from the Eastern Delaware Nations. A representative had also been invited to participate as a provisional member of the FME's EMAC. In the past, the FME has also sent written invitations, which were reviewed by previous auditors, to the United Eastern Lenape Nation and the Eastern Lenape Nation of Pennsylvania to request their review of the FME's land base for customary use rights and significant sites. To date, the FME had not yet received a response from the Eastern Lenape or any other tribal representatives. Additionally, in August 2009, the FME re-sent its written invitation to all federally-recognized Native American groups identified as having interests in Pennsylvania state forests. This invitation was originally sent in December 2004. In lieu of direct participation from American Indian groups, the FME is able to identify and monitor known sites through communication with, and data provided by, the Pennsylvania Heritage and Museum Commission (PHMC). Database information provided by the PHMC is not shared with any external parties. In the broadest context, the FME has been made aware that most archaeological sites in the state are located in valley bottoms and in close proximity to rivers – areas where the FME generally does not plan harvest activity. On a site-specific level, the FME has access to a database of historic sites. Data is in tabular format and references which compartments have known archaeological sites. If a planned activity falls within a compartment with an archaeological site, maps are then consulted that show the general site location. This search is conducted for every planned activity. No sites of this nature were observed during the audit. **Gas Lease Arena** The FME and O&G concerns are working cooperatively, and following the law, in regard to achieving their goals for use and protection of state forests. These goals are articulated in the SFRMP and various documents related to the O&G issues. O&G representatives interviewed stated that they were committed to following the FME's guidelines and committed to protecting the forest. Also, they were aware of its FSC certification, and the FME's desire to maintain that status. Policy statements and actions by O&G concerns with relevance for local and regional planning more specifically found in the 2010 draft document titled ~~-~~Administering Oil & Gas Activities on State Forest Lands" and in the lease agreement. The former states that O&G ~~-~~Operators will be required to submit Development Plans, or seismic acquisition plans, prior to beginning	

		drilling activity. The Bureau will work with the operator in planning the gas exploration and development in a manner which minimizes impacts to State Forest lands." Specific actions include a number of plans, all of which are required by the lease, and include seismic surveys, pipelines planning, road plans, well pad development plans, an erosion and sedimentation plan, a water sourcing and waste handling plan, a site restoration plan, and the maintenance of MSDS Chemical Hazards Sheets from all chemicals stored and used on state forest lands. DEP permits and plans are also required and operator compliance builds into regional plans for that agency. In general, the FME specifically also asks all operators to present "master plans" to the forest districts for information and planning as to the size and scope of exploration and development plans on state forest lands now and in the near future. Those with an interest in the Marcellus Project and O&G drilling in general can use traditional means employed by the FME and previously discussed above to contact the FME and voice their opinions and provide inputs in forest management. However, the FME also has a targeted approach to addressing these issues as well. The FME developed a 2010 draft document titled ~~"M~~arcellus Shale Communications Strategy" whose main purpose is to maintain current efforts and initiate new ones to inform stakeholders of the Marcellus Project and receive inputs by those affected by O&G activities. These groups are primarily state forest visitors, recreationists, private landowners, and environmentally concerned citizens. The strategy has five goals directed toward (1) explaining why there is O&G activity on state forests, (2) providing information on forest ecosystem impacts and FME mitigation activities, (3) providing information to users of the state forest on how O&G activity will impact them, (4) providing avenues for interested or affected parties to make complaints about O&G activity, and (5) proving private landowners information on protecting and restoring forest resources. To adequately address these goals the FME will use a Web site, brochures, a FAQ document, and FME staff. For example, the Marcellus Project Web site is considered a primarily tool for providing information and soliciting inputs on O&G activities (See ~~"O~~il and Gas on State Forest Lands," http://www.dcnr.state.pa.us/forestry/oil_gas.aspx). In addition, each District Forest has a person dedicated to working with oil and gas development, with an emphasis on being available to receive public comments and monitoring drilling areas. The FME also has four geologists on staff that make presentations on the O&G issue, and there is the intent to hire two more. A member of the EMAC stated that they had requested a presentation by the FME on the O&G issues and that was accomplished within a very short time after the request. Those affected by the Marcellus Project and O&G drilling are apprised of activities via traditional means employed by the FME and those previously discussed above. The FME will inform the public about these sales through various print media. The PA DCNR is required to advertise competitive lease sales in a minimum of three (3) newspapers of general circulation in the area(s) where the sale will occur, once a week, for three (3) consecutive weeks. A copy of a ~~"~~***Bidders Notice for Sealed Bids 2008" was provided to the auditors.*** Typically, leases are very large, sometimes involving,	

		tens of thousands of acres, and notification is done more by public notices in the newspaper than by other means. PA DCNR also typically issues a press release highlighting the sale specifics and who to contact with questions. Press releases are picked up by the Associated Press, Reuters, and other international media outlets and have generally made the evening (television) news. A copy of an oil and gas press release was provided to the auditors. Recent sales have also been discussed at Governor Rendell's daily press conferences and picked up by all media outlets. PA DCNR also advertises lease sales in the weekly ***Oil and Gas Journal*** and ***IHS Drilling Wire*** industry publications. The ~~"O~~il and Gas on State Forest Lands" Web site also informs the public concerning proposed O&G activity (See for example, ~~"O~~il and Gas Leasing Offering", http://www.dcnr.state.pa.us/forestry/gas lease.aspx). This site has offerings by date and provides maps on locations. The Web site also contains a section summarizing public inputs title ~~"S~~ummary of Public Comments on Natural Gas Leasing" (See http://www.dcnr.state.pa.us/forestry/ O&G/Oil_gas_comments_summary.pdf). Beginning in 2008, all materials associated with a PA DCNR competitive lease sales, including the State Forest Environmental Review documents, were posted on the PA DCNR-Bureau of Forestry Web site (i.e., http://www.dcnr.state.pa.us/forestry/marcellus/pdfs/SFER_2008_LeaseSale.pdf). The FME also has modified its procedures in the Silviculture Manual, Chapter V. Section V. to address notification of O&G lessees and adjacent landowners of FME forest management activities. The FME must send a timber sale prospectus to the O&G lessee for all timber sales prepared on the O&G lease. Sample documentation was provided to the auditors on an Assistant District Forester's e-mails on notification and communication with a pipeline company prior to a timber sale. In many cases the District Foresters and O&G operators work together to notify stakeholders on planned activities. For example, in the 2010 draft document titled ~~"A~~dministering Oil & Gas Activities on State Forest Lands" it states that ~~"I~~n the event that gas production from a newly completed well or a well that is being serviced, is required to be vented to the atmosphere and flared for safety reasons, the operator will first notify the District Forester of its plans at least 10 days before the anticipated flaring operation, and will second make provision to notify all stakeholders, as specified by the District Forester, of the planned event and provide for the consideration of special events that may be planned on state forest or state park lands during this time frame. The goal is to eliminate ~~"s~~urprises" to the local community and provide for an uneventful operation." Procedures for notification of the Pennsylvania Fish and Boat Commission, PEMA, local fire departments, local county conservation offices, and possibly the Susquehanna River Basin Commission (SRBC) Inspector are outlined in the document in case there is a suspected pollution event, a road collision involving gas supply trucking, or any other event that may have the potential to release substances into local waterways, vernal pools, wetlands or onto the soil on state forest lands. The ~~"A~~dministering Oil & Gas Activities on State Forest Lands"	

		document EXHIBIT C, STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS contains a section on Historical and Archaeological Sites, with notification procedures for District Foresters. If a planned O&G activity falls within an area with a known archaeological resource, the FME contacts the PHMC, who then provides instruction on what, if any, survey work is needed. As directed by PHMC, the FME has only been required to conduct Phase 1 survey work (i.e., site visit, background research, testing, analysis). Typically, resources may be potentially impacted when there is surface disturbance that extends below the plow level (e.g., O&G activity such as impoundments or drilling, road building). Protection measures are developed based on the survey results. Through an examination of the SFRMP and associated documents related to the O&G issue (e.g., "Administering Oil & Gas Activities on State Forest Lands," "Administering Oil & Gas Activities on State Forest Lands," "Marcellus Shale Communications Strategy," "Oil and Gas on State Forest Lands" Web site), public comments in the SFRMP and on the Web site at "Summary of Public Comments on Natural Gas Leasing," field visits during the audit, and through stakeholder outreach it was determined that the FME is doing a credible job addressing significant concerns related to O&G activity and further incorporating these concerns into its forest management policies and plans. Similar to procedures for forest management activities, the FME is able to identify and monitor known sites related to O&G activity through communication with, and data provided by, the PHMC. Database information provided by the PHMC is not shared with any external parties. In the broadest context, the FME has been made aware that most archaeological and historical sites in the state are located in valley bottoms and in close proximity to rivers – areas where the FME generally does not extends leases for O&G activity. On a site-specific level, the FME has access to a database of historic sites. Data is in tabular format and references which compartments have known archaeological sites. If a planned activity falls within a compartment with an archaeological or historical site, maps are then consulted that show the general site location. This search is conducted for every planned activity. No sites of this nature were observed during the audit. For rare and endangered species, the Pennsylvania Natural Diversity Index (PNDI) is searched by the FME prior to any earth disturbance to determine possible presence of rare and endangered flora and fauna species of concern. If rare and endangered species are in close proximity to a planned O&G site, the site is relocated and/or adequate buffers are put in place to protect species of concern.	
4.5	Yes	Mechanisms for resolving grievances are included in District Forest management plans. The first approach on the part of FME staff is to try to resolve the grievance by open communication before use of litigation measures. The FME's liability insurance, which extends to its employees and its activities, is covered through the Commonwealth. The FME also embraces the Conservation Volunteer Program which is a result of the Conservation and Natural Resources Act, the act of 1995, P. L. 89, No. 18, Section 310, which authorizes the PA DCNR to recruit,	

		train, and accept volunteers ~~f~~or or in aid of interpretive functions, visitor services, conservation measures and development or other activities in and related to state park and forest areas and other conservation and natural resource activities administered by the department." The Act, states that volunteers in the program are to be treated as PA DCNR employees for the purposes of workers' compensation, and general and automotive liability. The requirement of third parties operating within the state forest to hold insurance or post bonds varies. It is FME policy that contractors purchase and maintain, at their expense, several types of insurance. The first is Workmen's Compensation Insurance which needs to be sufficient to cover all contractor employees. Second they need to have Comprehensive General Liability Insurance, including bodily injury and property damage insurance, to protect the Commonwealth and the contractor from claims arising out of contract performance. The amount of bodily injury insurance should not be less than $300,000 for injury to or death of persons per occurrence. The amount of Property Damage Insurance shall not be less than $300,000 per occurrence. If the policy is issued for Bodily Injury and Property Damage combined, the amount should not be less than $600,000 per occurrence. Last, they need to have Automotive Liability Insurance, covering bodily injury and property damage insurance to protect the Commonwealth and contractor from claims arising out of contract performance. The amount of Automobile Bodily Injury Insurance is not to be less than $300,000 for injury to or death of persons in a single occurrence. The amount of Automobile Property Damage Insurance is not to be less than $300,000 per occurrence. If the policy is issued for Bodily Injury and Property Damage combined, the amount should not be less than $600,000 per occurrence. Evidence of such coverage is required even though the contractor may claim to not to own any vehicles. Liability insurance is required when contractors work in high-density recreation areas (e.g., State Parks) due to the proximity to buildings, paved areas, and other infrastructure. It is also required for contractors that only have to post small bonds (e.g., herbicide, fencing, planting). Performance bonds, but no liability insurance, are required for timber sale buyers. A review of the ~~T~~FREE ESTIMATE TIMBER STUMPAGE SALE CONTRACT" contains a section titled ~~P~~erformance Deposit" which stipulates all requirements related to these bonds. Bonds are also required to cover an approved extension of a contract. The FME's legal department investigated the option of requiring liability insurance for timber sale buyers. However, it was deemed not necessary and was also discouraged by the Pennsylvania Forest Product Association. The feels the bonds posted adequately address any potential liabilities. If not, there is a clause in the contracts stating that the bond is not the sole recourse available to the FME in the event that damages ensue. In terms of recreation, liability insurance coverage is required for all ATVs that are required to have a general registration. Proof of this coverage must be carried by the operator. The law does not specify a minimum dollar amount for coverage	

		Several measures are taken to avoid loss or damage to legal or customary rights, property, resources and livelihoods, including mapping, marking boundaries, marking all cut and leave trees, environmental reviews, buffers, not skidding along trails, not hauling or skidding on R-O-Ws without written approval of the owner or lessee, clauses in contracts regarding damage to residual trees (and enforcing this with penalties), pre-work meetings with wood buyers and logging contractors to identify risks, and supervisory checks of jobs in progress and after completion. **Gas Lease Arena** Mechanisms for resolving grievances related to forest operations are included in District Forest management plans and would be similarly followed by issues related to O&G activity. The first approach on the part of FME staff is to try to resolve the grievance by open communication before use of litigation measures. Also, the 2010 draft document titled ~~"~~Administering Oil & Gas Activities on State Forest Lands" there is a clear dispute resolution policy for O&G operators relative to disputes with the FME (Section J. Guidelines for Dispute Resolution). These procedures are also delineated in the lease agreement under Section 40. Dispute Resolution. Again, there are several steps that can be taken before legal actions would be taken by either party. The FME and O&G operators have lease agreements in place to cover performance bonds and liability from all activities. A copy of the lease agreement can be found in the 2010 draft document titled ~~"~~Administering Oil & Gas Activities on State Forest Lands." Items specific to bonds and liability state that the O&G operator ~~"s~~hall furnish a surety or performance bond satisfactory to Department. Upon Department's consent to the assignment and assignee's assumption of all liability under this lease arising or accruing subsequent to the date of such assignment as to the part or parts so assigned, Lessee shall be released from all such liability; and assignee shall be deemed to have assumed and be responsible for the covenants, conditions, and obligations of this lease as to the part or parts assigned." The lease agreement also states that the ~~"L~~essee shall, at its sole expense, provide and maintain in full force and effect during the term of this lease general comprehensive liability insurance in an amount not less than TWO HUNDRED FIFTY THOUSAND DOLLARS ($250,000) for each occurrence and ONE MILLION DOLLARS ($1,000,000) aggregate, which shall cover Lessee and Department for damage claims including, but not limited to, personal injury, accidental death, and property loss that may arise from operations conducted under this lease or any occurrence on or about the leased premises whether such operations are by Lessee or anyone directly, or indirectly, employed by Lessee. Department shall be named as additional insured on Lessee's liability insurance. Lessee shall also maintain equivalent insurance coverage for the operation of its motor vehicles." Specific measures are taken by the FME to avoid loss or damage to rights, property, resources and livelihoods related to O&G activity, including Web site notification of O&G activity, agency and other landowner notifications, mapping, marking boundaries, creating buffers, provisioning to protect the forest from spills of any liquids,	

		pre-work meetings with O&G companies and various contractors to identify risks, and supervisory checking of jobs in progress and after completion. Interviews with O&G operators revealed that the planning for a drill site starts at least six months in advance and that they work very closely with the FME and DEP to ensure forest and water resources are going to be protected. During O&G activity, O&G operators stated that they are in continual contact with District Foresters and the FME's geologist, at a minimum. One operator also said they coordinate their projects to minimize interference with hunting season activity, and they also plan equipment movements to account for the topography on state forest lands to account for seasonal climate limitations. Often times they meet or communicate with PA DCNR personnel over a number of issues. Also, communication and cooperatively working with other agencies is essential, and operators realize that this is the law, and the appropriate action to take. Nothing is more important, beyond working with the FME, than cooperating and working with the DEP.	
Principle 5. BENEFITS FROM THE FOREST			
5.1	Yes	The BOF has been a forestry organization (albeit under different names over time, starting with the Division of Forest and Waters in 1895) for over 100 years. A century of persistence as an organization indicates that the BOF has the resources to support long-term forest management. Planning, inventory, resource protection, capital improvements (e.g., forest roads), and post-harvest management activities, among other resource management endeavors, are well supported in terms of attention, money and personnel. Support for silvicultural activities is high. The districts were observed to be well staffed in support of timber management, though some concern was raised with regard to reductions in maintenance personnel and how it is affecting/will affect non-timber forest values and services, particularly in the area of road maintenance and recreation access (**OBS 02/11**). Shortfalls in maintenance personnel could expand to affect other forest and natural resources management work if budgets continue to be cut, revenues shrink, and gas management activities expand. Monetary support for the BOF comes primarily from appropriated State funds, timber receipts, and gas and oil leases. Lower stumpage prices (particularly for cherry) and shifts in how gas lease dollars are used in the State budget have produced growing concerns within and outside the agency about future funding and staffing. Timber management and other related forest and natural resources management activities have not changed in response to short-term financial factors. Silviculture is fully practiced across BOF forest lands. No degrading timber harvests (e.g., diameter limit cutting) were observed on BOF lands. The BOF has a long history of high investment in managing the forest and restoring health and productivity, including the long standing practice of reinvesting 10% of timber receipts back into the forest for regeneration practices, e.g., fencing, use of herbicides to control interfering plants. Auditors were given copies of documents relating to numerous timber sales, including a prospectus for each visited harvest area (total number of areas = 15). Conditions for each timber sale were	**OBS 02/11**

		observed to be clearly stated in these documents. A subset of timber sale contracts were reviewed in detail and found to be complete, including high quality timber sale maps (all produced using GIS). **<u>Gas Lease Arena</u>** While the BOF is a forest management organization, it is recognized that all natural resources are open for management on PA State Forests, including oil and gas development, to sustainably meet societal needs and desires. It appears that gas development activity has not negatively affected the FMU and that the forest operations of the BOF will continue to provide long-term economic, environmental, and social benefits from the State forests with planned gas development. The BOF has invested significant amounts of personnel time and money to address the leasing for, and expansion of activity in, Marcellus shale gas development over the past few years. Each District has at least one forestry person dedicated to monitoring gas well pad installation and development. Dozens of personnel are involved in well pad siting, including an in-house team of geologists (presently four people, with two more geologists to be hired by the BOF in the near future), with BOF activities ranging from examination of site-specific assessment of ecological conditions to landscape-level impact on recreation. Shortfalls in the State budget caused the BOF to accelerate the development of some gas leases over the past few years as a quick source of revenue, but this does not seem to have affected the agency in its ability to fulfill the forest management plan. Leasing contracts and agreements have become more detailed and complex over the last decade, particularly over the last few years, and seem well in line with what is needed to provide for environmental protection and socioeconomic benefits.	
5.2	NE		
5.3	NE		
5.4	Yes	A diverse variety of forest uses and products are produced by the BOF, including wood products (high quality sawtimber and various biomass-based products such as pulpwood), NTFPs, game for hunting, and various recreational activities (e.g., hiking, mountain biking, horseback riding, skiing, snowmobiling, ATV riding, fishing, camping). Forest composition, structure and function are maintained by the full application of silviculture to regenerate and tend stands of diverse tree species, road and trail construction and maintenance that meets or exceeds state BMP guidelines and regulations, and protection of ecologically special areas (e.g., Natural Areas, Wild Areas, Special Resource Management Zones, Limited Resource Management Zones, Aesthetics/Buffer Management Zones; and proposed Old-growth and Bio-reserve Areas). Ecologically special areas cover nearly 50% of PA State Forest. BOF has worked to control high impact recreational activities such as ATV use by providing dedicated trails and posting all Forests to minimize unauthorized use. The BOF has reinvested in the local economy through the regular	

		production of wood products, development of forest infrastructure (e.g., forest roads, parking areas, hiking trails), and payments in lieu of taxes ($3.50/acre paid to the counties). Staff at all levels are active in civic organizations, participate in educational activities with local schools, and work with local governments and organizations on advisory boards such as those dealing with water quality and conservation. Examples discovered during the audit include: Pine Creek Watershed Council membership; foresters leading hikes during Hiking Week 2010, providing tours as part of Pabucks, a game habitat and hunting organization, working in booths during county fairs and woods events, maintenance of forest stewardship demonstration sites (e.g., Sproul State Forest), including 40 miles of interpretative trails, and providing field tours and outdoor learning opportunities for College students. **Gas Lease Arena** Gas development is not a forest use or product, but the extraction of gas from the Marcellus play can influence production of forest uses and values. Trucking (stone, water, and equipment) has produced an upgrade of forest roads, but has also temporarily degraded use of forest roads by BOF staff and the general public through increased truck traffic, affecting work and recreational experiences. Many BOF staff complained about being nearly ~~r~~run off the road" by large, fast moving gas industry trucks and equipment. Other stakeholders influenced by the increased truck traffic are camp lessees – there are ~4,000 leased camp sites across the State Forests, averaging about ¼ acre in size, often with a small cabin. It is expected that road use associated with gas development will be reduced over time after the gas collection systems (wells, pipelines and compressor stations) are installed, perhaps over the next decade. Actual area of disturbed areas, while large for any one well pad site (5 to 15 acres), is small compared to the size of the State Forests, perhaps in total to be less than 0.5% of area affected, so the direct effect on forest uses and values is and will be small. In general, gas development has not apparently negatively affected forest uses and values, but this is an open question that monitoring and research will address. FME staff has been active with local governments and organizations, including participating on advisory boards that are dealing with water quality and conservation issues associated with the Marcellus Project shale development. Staff geologists have been frequent guest speakers at a wide variety of lay and professional meetings on the Marcellus Play, educating these stakeholders on facts associated with hydro fracturing and Marcellus shale (dozens of presentations over the past few years).	
5.5	Yes	Forest management operations recognize, maintain, and, where appropriate, enhance the value of forest services and resources such as watersheds and fisheries. Watersheds are generally protected by the full application of BMPs during timber harvesting and other site disturbing management activities, including the full protection of riparian areas. In most harvest sites, riparian areas are excluded from the timber sale by marking uncut buffers. Also, most timber harvesting has occurred on the relatively dry ridge and plateau tops and upper slopes. BOF recognizes when timber harvest	

		are to occur in municipal watersheds (e.g., watershed sensitivity in the recent District 7 –Sand Mountain Salvage" timber sale and the protection of the headwaters of Lingle Stream, even where the water was only weakly intermittent) and works with community stakeholders to adjust management to protect water. Brook Trout restoration (e.g., deflectors associated with culvert, in-stream placement of CWD) has been conducted with Trout Unlimited over the past few years. The BOF is finalizing a management plan for Brook Trout throughout the State Forest system. **Gas Lease Arena** The BOF identifies, defines and implements appropriate measures for maintaining and/or enhancing forest services and resources that serve public values in the siting, monitoring and required rehabilitation of gas development sites, including protecting water resources and associated fisheries.	
5.6	NE		
		Principle 6. ENVIRONMENTAL IMPACT	
6.1	No	The 2008 reassessment confirmed that assessments of ecological processes, current ecological conditions compared with historical conditions, common plants and their habitats, water resources, and soil resources are included in the State Forest Resource Management Plan (SFRMP) as well as the individual District Forest (DF) Plans. BOF has not needed to update these baseline assessments since the 2007 SFRMP was prepared. DCNR is a partner in the Pennsylvania Natural Heritage Program (PNHP, formerly the Pennsylvania Natural Diversity Inventory or PNDI) and maintains current data on rare, threatened and endangered species and natural communities. This information is reviewed before any site disturbing activities, including forest management, recreation site development (e.g., trails) and approving well locations on oil and gas leases. The review process and associated documents were reviewed with BOF during the current audit. Potential impacts are evaluated during the development of harvest prescriptions, such as protection of rare species, measures needed to protect soil and water, and need to control invasive species before harvesting begins. BOF records the presence of invasive non-native plant species in the Continuous Forest Inventory Assessment (CFIA) plots and informally monitors the occurrence of invasive non-native plant species during field activities. BOF conducts annual egg mass counts for gypsy moths across its forests as well as conducts aerial surveys of tree mortality due to gypsy moths. Emerald ash borer and hemlock wooly adelgid are also monitored. BOF continues restoration activities associated with control of deer browsing, including fencing sites to ensure regeneration, and BOF participates in the DMAP program. **Gas Lease Arena** New well pad locations, pipeline locations, road upgrades and new locations and are reviewed and approved by DCNR prior to the	**CAR 03/11** **CAR 04/11**

		lessee obtaining permits from other agencies as appropriate to the resource, including those identified under Criterion 1.1. The Oil and Gas (O&G) Program is administered by the Marcellus and Minerals Section in a process that includes Department-wide coordination, including BOF and the Ecological Services Section. **Leases issued during or after 2008**. For recent leases (2008 an later) DCNR has implemented a landscape and site assessment process to avoid and minimize impacts due to oil and gas activity. First, designated Wild Areas and Natural Areas were categorically excluded from leasing activities, amounting to 226,000 acres or approximately 11% of the BOF lands. Next, other ecologically sensitive areas were identified and assessed on each tract and landscape. Most areas with a concentration of rare, threatened, or endangered species and rare natural communities identified by PNDI data, priority forest patches identified by The Nature Conservancy and the Western Pennsylvania Conservancy and/or concentrations of wetlands were not included in the 2008, 2009, and 2010 lease offerings. Any ecologically significant areas that were included in the lease sales were designated as Areas of Concern, which require further coordination and conference with BOF and other jurisdictional agencies prior to approval. The remaining areas offered for lease had some areas where ecologically or culturally sensitive features (e.g. rare species, steep slopes, wetlands, recreation trails) occur. Within the lease tracts DCNR applied a zoning process that identifies highly critical resources: Non-Development areas and buffers (e.g. wetlands, steep slopes), and Areas of Special Consideration. Areas of Special Consideration include high value timber stands, ecological features (point features, such as rattlesnake dens, or landscape features such as rattlesnake foraging and travel habitat), and viewsheds. The environmental review for each of the three recent Marcellus Shale leases is posted on the DCNR gals leasing Web pages. Additional detail on the process was provided to the audit team by DCNR. After a lease is issued the district BOF field forester works with the lease holder to avoid and minimize impacts within the lease area using BOF guidelines and those of the other applicable agencies (e.g. the PA Boat and Fish Commission guidelines for rattlesnake habitat). BOF buffers for protecting vernal ponds and other water bodies exceed the minimum required by the PA Department of Environmental Protection DEP) by 100 feet. After review by the District forester, the site plan (for a well pad, pipeline, or road) is reviewed by the central office and approved or modified as necessary based in review by Marcellus and Minerals Section, BOF and the Ecological Services Division. Following DCNR location approval the lease holder then conducts the necessary ecological studies to collect more detailed site information, including wetlands delineation and on-site rare, threatened, and endangered species (RTE) surveys (e.g., rattlesnakes and bats). If additional sensitive features are identified, site location may be modified by DCNR as necessary. The lease	

		holder then applies for site development permits from DEP, Susquehanna River Basin Commission, PA Fish and Boat, and/or PGC as applicable to the proposed activity. Each of these agencies evaluates the potential impacts from the proposed activity (e.g. habitat loss and fragmentation or the impact of surface and groundwater withdrawals on wetlands and other water bodies) and may impose restrictions on the permit **Leases issued prior to 2008.** For older leases (pre 2008, leased when shallow drilling was the norm) the landscape-scale planning and zoning processes were not built into the leasing process. For these older leases, DCNR reviews site locations proposed by the lessee and approves or requires that pads be moved based on ecological factors including the presence or rare, threatened or endangered species or rare natural communities in the PNHI data base, steep slopes, and other sensitive features (e.g., streams, wetlands) identified on resource maps and/or by the field forester. Following the BOF approval, the process is identical to that described above for the current leases (2008 and later). Examples of this process were reviewed during the field audit (D-10, Tract 252 Pad A and Tract 653 Pad D). **Impact Assessment.** Each DCNR lease is subject to an individual environmental impact assessment (e.g., ~~F~~FY 2009-10 Oil and Gas lease Sale Environmental Review"). Review parameters include erosion and sedimentation, surface water quality, groundwater, water quantity, air quality, soils, aesthetics, noise and light levels, and impacts on protected animals and plants, habitat diversity and interspersion, and biological productivity. These assessments address short-term and cumulative impacts for each of the current leases. BOF has estimated cumulative losses from existing Marcellus gas leases and posted that information on its Web site (see http://www.dcnr.state.pa.us/forestry/marcellus/pdfs/ProjectedForestConversion_OilGas.pdf). Considering the potential amount of habitat loss (almost 24,000 acres) and fragmentation (e.g., over 3,000 miles of new forest edge) that may occur under current leases and areas with severed rights in the Marcellus region (BOF estimate), the audit team has found the assessment for impacts to plant and wildlife habitat impacts in the individual lease assessments to be lacking. Specifically, the individual lease impact assessments describe in a short paragraph measures that will be used to protect and manage non-listed species (e.g., see ~~—F~~ 2009-10 Oil and Gas lease Sale Environmental Review," Section 18, Habitat Diversity and Interspersion). However, the description of measures to protect and manage non-listed species does not include a short-term or cumulative impact assessment. For example, the cumulative effect of forest loss and fragmentation on species that depend on large, unfragmented block of forest is not addressed by in the impact assessments before current leases. . Likewise, some of the other resources addressed in the lease assessments (e. g., groundwater) also focus on preventive measures and do not address short-term and cumulative impacts. (**CAR 03/11**) Beyond the individual leases, BOF has also conducted a cumulative	

		impact assessment for multiple leases across the entire Marcellus region (see http://www.dcnr.state.pa.us/forestry/marcellus/moratorium.html). DCNR's proposed long-term ecological monitoring (see Principle 8) will also provide data that will be used to refine the ecological impact assessment process and develop additional strategies to avoid and minimize impacts. The Susquehanna River Basin Commission (SRBC) regulates water withdrawals within the Susquehanna River Watershed. The SRBC assesses the impact of proposed water withdrawals on water quantity and aquatic ecology prior to issuing permits. The Delaware River Basin Commission (DRBC) has issued few permits for withdrawals to date because much of the land is in high priority watersheds, including the New York City and Philadelphia water supplies. **Invasive Species Monitoring.** DCNR's 2008 and later Marcellus gas leasing also requires that invasive plant species be monitored prior to approval for site development. If invasive plants are identified they must be controlled prior to site disturbance. All sites are monitored by the lease holder for five years after completion of the project and any new occurrences of invasive plants must be controlled (for example, see FY 2009-10 Gas Lease Sale Environmental Review, Section 20). BOF does not have similar monitoring or control for pre-2008 leases or for lands with severed subsurface rights that do not have a recent negotiated land use agreement. While BOF is planning an expanded monitoring program for gas activities, the details have not been specified and the funding has not been secured. (**CAR 04/11**)	
6.2	NE		
6.3	No	**6.3.a. Forest regeneration and succession** Small landscape units are used as the basis for local management planning. BOF manages for the full range of age classes and successional stages found in natural forests, with the oldest age classes are found on protected sites. BOF relies almost exclusively on natural regeneration. Regeneration techniques are primarily justified for each harvest unit through use of the SILVAH decision support system. Importantly, the SILVAH recommendation can be altered if the forester believes it does not adequately reflect stand conditions and species requirements. A description of regeneration considerations and intent is written by the forester in association with each harvest plan (Timber Sale Proposal, prospectus and contract). BOF indicates they are using uneven-aged silviculture, but timber harvests observed in the field that were referred to as ~~s~~election system" were determined by the auditors to be 1st partial cuts to convert 80- to 110-yr-old, even-aged hardwood stands to multi-aged conditions that could eventually support uneven-aged silviculture.	**CAR 05/11** **OBS 03/11**

		Canopy openings with these —uneven-aged" partial cuts were less than 2.5 acres in size. Diameter-limit cutting, as a means of maximizing short-term value and as a part of high grading, is not used by the BOF. The BOF ***Silviculture Manual*** specifies a minimum 10-20 square feet per acre of retention in clearcuts and overstory removal (OSR) harvests, and 20-40 square feet where 2-aged management is practiced (primarily buffer zones). The retention may be in clumps or scattered trees within the harvest block. One district visited relied primarily on clump retention, which all canopy layers and ground vegetation intact in roughly 1/10 t o1/4-acre patches. Sites at other two districts audited were characterized by scattered retention, often uniformly spaced, with no mid-story or understory structure retained. The ***Silviculture Manual*** makes no reference to retention of live trees and native vegetation and opening sizes in a manner that is consistent with the characteristic natural disturbance regime in each community type (as required by indicator 6.3.a.8). Opening sizes and retention appeared to be characteristic of catastrophic disturbances, not characteristic disturbances. Interviews with field foresters indicated that the guideline in the manual and other guidance on production forestry (e.g. Silvah model outputs), not natural community disturbance patterns, guided their decisions on retention and opening sizes. See **CAR 05/11**. **6.3.b. Genetic, species, and ecosystem diversity.** Silviculture is focused on maintaining native species diversity, with genetic diversity conserved by allowing open pollination among all forest trees. The best quality trees are left for seed and in shelterwood harvests. The ***Silviculture Manual,*** Reservation Guidelines address retaining species diversity and superior trees at the time of harvest. In anticipation of species loss and decline due to climate change, BOF is also preserving seed in long-term storage a potential source Herbicide site preparation is used to reduce understory competition at the time of regeneration, but nearby seed sources and lack of complete kill ensures that the target species will be represented in future stands. The BOF protects, maintains and enhances a wide variety of habitats for native species, but some ecologically important within-stand elements are not currently being fully conserved, e.g., late-successional forest remnants (< 1 acre to nearly stand-sized) and monolithic rock complexes (both were observed and discussed at length during the field audit) (**OBS 03/11**). Species diversity maintained through BOF silviculture is used as a defense against natural pests. Exotic pests (gypsy moth, emerald ash borer) continue to be a management challenge with no clear silvicultural options to minimize risk. **6.3.c. Natural cycles that affect the productivity of the forest ecosystem.**	

		Due to limited low value markets and the very limited amount of biomass harvesting allowed on SFL, an abundance of large and small woody material was found on all harvest sites visited in the audit. Coarse woody debris was also evident in the salvage harvests observed. BOF maintains soil fertility and function by only allowing whole tree harvests in very limited cases. Salvage harvests (gypsy moth mortality) retained an abundance of woody material similar to non-salvage cuts. BOF estimates that approximately 95% of the Bureau's timber sales specifically do not permit whole tree harvesting (WTH). The small number of sites on which the FME does whole tree harvesting require approval by the State Forester. WTH is permitted in cases where BOF needs to meet its objectives for early successional habitats for species at risk and other species, but the stands to be harvested lack the volume or quality to be harvested commercially. BOF has found that without the use of whole tree harvesting fewer acres would be regenerated each year to early successional habitat. **Gas Lease Arena** **6.3.a. Forest regeneration and succession.** 6.3.a.1. BOF considers the local landscape context to make management decisions regarding the location of well pads, water storage, roads and gas lines as described above under Criterion 6.1. The remaining indicators of 6.3.a are applicable to forest management operations only. **6.3.b. Genetic, species, and ecosystem diversity.** 6.3.b.2. A diversity of species for native species is protected and maintained beyond the footprint of the area converted to well pads, roads, water storage ponds, and gas pipelines. This is accomplished through the landscape zoning and project location approval processes described in 6.1. At the landscape scale, impacts include cumulative direct habitat loss and associated impacts of fragmentation (e.g., edge effects). BOF has estimated cumulative losses from existing Marcellus gas leases and posted that information on its Web site (see http://www.dcnr.state.pa.us/forestry/marcellus/pdfs/ProjectedForestConversion_OilGas.pdf). For existing leases and areas where subsurface rights are severed, BOF estimates a loss of 24,833 acres of forest within the portions of the SFL within the Marcellus gas region. This represents 1.57% of the total SFL ownership in the Marcellus region. Approximately 8,725 acres would be converted by 2018, with the balance coming in later years. The total area of new forest edge would be almost 3,063 miles over the life of the leases, or roughly 1.2 miles of edge for every square mile of forest. These and other data are included at the Web link above. Approximately half of the SFL within the Marcellus region is currently	

		leased or subject to severed subsurface rights, thus the density of loss and fragmentation would be greater on the leased lands. BOF is developing strategies to reclaim sites after drilling has ceased to an open herbaceous condition (except for the core pad area). As noted in 6.1, BOF has not adequately assessed the impacts of the current leases on species and ecosystem diversity. However, when considering the habitat zoning and protection measure that are in place, the audit team has found BOF to be in conformance with this sub-indicator. Other indicators of 6.3.b are not applicable to oil and gas development. **6.3.c. Natural cycles that affect the productivity of the forest ecosystem.** None of the indicators of 6.3.c are applicable to oil and gas leasing.	
6.4	NE		
6.5	Yes	Harvesting, road construction, and other mechanical operations were observed to meet or exceed State Best Management Practices (BMPs). Written harvest plans for the protection of soil, tree and water resources are the timber sale contract, which includes a detailed Erosion and Sediment Control Plan (E&S Plan) and a map of the harvest site showing the locations of streams and other environmentally-sensitive areas (e.g., wetlands). Logging and site preparation (e.g., herbicide treatment to control interfering understory plants, fencing to reduce negative deer impact, prescribed fire to promote oak regeneration) activities were observed to produce desired effects while conserving soil, water and tree resources. Residual damage to trees was negligible. The transportation network, including permanent and temporary haul roads, skid trails, and landings, were observed to be well designed, (re)constructed and maintained. BOF foresters define where contractors will build new roads, main skid trails and landings. Measures to protect streams (including perennial, intermittent, and ephemeral streams and other waters) from degradation of water quality and/or their associated aquatic habitat were observed to be fully and properly used in all forestry operations. All streams—from intermittent to perennial—were marked and buffered in excess of the FSC Standard. BOF avoids crossing streams—no stream crossings were observed during the audit except for long-standing culverts on haul roads. Measures are routinely taken to stabilize active and potential sources of soil erosion through regrading and seeding, consistent with E&S Plans for each harvest area. Activities of forest management resulted in rare, small observable siltation of streams, and in these situations, BOF was set to remediate the situation to control erosion and sediment sources. **<u>Gas Lease Arena</u>** Disturbed areas associated with well pads, access roads, staging	

areas, and pipeline rights-of-way were exceptional in application of BMPs. At the five Marcellus gas drilling sites audited, little to no effects of these disturbances were observed outside the gas development areas into the surrounding forest.

A DEP water quality specialist responsible for monitoring oil and gas activities on DCNR and private lands reported that minor spills of drilling mud, flowback water, and diesel fuel are common. The specialist further reported that no major spills have occurred recently on the DCNR for which the individual is responsible for, significant spills of drilling mud and diesel fuel have occurred on private lands and that containment devices surrounding the pad have not been sufficient to contain larger spills (e.g., 1,000 gallons of drilling mud) in the past. This specialist also reported that pits that hold drilling mud, frac flowback, water, etc. are prone to leakage. Some companies are going —tanks less". While there is less risk, DEP reports that tanks do leak on occasion and there is more truck traffic required to transport the waste off site to a containment facility.

BOF provided the audit team with all DEP inspection reports from the DEP Web site (most of these reports were for recent activities, but some inspections dated back to 1988). The vast majority of inspections found no non-conformances. Administrative violations (e.g., incomplete E&S Plan) were most common. The reports included the following Environmental Health and Safety violations:

Improperly lined pit: 1
Failure to implement E&S plan: 14
Discharge of pollutional material into the waters of the Commonwealth: 10
Impoundment not structurally sound: 4
Failure to restore site within 9 months: 1
Improper encapsulation of waste: 1
Failure to take the necessary measures to avoid spills: 2

The reports did not contain sufficient detail to determine the significance of these violations, including short-term and cumulative impacts. See findings in Criterion 8.5 for more details.

Forest roads have been upgraded by gas companies to exceed normal forestry standards and have held up well to heavy truck traffic associated with gas development. A DEP water quality specialist noted that the forest roads are much larger than before, and that is difficult to identify the responsible party when impacts occur. For example, there have been complaints about impacts to Fall Brook Creek in District 16, but the impacts could not be specifically tied to gas drilling operations.

E&S Plans were observed to be posted by gas development entities on all active well sites, usually in a visible, temporary mail box. Measures to protect streams from degradation of water quality and/or their associated aquatic habitat were observed to be fully and properly used in all operations. Virtually no siltation of streams was observed across gas operations. Each of the audited gas operations was different, one to the other, in terms of BMP applications and associated efforts to conserve soil and water, but all seem to be

		working effectively. As noted in 6.1, the Susquehanna River Basin Commission (SRBC) regulates water withdrawals within the Susquehanna River Watershed. Permits for withdrawals for use in gas operations are designed to ensure that sufficient water is available for downstream needs and for maintaining the ecological integrity of the creeks and rivers in the watershed. Permits include a low-water threshold when withdrawals must stop.	
6.6	NE		
6.7	Yes, Indicator 6.7.a only.	In order to address CAR 02/10 issued during the 2009 FSC FM Audit, the BOF developed a system to ensure contractors and other service providers adhere to state regulations regarding the containment and remediation of hazardous material spills on State forest lands. The system was instituted only in early August 2010, just prior to the annual audit. CAR 02/10 has been closed. Recent implementation of spill policy and management systems should be followed up in future audits to be sure the system is working. During the audit, one logging contractor was observed to not have a spill kit on site, and on the same job, it was observed that log loading equipment had recently and regularly leaked oil along the roadside (**OBS 04/11**).	**OBS 04/11**
6.8	NE		
6.9	Yes, Indicator 6.9.a only	In order to address CAR 03/10 issued during the 2009 FSC FM Audit, the BOF destroyed all of the recently planted European black alder. Additionally, this species is no longer grown at or supplied from Penn Nursery, the BOF's primary source of forest planting materials. CAR 03/10 has been closed.	
6.10	Yes	**Conversion to plantation or non-forest use:** **a. Entails a very limited portion of the management unit.** FSC US guidance (Forest Management Standard V1.0, July 2010) defines ~~v~~ery limited portion" as less than 2% of the certified forest area of the FMU over a five-year period. **Marcellus Gas Conversions:** Using data supplied by the BOF, SmartWood estimates that the total forest conversion from Marcellus activities since the program began in 2008 has been approximately 344 from BOF leases and 1,059 acres on lands with severed subsurface rights. Pro-rating these data to a 5-year period would indicate less than 0.2% of the FMU (the entire 2.14 million acre SFL is a single FMU) converted for Marcellus gas activities for BOF leases and leases with severed rights combined. For BOF leases only the pro-rated 5-year conversion would be 0.04%. BOF estimates that conversion to non-forest for Marcellus activities will be less than approximately 1.2% of the SFL over the entire life of the development of the gas field (40 years, more or less), based on current BOF leases and areas with severed rights. While the audit team is confident that the total amount of conversion is well below the FSC-US definition of ~~v~~ery limited amount," three areas of concern were noted in the conversion estimates supplied by BOF:	**OBS 05/11** **OBS 06/11**

		• Marcellus conversion estimates reported above are based on average well pad size and miles of new road constructed, not actual measurements. • In reviewing the data, it was not clear how accurately conversion due to roads and pipelines was accounted for in the conversion estimates, which were based on an average figure per well pad. • BOF reports that conversion from older leases and other sources of conversion are minimal, but does not have accurate records. (**OBS 05/11**) No land has been converted to plantations as defined by the FSC. **b. Does not occur in High Conservation Value Forest areas.** BOF has corrected its High Conservation Value Forest (HCVF) assessment, as described in the findings to CAR 04/10 and below for Criterion 9.1. Based on this revision there is no conversion of HCVF to plantations or non-forest use. **c. Will enable clear, substantial, additional, secure, long-term conservation benefits across the forest management unit.** From 2005-2010 BOF has spent over $38 million to add over 44,000 acres to the SFL. Funding is from a variety of sources, including legislative bond packages, the Oil and Gas Fund, and other funds. The O&G Fund is not strictly dedicated to land conservation and has been primarily for operations and programs in recent years. However, the non-dedicated nature of the O&G fund allows flexibility in the timing and sources of revenues used for land conservation that provides conservation benefits while meeting other funding needs of the DCNR. Examples of specific conservation benefits of the purchases include: Five tracts totaling 223 acres located on an exceptional value stream were purchased to protect the land from development, 3 of those tracts included species of concern. • Several properties were purchased for wetland protection. • Several islands (such as Harigan's, Byer's, and Hess) were purchased which protect unique micro sites and sensitive species such as Bald Eagle, Northern Myotis bat and provide numerous other wildlife and plant habitat values. • A purchase of a number of tracts in 2007 known as the Theta III acquisition with a total of 4171 acres is known for its unique habitat types and wetlands. • Two tracts of the Theta III acquisition in particular host a number of rare plants, plant communities and wildlife. • An 875 acre tract in Westmorland County contains the green salamander and population of sourwood as well as a historic site which encompasses approximately 50 acres of the tract. • A 672 acre tract was purchased in 2009 that contains a rare plant (bushy bluestem) and has a population of the threatened Allegheny Woodrat living just off the property. • Another property that was being considered for a wind farm was acquired in 2008. This 5,061 acre property has a ridge top dwarf tree forest as well as 3 rare plant species.	

		• Currently there are 708 acres, purchased in 2009, being proposed to be a Wild Area (Stairway Wild Area, potential HCVF). • Additionally a 15 acre tract purchased in 2007, as well as a 1378 acre tract, a 500 acre and a 376 acre tract purchased in 2006 were added to the Bucktail Natural Area (existing HCVF). • A 50 acre tract purchased in 2009 will be added to the F.H. Dutlinger Natural Area (existing HCVF). Other conservation benefits of these land acquisitions include water quality protection, wetland protection, wildlife habitat, timber management improvement, historic site protection, recreational opportunities, aesthetical values (viewsheds), and carbon sequestration benefits. Over 5,000 acres near expanding population areas were protected from risk of development, and much of the other land conserved was at varying degrees of risk from low density development The audit team has found that the O&G Fund enables DCNR to secure land conservation benefits are clear, substantial, additional, and long-term as clarified in the 6.10.c intent statement of the FSC-US Forest Management Standard. Gas and oil development is occurring on forestland where the Commonwealth of Pennsylvania owns the subsurface rights (the leased areas) and also on forestland where the Commonwealth does not own the subsurface rights. For the areas subject to the leases (where the subsurface rights are owned by the Commonwealth), PA DCNR has substantial control over activities to ensure conformance with the FSC standards and requirements. For lands where the Commonwealth does not own the subsurface rights, it is not clear, in all situations, whether PA DCNR has enough control over activities to ensure conformance with FSC standards and requirements. PA DCNR needs to evaluate the certified landbase and determine in which situations they maintain enough control to ensure conformance with the FSC standards. For ~~s~~evered lands" where they cannot ensure conformance, these lands will need to be excised. (Note: The entire leased area does not need to be excised. Only the areas that are directly impacted by oil and gas activities (i.e. converted to non-forest use) need to be excised.) PA DCNR needs to provide SmartWood with the protocol used in making this determination and the results of this evaluation. (**OBS 06/11**)	
Principle 7. MANAGEMENT PLAN			
7.1	Yes	The FME currently abides by the ~~S~~State Forest Resource Management Plan (SFRMP) 2007 Update" which was developed using the five-year planning and public input cycle established in 2003 as a guide. The current SFRMP involved reviewing and discussing the 2003 SFRMP implementation. This internal review, along with feedback received from several advisory committees (e.g., CNRAC, EMAC, RAC) and other stakeholder groups (e.g., academia, recreationists, oil and gas industry), resulted in the 2007 document completion. The document provides an overview of the	**OBS 07/11**

		current status of the FME's planning and management to allow for the most constructive public dialogue possible on prevailing values and concerns. It contains three basic sections: 1) planning history and public input processes; 2) current issues; and 3) a summary of proposed SFRMP updates and new additions. These sections cover management goals and objectives not only for the FME in general, but objectives specific to each category of operation (e.g., silviculture goals, recreation goals). A description of forest resources to be managed, environmental limitations, land use and profile of adjacent lands is included the SFRMP's main Appendix. Here there is also a link to information titled "Updated Resource Summaries (2007)" providing further descriptions. Silvicultural systems used are described on pp. 11 and 12. Supplemental information to support the silviculture used is based on the ecology of the forest (p. 19) and information gathered through resource inventories are mentioned throughout the SFRMP for various scenarios (e.g., timber inventories, wild area inventories). The rationale for the annual harvest rate and species selection is included, with the harvest goals for the forest and is summarized on p. 35. Also included is a "Harvest Allocation Plan Summary" for each of the FME's Districts Forests. Provisions for monitoring of forest growth and dynamics is included in the section titled "Analysis of First 5-Year Continuous Forest Inventory Cycle Resource Inventory & Analysis Section" whose main purpose is to describe the monitoring of growth and yield of the forest. Environmental safeguards based on environmental assessments are discussed for each forest management operation throughout the SFRMP. Plans for the identification and protection of rare, threatened and endangered species are found, in a section titled CONSERVING SPECIAL PLACES, DCNR'S PLAN FOR GUIDING FUTURE INVESTMENTS IN LAND ACQUISITION." Maps, graphs, histograms, and tables, describing the forest resource base (e.g., Table Mountain-Pitch Pine forest communities), including protected areas (e.g., State Forest Districts, sample maps of fenced areas in the Deer Control Permit), planned management activities (e.g., Forest Age Class Distributions by District over time, Potential Opportunities on State Forest Lands, proposed ATV trail connectors), and land ownership (e.g., State Forest Districts) were found throughout the SFRMP. Last, the SFRMP describes and justifies harvesting techniques and equipment to be used on the forest primarily in the section titled "COMPETING VEGETATION TREATMENT GUIDELINES." FMPs, using basically the same format, have also been developed for all District state forests. FME personnel interviewed by the auditors stated that there have been no substantial changes to the SFRMP since the 2007 revision. The FMP is due for revision within the next few years. Relative to forest management, the audit team has found the FME to remain in conformance with the forest management planning requirements of Criterion 7.1. **Gas Lease Arena** The SFRMP contains a section titled "Current Issues." Under this there is another section titled" Oil and Gas Leasing" (p. 9) which describes elements of this activity. Other sections of the SFRMP that	

		address this issue include Appendix Section 4. Geology/ Minerals, p. 25, and a link in the SFRMP to a more detailed section titled —Draft Geology/Minerals Section" covering in detail all items related to the SFRMP components needed for regulatory conformance. The FME utilized the 2007 public meetings to solicit input on its oil and gas (O&G) leasing program. The SFRMP is supplemented through a number or related documents that have been developed to deal with increase in (O&G) activity since the SFRMP was last updated. These include the use of a 2010 document titled "DCNR, Bureau of Forestry, Oil and Gas Monitoring Program." This document is broader than just monitoring and supplements the SFRMP on every issue from "Mission and Purpose" relative to the forest resource to gathering stakeholder inputs, through the "Oil and Gas Monitoring Program Committee" to "Comprehensive Program Development" complete with forms for monitoring mineral operations and a proposed operational budget. In addition there is a 2010 draft document titled "Administering Oil & Gas Activities on State Forest Lands." This document provides guidance to the FME staff and O&G interests on how to proceed with mineral extraction, while still maintaining the FME's mission of ensuring the long-term health, viability, and productivity of the Commonwealth's forests and to conserve wild plants. A number of other planning and policy documents are located on the PA DCNR natural gas leasing Web pages. **Social issues.** The FME's "Oil & Gas Position Statement" clearly states that the primarily control mechanisms to avoid conflicts are the terms built into its Oil and Gas Lease. Specifically, there is a conflict resolution section in gas leases. The 2010 draft document titled "Guidelines for Administering Oil & Gas Activities on State Forest Lands" (hereinafter referred to as the *O&G Guidelines*) contains a section titled "Guidelines for Dispute Resolution" which clearly outlines the processes involved when there will be disputes between lessees and the FME. If the dispute cannot be resolved informally regulations 40. Dispute Resolution, sections 40.01 and 40.02 give a step-by-step process for seeking resolution. The *O&G Guidelines* contains a section titled "Guidelines for Recreation and Public Safety" which refers to customary use rights to the forest and rules and regulations governing these activities near gas drilling activities and facilities. A general focus on this section is public safety. The "Oil and Gas Monitoring Program" document contains a section on planning around areas of special significance to avoid adverse impacts. Section 1.a. details proactive planning to avoid sensitive areas and will employ a GIS tools, results from State Forest Environmental Reviews, and, in certain cases, additional field surveys. A timeline is included for assessing various social impacts form gas drilling which includes "Park and Forest Image," Park and Forest Experience," and —Park and Forest Access and Use Patterns" to name a few. The Penn State Workforce Education and Development Initiative has produced a number of briefs on oil and gas issues. This includes briefs on the economy and economic impacts from these activities,	

		which includes job impacts. These briefs can be found on the Economic and Workforce Brief section (http://train.ed.psu.edu/brief/). An example brief is titled "Role of Drilling Oil and Gas Wells in the Economy of Elk, Forest, McKean, & Warren Counties." These briefs produce regional or county job multipliers that can be applied to oil and gas activity on state forest lands to identify and assess job creation and maintenance and workforce composition. A summary of O&G lease and subsurface rights held by other parties is included on the PA DCNR Web site. **Environmental Issues.** The *O&G Guidelines* is the key document guiding oil and gas leasing. The *O&G Guidelines* include landscape level issues related to setbacks to water bodies. At the larger scale, the "Lease Sale Decision-making process" and the "Natural Gas Impact Analysis" on the DCNR Web site describes the approach to landscape-level considerations. Invasive species detection and management are addressed in the *O&G Guidelines* and more specifically in lease documents. Environmental safeguards are addressed in the *O&G Guidelines* and in the actual leases. Leases were provided to the auditors for examination. RT&E species are addressed in the *O&G Guidelines*. Additional environmental data is included in the environmental reviews prepared for each lease. More specific "Best Management Practices" for O&G activities are currently being developed by DCNR, with a draft planned for late 2010. **Monitoring.** Monitoring is addressed in 2010 document titled "DCNR, Bureau of Forestry, Oil and Gas Monitoring Program." **Maps.** The GIS being used includes all relevant map data required by the FSC Standard. O&G information is integrated with the forest resource data to provide comprehensive analyses. **Gas Lease Summary.** The audit team found that the O&G information in the 2007 SFRMP to be somewhat limited and dated due to the increase in Marcellus gas activity since the plan was last updated. Since then the FME has developed the policy and planning documents described above, and other tools, to address O&G issues. These documents are being used by DCNR to guide O&G activity SFRMP and serve to meet the requirements of Criterion 7.1 relative to Marcellus gas leasing issues. However, many supplemental documents are relatively new, in draft form, and/or in development and not presently linked to the SFRMP. (**OBS 07/11**)	
7.2	NE		
7.3	NE		
7.4	NE		
Principle 8. MONITORING AND ASSESSMENT			
8.1	Yes	Implementation of the FME's 2003 *State Forest Resource Management Plan* (SFRMP) was fully assessed in 2007. Assessment results were reported in the *State Forest Resource Management Plan 2007 Update* (report available on the following FME Web site): www.dcnr. state.pa.us/forestry/sfrmp/sfrmp_update_2007_complete.pdf. The 2007 report contains three basic sections: 1) Planning history	**OBS 08/11**

		and public input process; 2) Current issues; and 3) Summary of proposed updates and new additions to the SFRMP. A variety of monitoring reports were presented in the 2007 update, including reports on Continuous Forest Inventory (CFI), forest health, and forest products. Each BOF Division (e.g., Forest Fire Protection) and Section (e.g., Silviculture) has separate goals and objectives, and associated plans, procedures and practices for monitoring. In total, BOF has a comprehensive monitoring program that includes a variety of protocols that evaluate a multitude of parameters throughout the State Forests. Management documents include adequate descriptions of the rationale for and intensity of the various monitoring protocols. BOF has comprehensive and replicable written monitoring protocols, e.g., the new *Non-Native Planting, Seeding and Monitoring Guidelines*, from the BOF Ecological Service Section, dated January 2010. **Gas Lease Arena** Expansion of Marcellus gas development over the past 2 years has led to the development of a gas development-specific monitoring program, including new written protocols related specifically to gas activities. BOF has a Oil and Gas Monitoring Program whose purpose it is to develop and implement a comprehensive approach to track, detect, and report on potential impacts of oil and gas development on State Forest land and institute appropriate correction actions or changes to management activities (from the report entitled *Oil and Gas Monitoring Program*, dated July 14, 2010). BOF listed potential resource impacts from gas development on water quality and quantity, plant and animal habitats, fragmentation, invasive species, social/recreation values, soil loss and quality, and air quality. Recent monitoring of gas activities on State Forest land includes (from the Geology/Minerals section of the 2007 Update of the SFRMP): • Oversight of the premises for mechanical integrity, functionality, and general housekeeping. • Contracting for auditing of gas volumes and revenues as directed in the applicable lease agreements. • Evaluation of adherence to terms of lease agreements by the operator. Expanded monitoring will follow a three-tiered approach (from the report entitled *Oil and Gas Monitoring Program*, dated July 14, 2010): 1) current oil and gas program management; 2) research and external partner collaboration; and 3) comprehensive program development. Current oil and gas program management relates to monitoring through the following: accounting of planning activities; field management and inspection of well pad and associated infrastructure construction including the completion of inspection forms by BOF personnel for each site visit; tracking of environmental and public incidents; accounting of infrastructure and associated	

		resources including numbers of wells, pads, gas produced, revenues generated, miles of pipelines and access roads, area of forest land converted; and listing of waiver request to change certain conditions in the lease or guidelines. Ongoing BOF-funded (co-funding with other sponsors) research activities includes the SRBC Water Quality Monitoring Network ($200,000) and assessing landscape change (fragmentation, tree and plant health, birds, invasive plants, and soils). This landscape project has in-kind support from BOF, with request for funding under consideration. A variety of other research projects are under consideration by the BOF. The research will produce information that will allow the BOF to improve gas management programs. The BOF is planning to expand staffing to support the new monitoring program, including a botanist, a wildlife biologist, water quality specialist, soil scientist, biometrician, GIS specialist, four foresters and four forest technicians. Currently, each BOF District has a person dedicated to working with oil and gas development, with an emphasis on monitoring. Rapid expansion in gas development and new monitoring programs will produce monitoring reports in subsequent years – the BOF does not have reports to date. While the audit team did review data on current oil and gas program management and field inspection forms, full reports on the spectrum of oil and gas monitoring are not currently available (**OBS 08/11**).	
8.2	Yes	BOF maintains an inventory for all commercially harvested products. Source of monitoring data: CFI inventories (over 1,500 plots across the Forests measured every 5 years); timber sale records, including stand-level inventories used to make silvicultural prescriptions. BOF maintains records of the harvest volumes by species and product for all properties. Source of monitoring data: timber sale records. NTFPs are only rarely harvested from BOF-managed forests (e.g., stone and rock, blueberry bushes, and ornamental greenery including grape vines, bittersweet, and club moss). Level of harvest is currently considered by BOF as negligible in comparison with abundances of these NTFPs across State Forests. BOF does not maintain records of harvested NTFPs (volume and product and/or grade) other than indirectly through permits, nor are records adequately kept to ensure that the requirements under Criterion 5.6 (sustainable harvest levels) are met. These records and associated analyses are not warranted given the small scale and low intensity of NTFP operations. BOF monitors unauthorized activities across the State Forests. Additional unanticipated removal or loss of forest products from fire, pests, disease, storms, and overbrowsing is also monitored by BOF. Source of monitoring data: records of poaching and theft of timber maintained at District office; deer impact evaluations used as a basis for DMAP requests; Forest Pest Management Division assessments of insects and disease. BOF periodically monitors for the following on State Forests: 1) Rare, threatened and endangered species and/or their habitats	**OBS 09/11**

		(qualitatively evaluated during stand inspection prior to management activity; PNDI database); 2) Common and rare plant communities and/or habitat (CFI and stand-level inventories); 3) Location, presence and abundance of invasive species (site-specific evaluations to represent the State Forest; see new report and procedure *Non-Native Species Monitoring Report 2010*); 4) Condition of protected areas, set-asides and buffer zones (unknown for protected areas; set –asides and buffer zones are assessed by the District Forester in his/her approval of harvest areas); 5) High Conservation Value Forests (see findings associated with Criterion 9.4). Growth rates, regeneration, and condition of the forest are monitored at least every 5 years. Source of monitoring data: CFI inventories; stand-level inventories associated with silvicultural treatments. Final evaluation of a regenerating stand is set for 20 years post silvicultural intervention, but regeneration is informally assessed in these stands on a regular basis, particularly during the first 5 years after cut. Monitoring is conducted by BOF to ensure that site-specific plans and operations are properly implemented, environmental impacts of site disturbing operations are minimized, and that harvest prescriptions and guidelines are effective. Source of monitoring data: harvest inspection and close-out forms completed by foresters on at least a weekly basis during active timber harvest operations. Condition and environmental impacts of the forest-road system are included in harvest inspections. In addition, BOF road maintenance crews monitor all state forest roads annually. BOF informally and formally monitors relevant socio-economic issues. They do not track the creation and/or maintenance of local jobs in a formal way. BOF does track timber sale volumes, which provides an indication of related jobs. BOF contributes to the development of jobs through its support of local economic development, but it is not possible for the number of jobs to be quantified due to varying and external factors. The BOF monitoring of public responses to management activities by public reporting of timber sales and including information on how to contact the BOF with feedback/input. Surveys of public satisfaction with management operations are periodically conducted, as are town hall meetings for public input on management decisions. Results of these surveys and meetings are formally recorded and kept on file at District offices. BOF works with the Pennsylvania Heritage and Museum Commission to monitor the management of sites of special significance. No sites were observed during the audit. BOF maintains detailed records on the costs of forest management activities. The state Controller's Office oversees all FME financial transactions. **<u>Gas Lease Arena</u>** Nearly all monitored elements of forest management accounted for	

		in the above findings associated with Criterion 8.2 are included in monitoring for gas development effects (see 8.1 for a summary of monitoring associated with O&G development). It is commonly not necessary to monitor for some elements due to those elements being avoided during the siting process, e.g., RT&E species and communities. Once a project is under construction BOF relies in part on DEP for site-specific monitoring of direct impacts from drilling operations (e.g., road sediment, spills, leaks, etc.). DEP monitoring personnel report being understaffed and they do not have the time to visit all phases of each operation, and cannot respond to all spills. Because DEP does not have the resource to visit all sites frequently, DEP relies on self-reporting from the gas companies. Thus, there are potential gaps in the monitoring of gas drilling operations (**OBS 09/11**). SRBC monitors watershed level impacts, including the levels and biological integrity of larger creeks and rivers. SRBC is setting up a remote, real-time monitoring program that will be available on the Web and is partnering with DCNR to put a number of stations on SFL.	
8.3	NE		
8.4	NE		
8.5	Yes	As observed in the 2008 assessment: > BOF's Executive Summary contains the Montreal Process's monitoring indicators as a summary of monitoring used on state forest lands. In addition, BOF's website includes the SFRMP District Forest Plans, 2007 update documents, and numerous links to annual reports of various monitoring programs. However, there is not a single annual report that compiles all of the various monitoring results. These findings led to an observation which is modified here, with emphasis on need for a summary of monitoring information as more specifically required in the new FSC-US Forest Management standard (**OBS 10/11**). **<u>Gas Lease Arena</u>** Monitoring data from oil and gas development has been collected by the BOF for decades, with increased monitoring efforts over the last few years associated with the expansion of gas leasing. BOF has not fully reported nor summarized for the public all of these oil and gas data. For example, DEP incident reports with connection to O&G development on state forests over the last two decades are held by BOF, but were not collectively reported on or summarized. The summary of these incidents reported in this audit report associated with Criterion 6.5 findings were compiled by Robert Bryan, the lead SW/FSC auditor, not by BOF (**CAR 06/11**).	**OBS 10/11** **CAR 06/11**
Principle 9. MAINTENANCE OF HIGH CONSERVATION VALUE FORESTS			
9.1	No	As reported in the 2010 audit report, during 2008-2009, BOF conducted the required analysis for all State Forest Lands and documented the findings. Documentation reviewed by the audit team, at that time, included:	**CAR 07/11**

		• —High Conservation Value Identification, Management, and Monitoring Processes within the State Forest System: A Corrective Action Request Response" (HCVF EMS1.doc), which is the primary response to CAR 08/08. • HCV Maps.pdf • Screen shot of HCV4 assessment tool The 2010 audit determined that: —Tthe HCVF EMS1.doc analysis addresses each of the six High Conservation Values (HCV) potentially present and found that all are present on the forest. The assessment process included appropriate data sources and range of stakeholders." At that point, BOF designated the entire forest as HCVF. The auditors determined that PADCNR had taken an aggressive approach to designating HCVF and placed more acres in HCVF than was appropriate given the requirements in the standard and under new guidance (the FSC-US HCVF Assessment Framework). At the time of this designation, the HCVF Assessment Framework was in draft form and clear guidance on interpreting and implementing the HCVF concept was just emerging. The 2010 audit also identified a new potential nonconformance with Criterion 6.10 and HCVF. Under Criterion 6.10, conversion of HCVF is not allowed. Since, BOF had, in error, designated the entire forest as HCVF. CAR 04/10 was issued; however, since some lands were incorrectly designated as HCVF, conversion of actual HCVF was not occurring. CAR 04/10 has been closed in this report; for details see above for findings to close CAR 04/10. Prior to this audit, BOF provided the audit team with a corrected High Conservation Value Forest (HCVF) assessment. The corrected assessment includes 245,737 acres designed as HCVF (reduced from 2.14 million acres indicated in the 2010 report). The new HCVF designation includes all Wild Areas and Natural Areas (WNAs). The BOF has determined that the designation of WNAs correlates closely with the HCVF definitions and is consistent with their 2009 HCVF assessment. Due to their conservation value, WNAs have been designated as HCV1 (Significant concentrations of biodiversity) HCV2 (Significant large landscape level forests), and HCV3 (Rare, threatened or endangered ecosystems). While currently, all WNAs are designated as HCVF, there are small portions where sub-surface rights had previously been severed or leased to others. There is no conversion allowed on HCVF. Since the potential for conversion is largely outside of the control of BOF, if the sub-surface right holder decides to exercise their rights which would result in a conversion of acreage in a WNA to non-forest use, BOF would have to excise the area before it is converted (as per the FSC excision policy (20-003)) in order to remain in conformance with the FSC standard. (Note: Only the specific areas that are directly converted need to be excised.) The corrected HCVF assessment has not been formally vetted with stakeholder or otherwise formalized to reflect the recent changes. Therefore, a new CAR has been issued for BOF to formally revise their HCVF assessment. BOF must correct the HCVF assessment and ensure the HCVF designation is consistent with FSC standards and polices (**CAR 07/11**).	

		Since there was a previous nonconformance with the Indicator, FSC procedures require that this be issued as a major CAR. Due to the complexity of the issue, the size of the FMU and that PA DCNR BOF manages public land, in order for BOF to complete a thorough revision to their HCVF assessment (utilizing their full, detailed planning process); BOF has six (6) months to address this CAR. Additionally, BOF has already completed an HCVF assessment and HCVF areas are currently designated and protected, this extended time frame is appropriate. The following gaps were identified with the current (corrected) HCVF assessment: 1. BOF has not provided the audit team with an updated assessment appropriate to the scale and intensity of its forest management. There was a) no information provided as to what definitions, information sources, and other criteria were used to identity each of the six HCVs (such as that found in the —High Conservation Value Forest Toolkit or the FSC-US HCVF Assessment Framework, or similar definitions and guidance developed by BOF in consultation with stakeholder and scientists), and b) no assessment showing why areas the selected areas were included why and other potential HCVF areas were not. For example, was no evidence provided as to what criteria were used to identify *"globally, regionally or nationally significant: concentrations of biodiversity values (e.g. endemism, endangered species, refugia)"* (HCV 1), why BOF Wild Areas and Natural Areas contain this value, or why other areas on the forest such as concentrations of rare, threatened, and endangered species mapped by the Pennsylvania Natural Heritage Program (PNHP) do not include HCV 1. There was a similar lack of definition, criteria, and analysis for each of the other five HCVs. 2. Municipal watersheds were considered to be HCVF prior to revision of the HCVF assessment, but subsequently none were included as HCVF. In the revised assessment BOF stated that municipal watershed resource values are not at risk from standard forest management activities. While conservation practices are in place to protect municipal watershed values, that is not a reason to exclude any area from consideration as to its potential as an HCVF. If an area has high conservation values, appropriate management is addressed as described under Criterion 9.3. SmartWood recognizes that previous interpretation of HCVF guidance was that municipal watersheds should be designed as HCVF. Current interpretation is that HCVF guidance in the standard should be used by the FME to determine if municipal watersheds are HCVF but municipal watershed are not automatically considered HCVF.	
9.2	No	The 2008 assessment found that BOF had conducted adequate stakeholder consultations for the areas included as HCVF at that time. Additionally, the 2010 audit found that the assessment process and consultation addressed all six HCV elements, designated and mapped areas with the identified HCVs, and met the requirements of Criteria 9.1 and 9.2. The areas that are currently included as HCVF (Wild Areas and Natural Areas) have been subject to extensive stakeholder consultation and review. However, BOF has recently corrected the	**CAR 08/11**

		HCVF assessment. BOF did not consult with stakeholders and scientist to confirm that the revised areas with HCVF attributes and resulting HCVF were properly identified, nor was there a public review process to review the changes in the HCVF assessment (**CAR 08/11**).	
9.3	Yes	Potential old growth areas that are under study as potential HCVF (pending outcome of the old growth analysis) are reserved from harvesting. Areas identified as HCVF (Wild Areas and Natural Areas) are excluded from timber harvesting and other site-disturbing activities. This approach should protect the HCV values identified. BOF cooperates and participates with various state and federal agencies that own and manage other HCV areas (e.g., state parks, Allegheny National Forest). BOF is active on advisory committees regarding the planning and management of lands throughout Pennsylvania (e.g., Ecosystem Management Advisory Committee). An update of the HCVF assessment has been posted in the executive summary of the management plan on the BOF Web site. Management and protection policies for these areas are included in the original 2003 FMP, which is available on the PADCNR Web site at http://www.dcnr.state.pa.us/forestry/sfrmp/eco.htm#natural.	
9.4	Yes	Monitoring procedures have been summarized in the document —PA BOF HCVF Monitoring Matrix.doc" (10-1-09). This process enabled BOF to clearly describe its annual monitoring procedures. The audit team confirmed that annual monitoring procedures for the current HCVF (Wild Areas and Natural Areas) continue as described in the last annual audit. See 2010 audit report, CAR 10/08 for details. Wild and Natural areas are monitored annually through forest pest surveillance flights, forest fire detection flights, and on the ground reconnaissance by foresters, maintenance staff, rangers, and state forest users going about their day to day activities. Natural Areas defined by unique community types that create seasonal use patterns such as Bear Meadows (Blueberry/Huckleberry flat) receive increased monitoring by rangers and District managers during high use season to monitor and potentially mitigate use impacts to the biological communities in these areas. Other natural areas defined by communities under threat (such as the Hemlocks Natural Area) receive monitoring from both District staff, forest pest management staff, and Ecological Services staff to monitor treatment effects and community changes. Rangers monitor gated roads in Wild Areas to detect evidence of illegal ATV or OHV intrusion into these areas.	
Principle 10. PLANTATIONS			
10.1	NE		
10.2	NE		
10.3	NE		
10.4	NE		
10.5	NE		
10.6	NE		
10.7	NE		
10.8	NE		
10.9	NE		

APPENDIX IV: Chain-of-Custody Conformance (confidential)

Note: This CoC Appendix is used for FMEs only selling standing timber, stumpage, logs and/or chips produced within a FMU covered by the scope of the certificate. FME certificate scopes that include primary or secondary processing facilities shall include an evaluation against the full FSC CoC standard: FSC-STD-40-004 V2. Refer to that separate report Appendix.

Definition of Forest Gate: (check all that apply)

☒	**Standing Tree/Stump:** FME sells standing timber via stumpage sales.
☒	**The Log Landing:** FME sells wood from the landing/yarding area.
☐	**On-site Concentration Yard:** Transfer of ownership occurs at a concentration yard under the control of the FME.
☐	**Standing Tree/Stump/Log Landing/On-site Concentration Yard WITH temporary implementation of COC-12 interim policy:** Transfer of ownership occurs to a non-certified logging company or other entity prior to delivery off-site to a FSC CoC certified operation but FME has procedures to control wood during transportation. (See COC-12 section below for specific requirements.) **Note: FSC requires that use of COC-12 be phased out since it is not consistent with current FSC standards. Phase out time frame is still to be determined but could be as early as 12/31/10. Contact your SmartWood project manager for more information.**
☐	**Off-site Mill/Log Yard:** Transfer of ownership occurs when offloaded at purchaser's facility.
☐	**Other:** *explanation*
Comments: The vast majority of timber is sold as stumpage during bid sales. BOF may also sell small quantities of dead timber commercially inoperable timber under firewood permits – in these cases the forest gate is the stump. Occasionally BOF cuts a small amount of timber during maintenance projects – in these cases the landing is the forest gate.	

Scope Definition of CoC Certificate:

Does the FME further process material before transfer at forest gate? *(If yes then processing must be evaluated to full CoC checklist for CoC standard FSC-STD-40-004 v2.)* **Note: This does not apply to on-site production of chips/biomass from wood harvested from the evaluated forest area.**	Yes ☐ No ☒
Comments:	
Is the FME a large scale operation (>10,000 hectares) or a Group Certificate? *(If yes then CoC procedures for all relevant CoC criteria shall be documented.)*	Yes ☒ No ☐
Comments: See CoC 1.3	
Does non-FSC certified material enter the scope of this certificate prior to the forest gate, resulting in a risk of contamination with wood from the evaluated forest area (e.g. FME owns/manages both FSC certified and non-FSC certified FMUs)?	Yes ☒ No ☐
Comments: See CoC 2.1	
Does FME outsource handling or processing of FSC certified material to subcontractors (i.e. milling or concentration yards) prior to transfer of ownership at the forest gate? *(If yes a finding is required for criterion CoC 7 below.)*	Yes ☐ No ☒
Comments:	
Does FME purchase certified wood from other FSC certificate holders and plan to sell that material as FSC certified? *(If yes then a separate CoC certificate is required that includes a full evaluation of the operation against FSC-STD-40-004 v2.).*	Yes ☐ No ☒
Comments:	
Does FME use FSC and/or Rainforest Alliance trademarks for promotion or product labeling? *(If FME does not nor has no plans to use FSC/RA trademarks delete trademark criteria checklist below.)*	Yes ☒ No ☐

Comments: See CoC 5

Chain-of-Custody Criteria *[FM-35 SmartWood Chain-of-Custody Standard for Forest Management Enterprises (FMEs)]*

1. Quality Management	
COC 1.1: FME shall define the personnel/position(s) responsible for implementing the CoC control system.	Yes ☒ No ☐
Findings: The primary person responsible for the COC system (Chief of Silviculture) has been identified in the written procedures.	
COC 1.2: All relevant staff shall demonstrate awareness of the FME's procedures and competence in implementing the FME's CoC control system.	Yes ☒ No ☐
Findings: Staff interviewed indicated awareness of the COC system and their responsibilities.	
CoC 1.3: FME procedures/work instructions shall provide effective control of FSC certified forest products from standing timber until ownership is transferred at the forest gate. *Note: For **large scale operations (>10,000ha) and Group Managers**, CoC procedures covering all relevant CoC criteria shall be documented.* Including: a) Procedures for physical segregation and identification of FSC certified from non-FSC certified material. **(If applicable)** b) Procedures to ensure that non-FSC certified material is not represented as FSC certified on sales and shipping documentation. **(If applicable)** *c)* Procedures to include FME FSC certificate registration code and FSC claim (FSC Pure) on all sales and shipping documentation for sales of FSC certified products. *d)* Recordkeeping procedures to ensure that all applicable records related to the production and sales of FSC certified products (e.g. harvest summaries, sales summaries, invoices, bills of lading) are maintained for a minimum of 5 years. *e)* Procedures to ensure compliance with all applicable FSC/Rainforest Alliance/SmartWood trademark use requirements.	Yes ☒ No ☐
Findings: All procedures listed above are applicable and are found in the document –Chain-of-Custody Guidelines.doc."	

COC-12: SW Interim Policy (COC Certification of Loggers and procedures for bridging gaps in the chain of custody)

☒ **Check if section not applicable (FME does not implement COC-12)**

COC-12 temporarily allows the FM/COC or COC certificate holder to include a non-certified logging contractor into their scope. For certified landowners, it extends the forest gate to the delivery point at the mill or log yard.

Note 1: FSC requires that use of COC-12 be phased out due to inconsistencies with current FSC standards. Phase out time frame is still to be determined but could be as early as 12/31/10. Contact your SmartWood project manager for more information.
Note 2: This is only applicable if the FME plans to pass on a FSC certified claim on sales of forest products from their FSC certified forests.

2. Certified Material Handling and Segregation	
COC 2.1: FME shall have a CoC control system in place to prevent the mixing of non-FSC certified materials with FSC certified forest products from the evaluated forest area, including: a) Physical segregation and identification of FSC certified from non-FSC certified material. b) A system to ensure that non-FSC certified material is not represented as FSC certified on sales and shipping documentation. **Note: If no outside wood is handled by FME within scope of certificate, mark as N/A.**	Yes ☒ No ☐ N/A ☐
Findings: a) There is little to no risk of mixing at the landing; however, procedures specify that certified and non-certified	

wood must be separated. b) BOF occasionally arranges harvests for other state agencies that are not certified (e.g. Bureau of State Parks). Procedures require that contracts specify ~~"N~~Not FSC Certified" for such sales.	
CoC 2.2: FME shall identify the sales system(s) or ~~"F~~Forest Gate", for each FSC certified product covered by the Chain of Custody system: i.e. standing stock; sale from log yard in the forest; sale at the buyer's gate; sale from a log concentration yard, etc.	Yes ☒ No ☐
Findings: The ~~"C~~Chain of Custody Guidelines" identifies the Forest Gates used by the BOF, as described above.	
CoC 2.3: FME shall have a system that ensures that FME products are reliably identified as FSC certified (e.g. through documentation or marking system) at the forest gate.	Yes ☒ No ☐
Findings: Sales contracts are used to identify FSC-certified wood. Timber sale contracts include the certificate number; and the words ~~"F~~FSC Pure" have been added to any new contracts issued after September, 2009. An example was reviewed during the annual audit.	
CoC 2.4: FME shall ensure that certified material is not mixed with non-FSC certified material at any stage, up to and including the sale of the material. **Note: If no outside wood is handled by FME within scope of certificate, mark as N/A.**	Yes ☒ No ☐ N/A ☐
Findings: See findings for CoC 2.1	

3. Certified Sales and Recordkeeping	
COC 3.1: For material sold with FSC claim the FME shall include the following information on sales and shipping documentation: a) FME FSC certificate registration code, and b) FSC certified claim: FSC Pure	Yes ☒ No ☐
Findings: See findings for CoC 2.3.	
CoC 3.2: FME shall maintain certification production and sales related documents (e.g. harvest summaries, invoices, bills of lading) for a minimum of 5 years. Documents shall be kept in a central location and/or are easily available for inspection during audits.	Yes ☒ No ☐
Findings: BOF procedures require that records be kept for 7 years.	
CoC 3.3: FME shall compile an annual report on FSC certified sales for SmartWood containing monthly sales in terms of volume of each FSC certified product sold to each customer.	Yes ☒ No ☐
Findings: Records of sales are maintained in digital form on BOF computers. Records of sales can be summarized and printed for any period or product desired. A summary of recent sales was provided to the audit team.	

4. Outsourcing	
CoC 4.1: FME control system shall ensure that CoC procedures are followed at subcontracted facilities for outsourcing and FME shall collect signed outsourcing agreements covering all applicable FSC outsourcing requirements per FSC--40-004 v-2.0 *FSC Standard for Chain of Custody* November 2007. **Note 1: If FME outsources processing or handling of FSC certified material the outsourcing report appendix is required.** **Note 2: Check N/A If FME does not outsource processing or handling of FSC material.**	Yes ☐ No ☐ N/A ☒
Findings: There is no outsourcing.	

5. FSC/Rainforest Alliance Trademark (TMK) Use Criteria

Standard Requirement:
The following section summarizes the FME's compliance with FSC and Rainforest Alliance trademark requirements. Trademarks include the Forest Stewardship Council and Rainforest Alliance/SmartWood names, acronyms (FSC), logos, labels, and seals. This checklist is directly based on the FSC labeling standard (FSC-STD-40-201 *FSC on-product labeling requirements* (version 2.0) and FSC-TMK-50-201 V1-0 *FSC Requirements for the Promotional Use of the FSC Trademarks by FSC Certificate Holders.* References to

the specific FSC document and requirement numbers are included in parenthesis at the end of each requirement. (Rainforest Alliance Certified Seal = RAC seal).	
General	
COC 5.1: FME shall have procedures in place that ensure all on-product and off product FSC/Rainforest Alliance trademark use follows the applicable policies:	Yes ☒ No ☐
Findings: COC 5.1 is addressed by the document "**FSC Logo Usage and Certification Referencing Guidelines for the Pennsylvania Bureau of Forestry**."	
COC 5.2: FME shall have procedures in place and demonstrate submission of all FSC/Rainforest Alliance/SmartWood claims to SmartWood for review and approval prior to use, including" a) On-product use of the FSC label/RAC seal; b) Promotional (off-product) claims that include the FSC trademarks ("Forest Stewardship Council", "FSC", checkmark tree logo) and/or the Rainforest Alliance/SmartWood trademarks (names and seal)(50-201,2.3).	Yes ☒ No ☐
Findings: a) BOF does not use on-product labeling. b) All applicable procedures for promotional use are included in the document "**FSC Logo Usage and Certification Referencing Guidelines for the Pennsylvania Bureau of Forestry**." All procedures were approved prior to the closure of CAR 6/10 in April 2010. There have been no new uses of the logos since that date.	
COC 5.3: FME shall have procedures in place and demonstrates that all trademark review and approval correspondence with SmartWood is kept on file for a minimum of 5 years (40-201, 1.10; 50-201, 2.4):	Yes ☒ No ☐
Findings: BOF COC procedures specify that approval correspondence with SmartWood is kept on file for a minimum of 5 years.	

Off-product / Promotional
☐ **Check if section not applicable (FME does not, and does not plan to use the FSC trademarks off-product or in promotional pieces)**
Note: promotional use items include advertisements, brochures, web pages, catalogues, press releases, tradeshow booths, stationary templates, corporate promotional items (e.g., t-shirts, cups, hats, gifts).
When applicable to the FME's promotional/off-product use of the trademarks, the criteria below shall be met: Yes ☒ No ☐
Findings: SmartWood has reviewed all uses of trademarks for consistency with the following indicators. Uses reviewed by the audit team were consistent with these requirements. The CoC auditor had questions on one logo use and DOF provided evidence of the approval.
COC 5.4: If the FSC trademarks are used for promotion of FMUs, FME shall limit promotion to FMUs covered by the scope of the certificate.
COC 5.5: In cases that the Rainforest Alliance trademarks are used (50-201, 13.1, 13.2): a) The FSC trademarks shall not be at a disadvantage (e.g., smaller size); b) The FSC checkmark tree logo shall be included when the RAC seal is in place.
COC 5.6: In cases that the FSC trademarks are used with the trademarks (logos, names, identifying marks) of other forestry verification schemes (SFI, PEFC, etc.), SmartWood approval shall be in place (50-201, 3.0).
COC 5.7: Use of the FSC trademarks in promotion of the FME's FSC certification shall not imply certain aspects are included which are outside the scope of the certificate (50-201, 1.6).
COC 5.8: Use of the FSC trademarks on stationery templates (including letterhead, business cards, envelopes, invoices, paper pads) shall be approved by SmartWood to ensure correct usage (50-201, 12.0).
COC 5.9: In cases that the FSC trademarks are used as part of a product name, domain name, and/or FME name, SmartWood approval shall be in place (50-201, 9.0, 10.0).

On-product

☒ **Check if section not applicable (FME does not, and does not plan to apply FSC labels on product)**

APPENDIX V: FSC Annual Audit Reporting Form: (confidential)

Forest management enterprise information:	
FME legal name:	Commonwealth of Pennsylvania, DCNR, Bureau of Forestry
FME Certificate Code:	SW-FM/CoC – 003821

1. Scope Of Certificate	
Type of certificate: single FMU	SLIMF Certificate: not applicable
Annual Sales Information	
Total Sales/ Turnover	$23,468,367.72 US$
Volume of certified product sold as FSC certified (i.e. FSC claim on sales documentation) (previous calendar year)	317270 m3
Value of certified product sold as FSC certified (i.e. FSC claim on sales documentation) (previous calendar year)	$21,095,107.35 US$

2. FME Information		
☐ No changes since previous report (if no changes since previous report leave section blank)		
Forest zone	Temperate	
Certified Area under Forest Type	Semi-Natural and Mixed Plantation Natural Forest	
- Natural	859497 hectares	
- Plantation	0 hectares	
- Semi-natural, mix of plantation and natural forest	9487 hectares	
Stream sides and water bodies	8543 Linear Kilometers	

3. Workers		
Number of workers including employees, part-time and seasonal workers:		
Total number of workers	604 workers	
- Of total workers listed above	531 Male	73 Female
Number of serious accidents	53 (compensation claims)	
Number of fatalities	0	

4. Forest Area Classification		
☐ No changes since previous report (if no changes since previous report leave section blank)		
Total certified area		868984 hectares
Total forest area in scope of certificate		868984 hectares
Ownership Tenure		**State/Public ownership**
Management tenure:		**state/public management**
Forest area that is: Privately managed State/Public managed Community managed	 0 hectares 868984 hectares 0 hectares	
Area of production forests (areas where timber may be harvested)		777596 hectares
Area without <u>any</u> harvesting or management activities: strict forest reserves		91388 hectares

5. High Conservation Values identified via formal HCV assessment by the FME and

respective areas			
☐ No changes since previous report (if no changes since previous report leave section blank)			
Code	HCV TYPES[1]	Description: Location on FMU	Area
HCV1	Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia).	Wild and Natural Areas	89,425 ha
HCV2	Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.	Wild Areas	57,896 ha
HCV3	Forest areas that are in or contain rare, threatened or endangered ecosystems.	Natural Areas	31,529 ha
HCV4	Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control).	None	0 ha
HCV5	Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health).	n/a	0 ha
HCV6	Forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).	n/a	0 ha
		TOTAL HCVF AREA	89,425 ha
		Number of sites significant to indigenous people and communities	0

6. Highly Hazardous Pesticide Use	
FME has a valid FSC derogation for use of a highly hazardous pesticide	☐ YES (if yes, fill in below) ☒ NO
Number of FSC highly hazardous pesticides used in last calendar year	0
Liters of FSC highly hazardous pesticides	0 liters
Number of hectares treated with FSC highly hazardous pesticides	0 hectares

[1] The HCV classification and numbering follows the ProForest HCVF toolkit. The toolkit also provides additional explanation regarding the categories. Toolkit is available at http://hcvnetwork.org/library/global-hcv-toolkits.

APPENDIX VI: SmartWood Database Update Form

Instructions: For each FSC certificate, SmartWood is required to upload important summary information about each certificate to the FSC database (FSC-Info). During each annual audit SW auditors should work with the certificate holder to verify that the information posted on FSC-Info is up to date as follows:

1. Print out current Fact Sheet prior to audit from FSC-Info website or direct link to fact sheets (http://www.fsc-info.org)
2. Review information with the FME to verify all fields are accurate.
3. If changes are required (corrections, additions or deletions), **note only the changes** to the database information in the section below.
4. The changes identified to this form will be used by the SW office to update the FSC database.

Is the FSC database accurate and up-to-date? YES ☐ NO ☒
(if yes, leave section below blank)

Client Information (contact info for *FSC* website listings)

Organization name			
Primary Contact		**Title**	
Primary Address		**Telephone**	
Address		**Fax**	
Email		**Webpage**	

Forests

Change to Group Certificate	☐ **Yes** ☐ **No**	**Change in # of parcels in group**	**total members**
Total certified area		**868,984 Hectares (or)**	**Acres**

Species (note if item to be added or deleted)

Scientific name	Common name	Add/Delete

Products

Product type	Description	Add/Delete

RA-Cert Division Headquarters
65 Millet St. Suite 201
Richmond, VT 05477 USA
Tel: 802-434-5491
Fax: 802-434-3116
www.rainforest-alliance.org

Audit Managed by:
United States Regional Office
801 Highway 3 North, Suite 201
Northfield, MN 55057
Tel: 507.663.1115
Fax: 507.663.7771
Contact person: Kara Wires, Forestry Technical Specialist
Email: kwires@ra.org

ACCREDITED
FSC-ACC-004

FM-06 19 April2012

Forest Management

2013 Annual audit

Report for:

Commonwealth of Pennsylvania, DCNR Bureau of Forestry

In

Harrisburg, PA USA

Report Finalized:	December 18, 2012
Audit Dates:	28-30/August/2012
Audit Team:	Stephen C. Grado C. Reed Rossell, Jr.
Certificate code:	SW-FM/COC-003821
Certificate issued:	January 1, 2009
Certificate expiration:	December 31, 2013
Organization Contact:	Chad R. Voorhees
Address:	Forest Resource Planner RCSOB 400 Market St. P.O. Box 8552 Harrisburg, PA 17105-8552

TABLE OF CONTENTS

1. INTRODUCTION 3

2. AUDIT FINDINGS AND RESULTS 3

2.1. AUDIT CONCLUSION 3
2.2. CHANGES IN FMES' FOREST MANAGEMENT AND ASSOCIATED EFFECTS ON CONFORMANCE TO STANDARD REQUIREMENTS: 4
2.3 EXCISION OF AREAS FROM THE SCOPE OF CERTIFICATE 4
2.4. STAKEHOLDER ISSUES *(COMPLAINTS/DISPUTES RAISED BY STAKEHOLDERS TO FME OR RAINFOREST ALLIANCE SINCE PREVIOUS EVALUATION)*: 4
2.5. CONFORMANCE WITH APPLICABLE NONCONFORMITY REPORTS 7
2.6. NEW NONCONFORMITY REPORTS ISSUED AS A RESULT OF THIS AUDIT 7
2.7. AUDIT OBSERVATIONS 8

3. AUDIT PROCESS 8

3.1. AUDITORS AND QUALIFICATIONS: 8
3.2. AUDIT SCHEDULE 9
3.3. SAMPLING METHODOLOGY: 10
3.4. STAKEHOLDER CONSULTATION PROCESS 10
3.5. CHANGES TO CERTIFICATION STANDARDS 11
3.6. REVIEW OF FME DOCUMENTATION AND REQUIRED RECORDS 12

APPENDIX I: FSC Annual Audit Reporting Form: 13

APPENDIX II: List of visited sites (confidential) 16

APPENDIX III: List of stakeholders consulted (confidential) 19

APPENDIX IV: Forest management standard conformance (confidential) 26

APPENDIX V: Chain-of-Custody Conformance (confidential) 46

APPENDIX VI: Rainforest Alliance Database Update Form 51

Standard Conversions

1 mbf = 5.1 m^3
1 cord = 2.55 m^3
1 gallon (US) = 3.78541 liters

1 inch = 2.54 cm
1 foot = 0.3048 m
1 yard = 0.9144 m
1 mile = 1.60934 km
1 acre = 0.404687 hectares

1 pound = 0.4536 kg
1 US ton = 907.185 kg
1 UK ton = 1016.047 kg

1. INTRODUCTION

The purpose of this report is to document annual audit conformance of Commonwealth of Pennsylvania, DCNR Bureau of Forestry (BOF), hereafter referred to as Forest Management Enterprise (FME).The report presents the findings of Rainforest Alliance auditors who have evaluated company systems and performance against the Forest Stewardship Council™ (FSC®) forest management standards and policies. Section 2 of this report provides the audit conclusions and any necessary follow-up actions by the company through nonconformity reports.

The Rainforest Alliance founded its previous SmartWood program in 1989 to certify responsible forestry practices and has grown to provide a variety of auditing services. Rainforest Alliance certification and auditing services are managed and implemented within its RA-Cert Division. All related personnel responsible for audit design, evaluation, and certification/verification/validation decisions are under the purview of the RA-Cert Division, hereafter referred to as Rainforest Alliance or RA.

This report includes information which will become public information. Sections 1-3 will be posted on the FSC web site according to FSC requirements. All appendices will remain confidential. A copy of the public summary of this report can be obtained on the FSC web site at http://info.fsc.org/.

Dispute resolution: If Rainforest Alliance clients encounter organizations or individuals having concerns or comments about Rainforest Alliance and our services, these parties are strongly encouraged to contact Rainforest Alliance regional or Headquarters offices directly (see contact information on report cover).Formal complaints or concerns should be sent in writing.

2. AUDIT FINDINGS AND RESULTS

2.1. Audit conclusion

Based on Company's conformance with FSC and Rainforest Alliance requirements, the audit team makes the following recommendation:	
☒	**Certification requirements met, certificate maintenance recommended** Upon acceptance of NCR(s) issued below
☐	**Certification requirements not met:**
Additional comments**:**	None
Issues identified as controversial or hard to evaluate.	Issues related to the abundance of white-tailed deer on the northern tier of Pennyslvania are highly controversial at this time. There is a divided stakeholder audience on this issue. No nonconformance was identified related to BOF management of deer; however, OBS 01/13 was issued related to stakeholder consultation. See Section 2.4 below for more details.

2.2. Changes in FMEs' forest management and associated effects on conformance to standard requirements:

There were no changes in the FME's forest management and no effects on conformance to standard requirements.

2.3 Excision of areas from the scope of certificate

☒Not applicable. Check this box if the FME has not excised areas from the FMU(s) included in the certificate scope as defined by FSC-POL-20-003.*(delete the rows below if not applicable)*

2.4. Stakeholder issues *(complaints/disputes raised by stakeholders to FME or Rainforest Alliance since previous evaluation)*:

Stakeholder consultation activities were organized to give participants the opportunity to provide comments according to general categories of interest based upon the audit criteria. The table below summarizes issues identified by the Rainforest Alliance audit team with a brief discussion of each based upon specific interview and comments received by the auditors.

FSC Principle	Stakeholder Comments	Rainforest Alliance Response
P1: FSC Commitment and Legal Compliance	The DCNR BOF mentioned a petition initiated by the Sierra Club that was circulating concerning the National Park Service. The issue is how the NPS is using the Land and Water Conservation Fund. The concern is that no funds are forthcoming to acquire lands to replace oil and gas development lands. The PA DCNR BOF is aware that it could be drawn into this issue. Several stakeholders mentioned this to the auditors as being a potential future issue relative to the PA DCNR.	Currently, this has not risen to the level of an issue for the FME.
P2: Tenure & Use Rights & Responsibilities	No comments received.	No response needed.
P3 – Indigenous Peoples' Rights	No comments received.	No response needed.
P4: Community Relations & Workers' Rights	Stakeholders acknowledged that not all social concerns can be addressed given budget constraints and competing interests on the land base (e.g., recreation and gas drilling). However, most stakeholders commented that the FME and its personnel show a genuine interest in trying to address clientele concerns (e.g., those of recreationists and adjacent landowners). It was also recognized that political influences	No response needed.

	are also a reality for any public agency. During the current audit, through stakeholder auditor contacts and auditor analysis of stakeholder lists provided by the Bureau of Forestry, it was determined that opportunity for public input was limited in some cases. Numerous comments were received by stakeholders indicating the BOF was engaged in credible forest management. However, there were some who indicated a less than satisfactory opinion. Certain groups (e.g., hunting organizations or associations, some enterprises within the gas and oil industry, environmental groups) were not included within the advisory group construct or other lines of communication and thus felt they were missing opportunities to provide public inputs to management, planning, and operations. For the most part, forest workers expressed satisfaction with their positions. A number of advisory group members, those who were not BOF employees, were satisfied with the way the BOF was managing the forest.	The Rainforest Alliance is aware of the many ways in which inputs are transferred to the BOF. However, certain groups and individuals expressed concern they were not included more explicitly in advisory committees, outreach activities, and/or stakeholder lists. **See OBS 01/13.** No response needed. No response needed.
P5: Benefits from the Forest	Numerous wood products industries were contacted by the auditors and asked for feedback about their relationship with PA DCNR BOF. All purchased wood from the PA DCNR BOF. One company noted that little wood has recently come up for sale and they wish more were available. Most companies had a market for FSC certified wood and stated that purchasing FSC certified wood from the BOF was critical for their business.	No nonconformance with the FSC standard was identified.
P6: Environmental Impact	According to some stakeholders, some BOF Districts may not be aggressive enough in implementing the DMAP program in light of the fact that the PA Game Commission (PGC) has reduced license sales of antlerless deer permits in the past few years, which may result in increased	BOF Districts all conduct DMAP surveys to help determine impacts of deer browsing on forest regeneration. Survey results are then used by each District to justify if a District needs to be enrolled in the DMAP program and how many coupons it should request from PGC. A BOF committee reviews

	browsing impacts on State Forests. Others have claimed that ecological factors in the State Forests do not warrant the use of the DMAP program or at least not to the extent it is currently being used.	each District's justification related to the DMAP program to ensure that Districts are adequately utilizing the DMAP program. No nonconformance with the FSC standard was identified.
	Acid rain, and not deer browsing, is the primary cause of poor regeneration across State Forests, particularly in the northern tier of Pennsylvania.	The Rainforest Alliance recognizes that acid deposition is potentially one factor that may be affecting forest regeneration. However, auditors observed numerous stands that contained both open areas and areas with deer exclosures, including some in the northern tier, and it was quite obvious that deer browsing is having a marked impact on forest regeneration. No nonconformance with the FSC standard was identified.
	BOF inappropriately tries to regenerate northern hardwood stands into Oak-Hickory stands.	BOF Foresters indicated that they rely on natural regeneration whenever possible, and they do not convert stand types. Foresters also consistently stated that they manage a stand based on what the site conditions and forest type dictates. Observations made by the auditors support these assertions. No nonconformance with the FSC standard was identified.
	BOF practices good forestry and manages harvest levels in a sustainable manner. BOF works hard to manage the State Forests, so that there is a diversity of successional stages and a balanced age-class distribution.	No response needed.
P7: Management Plan	Some stakeholders feel there is a lack of transparency in the development and revisions of the forest management plan [(i.e., the BOF State Forest Resource Management Plan (SFRMP)].	BOF's web site provides information on what goes into the SFRMP planning process. BOF provided numerous examples of ways stakeholders and the general public can provide comments before and after the draft SFRMP is developed. BOF has numerous advisory committees made up of a variety of stakeholder groups which provide input into the draft SFRMP. BOF holds numerous public meetings regarding the draft SFRMP across the state that are advertised by press releases. Public comments also can be posted on BOF's web site, by telephone, or by visits to the District Forest offices. BOF has a

		communications section that is dedicated to documenting and summarizing public comments which are then considered in the development of the SFRMP. No nonconformance with the FSC standard was identified.
P8: Monitoring & Assessment	BOF is doing a good job monitoring the impacts related to gas and oil development, and should continue its efforts as more development occurs on the forests.	BOF has recently hired additional staff members for monitoring gas impacts and activities.
P9: Maintenance of High Conservation Value Forest	BOF has done a good job soliciting stakeholder input on the designation of HCFVs. BOF also has appropriately designated HCVFs and is adequately protecting them.	No response needed.
P10 - Plantations	Not Applicable	Not Applicable

2.5. Conformance with applicable nonconformity reports

The section below describes the activities of the certificate holder to address each applicable non-conformity report (NCR) issued during previous evaluations. For each NCR a finding is presented along with a description of its current status using the following categories. Failure to meet NCRs will result in nonconformances being upgraded from minor to major status with conformance required within 3 months with risk of suspension or termination of the Rainforest Alliance certificate if Major NCRs are not met. The following classification is used to indicate the status of the NCR:

Status Categories	Explanation
Closed	Operation has successfully met the NCR.
Open	Operation has either not met or has partially met the NCR.

☒ Check if N/A (there are no open NCRs to review)

2.6. New nonconformity reports issued as a result of this audit

☐ Check if N/A (there are no new NCRs issued as a result of this audit)

NCR#:	01/13	**NC Classification:**	Major	Minor X
Standard & Requirement:		FSC-US National Forest Stewardship Standard Version 1.0, 6.1.a.		
Report Section:		Appendix IV		
Description of Nonconformance and Related Evidence:				
The Bureau of Forestry has a policy that Environmental Reviews, which include a PNDI search, will be conducted for all types of projects that will disrupt or alter the environment, such as impacts related to surface mining, oil and gas leasing, or new trail construction. During the visit to District 10 (Sproul State Forest), auditors examined impacts related to the annual Brandywine Enduro motorcycle race. Although observations indicated that the impacts on the forest from the race may be relatively minor, the District Forester indicated that an Environmental Review or a PNDI search had not been conducted for new sections of the course that were located in undisturbed portions of the forest, where there was potential for a state-				

listed plant species to occur.	
Corrective Action Request:	Organization shall implement corrective actions to demonstrate conformance with the requirement(s) referenced above. Note: Effective corrective actions focus on addressing the specific occurrence described in evidence above, as well as the root cause to eliminate and prevent recurrence of the nonconformance.
Timeline for Conformance:	Prior to next annual audit
Evidence Provided by Organization:	PENDING
Findings for Evaluation of Evidence:	PENDING
NCR Status:	OPEN
Comments (optional):	None

2.7. Audit observations

Observations can be raised when issues or the early stages of a problem are identified which does not of itself constitute a nonconformance, but which the auditor considers may lead to a future nonconformance if not addressed by the client. An observation may be a warning signal on a particular issue that, if not addressed, could turn into a NCR in the future (or a pre-condition or condition during a 5 year re-assessment).

OBS 01/13	**Reference Standard & Requirement:** FSC-US National Forest Stewardship Standard V1.0, 4.4.d
During the current audit, through stakeholder auditor contacts and auditor analysis of stakeholder lists provided by the Bureau of Forestry, it was determined that certain groups and individuals were not made aware of programs and activities where public inputs were being requested by the Bureau of Forestry. For example, certain groups (e.g., hunting organizations or associations, some enterprises within the gas and oil industry) were not included within the advisory group construct and thus felt they were missing opportunities to provide public inputs to management, planning, and operations.	
Observation The PA DCNR BOF should ensure: 1. Clearly defined and accessible methods for public participation are provided in both long and short-term planning processes, including harvest plans and operational plans; 2. Public notification is sufficient to allow interested stakeholders the chance to learn of upcoming opportunities for public review and/or comment on the proposed management; 3. An accessible and affordable appeals process to planning decisions is available. Planning decisions incorporate the results of public consultation. All draft and final planning documents, and their supporting data, are made readily available to the public.	

OBS 02/13	**Reference Standard & Requirement:** FSC-US National Forest Stewardship Standard V1.0, 8.2.d.1
Silviculture Section Chief indicated that regeneration surveys after harvests have been discontinued. However, it was unclear whether all stands are routinely visited by field foresters after harvests to ensure that adequate regeneration has occurred.	
Observation The PA DCNR BOF should ensure an inventory system is maintained that includes regeneration.	

3. AUDIT PROCESS

3.1. Auditors and qualifications:

Auditor Name	Stephen C. Grado	Auditor role	Lead Auditor
Qualifications:	Dr. Grado is a Society of American Foresters (SAF) Certified Forester/Forest Certification Auditor #1155 and Fellow, a Professor of Forestry, and the George L. Switzer Professor in the Department of Forestry at Mississippi State University. He received a Ph.D. in Forest Resources in 1992, a M.S. in Forest Resources and Operations Research in 1984, and a B.S. in Forest Science in 1979 at The Pennsylvania State University, State College, Pennsylvania. He also has a B.A. in Political Science from Villanova University near Philadelphia, Pennsylvania. Dr. Grado has served as a socio-economic assessor/auditor on 60 primarily Rainforest Alliance pre-assessments (1, lead; 3, team), assessments (12 lead, 20 team), USDA Forest Service Test Evaluations (2, SW team; 1, SGS team), and numerous annual field audits (16 lead, 5 team; 1 SFI team). In addition, he has served as an assessor/auditor for innumerable Rainforest Alliance chain-of-custody assessments/audits, and also served as a peer reviewer for numerous FSC certification FM/COC assessment reports. Dr. Grado is also certified to the ISO 9001:2008 standard for Quality Management Systems for Lead Auditors.		
Auditor Name	C. Reed Rossell, Jr.	Auditor role	Wildlife Ecologist
Qualifications:	Education: A.A.S in Wildlife, Hocking Technical College; B.S. in Wildlife Ecology & Management, West Virginia University; M.S. in Wildlife Ecology, University of New Hampshire. Experience: Reed has worked in the field of wildlife ecology, management and research for over 20 years. He is a certified Wildlife Biologist and author or co-author of 26 peer-reviewed articles on wildlife ecology and management. Reed is an independent contract biologist and a research associate in the Department of Environmental Studies at the University of North Carolina at Asheville. He has worked as an FSC Forest Management auditor (ecologist) since 2001. He completed the FSC Lead Auditor Training in 2008, FSC CoC training in 2009, and ISO 9001 Quality Management Systems training in 2010. Reed has participated in 41 Forest Management certification assessments and audits throughout the Appalachian, Lake States, Mississippi Alluvial Valley, Northeast, Ozark-Ouachita, Pacific Coast, and Southeast regions.		

3.2. Audit schedule

Date	Location /Main sites	Principal Activities
7/24/12-8/25/12	Off-site	Stakeholder notification sent out. Auditor review of FME information and documents provided by the Rainforest Alliance related to the annual audit. Transfer of documents to the auditor from the FME. Communications between the auditors and various stakeholders.
8/28/12	FME Main Office Harrisburg, Pennsylvania	Opening meeting, review of progress on OBSs (there were no open NCRs), Chain-of-Custody, FME records, and other documents.
8/28/12	District #6, Gallitzin State Forest, Pennsylvania	Brief meeting at the Babcock Maintenance Headquarters. Review of field conformance with FSC-US Standard. Interviews with FME employees and various stakeholders.
8/29/12	District #8, Clear Creek	Review of field conformance with FSC-US Standard.

	State Forest, Pennsylvania	Interviews with FME employees and various stakeholders.
8/29/12	District #14, Sproul State Forest, Pennsylvania	Review of field conformance with FSC-US Standard. Interviews with FME employees and various stakeholders.
8/30/12	FME Main Office Harrisburg, Pennsylvania	Interviews with FME employees and various stakeholders. Closing meeting, tentative findings on annual audit conformance, and further collection of documents, records, and other associated information by the auditors.
8/31/12-9/22/12	Off-site	Follow-up information and document review and stakeholder consultation, exchange of documents via e-mail between FME employees and the auditors.
Total number of person days used for the audit:11 = number of auditors participating 2**X**average number of days spent in preparation, on site and post site visit follow-up including stakeholder consultation5.5		

3.3. Sampling methodology:

Each year, the Rainforest Alliance has a goal of sampling at least three State Forest Districts. For the current audit, three Districts were sampled in western and Central Pennsylvania which included Districts 6 (Galitzen), 8 (Clear Creek), and 10 (Sproul). Galitzen and Clear Creek State Forest Districts had been visited for an annual audit since the last full assessment. The Districts included a range of sites including High Conservation Value Forest areas, recreational trails, timber harvest sites and other silvicultural activities, fenced and non-fenced forest stands, activities associated with reclaimed strip mine areas, Natural Areas, and a number of watersheds. During the audit 20 sites were visited.

Many sites within each District were chosen in response to stakeholder concerns about the forest and other resources (e.g., white-tailed deer populations and impacts to the forest, Enduro Trail impacts). Also, within each District the sampling process included a range of forest types, harvest methods, regeneration strategies, and species diversity. Active or recently completed harvests were selected to evaluate current impacts to soils, water, and existing vegetation, while closed harvests were sampled to observe longer-term impacts on resources and the amount of forest regeneration. Proximity to water courses was also a priority in selecting sites.

3.4. Stakeholder consultation process

The purpose of the stakeholder consultation strategy for this annual audit was threefold:

1. To ensure that the public is aware of and informed about the audit process and its objectives;
2. To assist the field audit team in identifying potential issues; and,
3. To provide diverse opportunities for the public to discuss and act upon the audit findings.

This process is not just stakeholder notification, but wherever possible, a process to secure detailed and meaningful stakeholder interactions. Stakeholder interaction does not stop after the field visits, or for that matter, after even a certification decision is made. The Rainforest Alliance welcomes, at any time, comments on certified operations and such comments often provide a basis for field assessment.

Prior to the actual PA DCNR audit, a public consultation stakeholder notification document was developed by the Rainforest Alliance and distributed by e-mail to it won internal stakeholder list

(n=169) and to those PA DCNR stakeholders with e-mails on their own lists. On July 24, 2012, the Rainforest Alliance sent out an initial 30-day notification via e-mail alerting stakeholders to the upcoming PA DCNR annual audit to take place from August 28-30, 2012.

Prior to, and during, the audit, PA DCNR BOF staff were interviewed in the office and at field sites. The auditors also made a series of telephone calls to various individuals on the above lists and to others who the auditor knew would be familiar with this FME. The Lead auditor also resent the stakeholder notification and a request for inputs on PA DCNR BOF forest management after the field visit was completed. This was sent to all stakeholders with e-mail addresses on the PA DCNR BOF stakeholder lists. Consultation was undertaken via e-mail and/or telephone to provide additional evidence for evaluation of PA DCNR BOF to the FSC-US standard requirements. Specific comments provided to Rainforest Alliance or the auditors also were summarized and addressed as described in Section 2.4. These included e-mails and field review of several forested areas or other items with issues identified as concerns to stakeholders.

Stakeholder Type	Stakeholders Notified (#)	Stakeholders Consulted/Providing Input (#)
Academia	24	3
Citizens Natural Resource Advisory Committee	16	1
Ecosystem Management Advisory Committee	33	0
Environmental and Conservation NGOs	36	5
Federal and State Government	16	5
FME Employees	32	32
Forest Industry	102	8
Forestry and Forest Products NGOs	15	0
FSC US	7	0
Hunting Organizations and Associations	3	3
Natural Gas Advisory Committee	18	0
Gas and Oil Companies	15	2
Other	33	0
Private Citizens	1	1
Rainforest Alliance	6	0
Regeneration Contractors	4	0
Snowmobile Advisory Committee	19	1
Strategic Advisory Committee	33	0
Vascular Plant Technical Committee	26	1

3.5. Changes to Certification Standards

Forest stewardship standard used in audit:	FSC-US Forest Management Standard (v1.0)
Revisions to the standard since the last audit:	☒No changes to standard. ☐Standard was changed (detail changes below)
Changes in standard:	None
Implications for FME:	Not applicable - no new requirements

3.6. Review of FME Documentation and required records

a) All certificate types

Required Records	Reviewed
Complaints received by FME from stakeholders, actions taken, follow up communication	Y☒N ☐
Comments: A list of complaints received by the FME from stakeholders that may or may not impact forest operations were provided to the auditors.	
Accident records	Y☒N ☐
Comments: A list of accidents or injuries incurred by FME employees and lists of reportable accidents or injuries for various activities (e.g., ATV-related incidents) were provided to the auditors.	
Training records	Y☒N ☐
Comments: A set of forms used to document training, as well as training sessions since the last audit were provided to the aduitors.	
Operational plan(s) for next twelve months	Y☒N ☐
Comments: Operational plans for the next 12 months were reviewed during this audit. The majority of the plans were future timber harvests which are goals established by the FME's Harvest Allocation model. There are no 12 month plans for most other operations.	
Inventory records	Y☒N ☐
Comments: The FME's latest inventory records were provided to the auditors.	
Harvesting records	Y☒N ☐
Comments: FME'sForest Products Statistical Report 2011 details harvest records and products sold during that year.	

APPENDIX I: FSC Annual Audit Reporting Form:

Forest management enterprise information:			
FME legal name:	Commonwealth of Pennsylvania, DCNR, Bureau of Forestry		
FME Certificate Code:	SW-FM/CoC – 003821		
Reporting period	Previous 12 month period	**Dates**	August 2011-August 2012

1. Scope Of Certificate	
Type of certificate: single FMU	SLIMF Certificate: not applicable
New FMUs added since previous evaluation	Yes ☐ No ☒

2. FME Information	
☐ No changes since previous report(if no changes since previous report leave section blank)	
Forest zone	Temperate
Certified Area under Forest Type	
- Natural	865,476 hectares
- Plantation	hectares
Stream sides and water bodies	8543 Linear Kilometers

3. Forest Area Classification			
☐ No changes since previous report (if no changes since previous report leave section blank)			
Total certified area (land base)			865476ha
1. Total forest area			865476ha
a. Total production forest area		765645ha	
b. Total non-productive forest area (no harvesting)		99831ha	
- Protected forest area (strict reserves)	ha		
- Areas protected from timber harvesting and managed only for NTFPs or services	99831ha		
- Remaining non-productive forest	ha		
2. Total non-forest area (*e.g., water bodies, wetlands, fields, rocky outcrops, etc.)*			0ha

4. High Conservation Values identified via formal HCV assessment by the FME and respective areas

☒ No changes since previous report (if no changes since previous report leave section blank)

Note: Some areas are designated as more than one HCV so the area per HCV or category in each HCV do not necessarily add up to overall total.

Code	HCV TYPES[1]	Description:	Area
HCV1	Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia).		ha
HCV2	Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of		ha

[1]The HCV classification and numbering follows the ProForest HCVF toolkit. The toolkit also provides additional explanation regarding the categories. Toolkit is available at http://hcvnetwork.org/library/global-hcv-toolkits.

	most if not all naturally occurring species exist in natural patterns of distribution and abundance.		
HCV3	Forest areas that are in or contain rare, threatened or endangered ecosystems.		ha
HCV4	Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control).		ha
HCV5	Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health).		ha
HCV6	Forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).		ha
		TOTAL HCVF AREA	ha
		Number of sites significant to indigenous people and communities	125

5. Workers		
Number of workers including employees, part-time and seasonal workers:		
Total number of workers	734workers	
- Of total workers listed above	640 Male	94 Female
Number of serious accidents	See PA DCNR Custom Injury Report	
Number of fatalities	0	

6. Pesticide Use		
☐ FME does not use pesticides. (delete rows below)		
FME has a valid FSC derogation for use of a highly hazardous pesticide		☐ YES ☒ NO
Non FSC highly hazardous pesticides used in last calendar year		
Name	Quantity (liters)	# of Hectares Treated
Glyphosate: N-(phosphonomethyl) glycine, isopropylamine salt	2600	29ha
Sulfometuron methyl {Methyl 2-[[[[(4, 6-dimethyl-2-pyrimidinyl) amino]-carbonyl] amino] sulfony] benzoate}	2356	26ha
Glyphosate: N-(phosphonomethyl) glycine, dimethylamine salt	2308	232ha
Glyphosate, isopropylamine salt	980	2ha
Triclopyr	784	63ha
Sethoxydim: 2-[1-(ethoxyimino) butyl-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	542	3ha
Glyphosate, N-(phosphonomethyl) glycine, isopropylamine salt	299	2ha
Aliphatic based petroleumoil	204	226ha
Isopropylamine salt of Imazapyr (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid)	204	226ha
Sethoxydim: 2-[1-(ethoxyimino) butyl]-5-[2-(ethylthio) propyl-3-hydroxy-2-cyclohexen-1-one	173	1ha
Glyphosate: N (phosphonomethyl) glycine,	117	1ha

dimethylamine salt		
Sethoxydim: 2-[1-(ethoxylmino) butyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	93	1ha
Metsulfuron methyl	61	1ha
Glyphosate	53	0ha
Sethoxydim: 2-[1-(ethoxyimino) butyl]-5-[2-(ethylthio) propyl]-3-hydroxy-2-cyclohexen-1-one	38	0ha
Alkylarylpolyoxykane ether, isopropanol and free fatty acids	30	7ha
Glyphosate, N-(phosphonomethyl)glycine,isoproplamine salt	8	0ha
Picloram: 4-amino-3, 5, 6-tricloropicolinic acid, potassium salt	2	2ha
Triclopyr: 3, 5, 6-tricloro-2-pyridinyloxy acid, butoxyethyl ester	2	2ha
Aminopyralid	0	4ha
Triclopyr: 3, 5, 6-tricloro-2-pyridinyloxy acid, triethylamine salt	0	4ha
Totals	10857	831ha

Note: Zero liters are due to a data entry backlog. The daily application log data (which includes liters applied) have not yet been entered into the system for projects using the listed chemicals. Liters applied are computed from the daily application log, which includes the application date(s), start/end times, applicator name(s), weather conditions, and gallons of solution applied for that period. This information is collected on-site during the actual application and entered into the system afterwards. Zero hectares are attributed to rounding.

APPENDIX II: List of visited sites (confidential)

FMU or other Location	Compartment/ Area	Site description / Audit Focus and Rationale for selection
District #6, Gallitzin State Forest	Ruffed Grouse/ Woodcock Habitat Project /14 acres	Viewed first year of a 5-year Ruffed Grouse/ Woodcock Habitat Project on 14 acres in collaboration with the Pennsylvania Game Commission. The goal was to annually cut aspen and shrubs to promote grouse and woodcock habitat and benefit non-game bird species.
District #6, Gallitzin State Forest	Project Oak Sale, Block 2, 06-2007BC01 /46 acres	Project Oak Shelterwood on Block 2. A previous improvement cut in the 1980s. A 2008 oak shelterwood sale that was fenced. High-quality site with abundant oak and poplar regeneration, with some oak mortality. Shelterwood residual basal area target of 110 sq.ft./acre.
District #6, Gallitzin State Forest	Brian and Marge Sale, Block 1, 06-2010BC04/23 acres	Retired beech salvage sale. Other valuable hardwoods maintained on-site. Sprayed for ferns. To be left as an unfenced area, and monitored for deer browsing impact. Will be fenced if needed. Supplemental black cherry tree planting. Clear boundary markings.
District #6, Gallitzin State Forest	Clear Shade Wild Area/2,791 acres	A black cherry, beech, and maple forest that includes Clear Shade Creek which is a native trout stream. Contains Fisherman's Path and the 5-mile loop John P. Saylor Trail, used for hiking, biking, and cross country skiing.
District #6, Gallitzin State Forest	Big T Timber Sale Block 1, 06-2010BC01/28 acres	A 2012 recently closed sale. Two oak shelterwood blocks and one black cherry block. Both oak blocks were fenced two weeks after harvest. Aiming for retention of 100 ft^2 of basal area on the oak blocks. Some hauling and road work to be completed. There was a road buffer area in Block 1.
District #6, Gallitzin State Forest	Culvert and Road Work near 2010 Railroad Grade Sale	Culvert and road work on Exceptional Value (EV) stream which is a tributary to Clear Shade Creek. Non-motorized activities permitted over the creek which includes hiking, biking and horseback riding. Viewed abundant aquatic wildlife species in the tributary. Viewed portion of snowmobile trail on road entering sale site.
District #6, Gallitzin State Forest	Restored Pot Ridge Strip Mine HCVF/11 acres	Reclaimed strip mine area designated as a HCVF. The FME maintains the roads. Issues with autumn olive. The site was prescribed burned. A 2012 native warm season grass planting with a clover buffer on perimeter. Habitat for four avian species of concern. To be mowed or burned to maintain grassland habitat on an as needed basis. Consultation with universities, the Pennsylvania Game Commission, and a local Audubon Chapter. Site to be monitored.
District #6, Gallitzin State Forest	Restored Pot Ridge Strip Mine /9 acres	Reclaimed strip mine area designated as a HCVF. Goal is to create grassland habitat for avian species. Sprayed in 2011 to achieve autumn olive mortality; however, often requires two years of treatments. Locust on-site to be evaluated for removal. Site to be mowed.

District #6, Gallitzin State Forest	Restored Pot Ridge Strip Mine /over 100 acres	Reclaimed strip mine area designated as a HCVF. Northern Harrier and Henslow Sparrow habitat. Further habitat improvements require consultation with the Pennsylvania Department of Environmental Protection.
District #6, Gallitzin State Forest	Restored Pot Ridge Strip Mine/30 acres	Reclaimed strip mine area designated as a HCVF. Small ridge containing Upland Sandpiper habitat, adjoining the 30-acre site. The FME will split this area into 5 units to include a control area and combinations of warm and cold season grass seeding. Goal is to expand on current upland sandpiper habitat. Strategy is to mow and herbicide in the fall, then spring burn, and plant.
District #6, Gallitzin State Forest	Laurel Run Division Food Plot Areas, Shortline Plot/20 acres	Food plot for wildlife which included planted pears and apples. Old homestead adjoined the site. Residual apple trees kept on-site. Food plot was planted in an area near electric utility lines, which can't support taller trees. DMAP Assistance Area #1355. Nelson food plot viewed from a distance.
District #8, Clear Creek State Forest	500 Flat 2, Blocks 1-4/56 acres	Proposed shelterwood harvest and expansion of group openings in sale area. A 1999 shelterwood harvest and group selection in buffer. Fenced in 1999, with gas well fenced in 2002. Planted pitch pine and dog hobble in openings. Prescribed fire and mowing of mountain laurel in 2010. Herbicide spraying on cut black gum stumps. Prescribed fire in spring 2012. Two on-site regeneration plots visited once per year. Viewed SMZ along a perennial stream.
District #8, Clear Creek State Forest	Painter Sale, Blocks 1-3, 08-1998BC05 and 08-2009BC04/46 acres	Primarily an oak forest. Shelterwood harvest in 2001. Woven fence installed in 2001. Salvage from storm damage in 2003. Ferns sprayed in 2005. A 35 acre overstory removal completed in 2010 on Blocks 1 and 2. On-site regeneration plot buried on landing. Wildlife snags abound. SMZ along an Intermittent stream protected with structured forest cover. Block 3 (11 acres) left as a two-aged buffer zone.
District #8, Clear Creek State Forest	Windfall Run, 08-1991BC03 and 08-1999BC03/47 acres	Primarily a red oak site with a number of other hardwood species. A 1993 shelterwood harvest. Fenced in 1993 and again with woven fencing in 1998. A 2002 overstory removal on 35 acres, with 12 acres left as a buffer. On-site regeneration plot Good regeneration. USDA Forest Service research site. Light meters outside blocks for baseline data. 2012 fence removal.
District #8, Clear Creek State Forest	Jim Town 2/50 acres	Along Clear Run Road, with a gas line adjoining the road. Overstory removal harvest in 2005. Two-aged management in the buffer area. Area left managed near neighbors for aesthetics. No fencing.
District #10, Sproul State Forest	Rattlesnake Enduro Area	Brandywine Enduro Trail. A 2012 site with a ford on Sandy Run. Laden with stone as were the trails leading in and out of the ford.
District #10, Sproul State Forest	Rattlesnake Enduro Area	Brandywine Enduro Trail. A 2011 section of trail with access blocked with logs. Trail was raked in and seeded; similar to a skid road, but narrower.
District #10, Sproul	10-2009BC03/70	Shelterwood cut in 2005. A 56 acre overstory removal

State Forest	acres	in 2010 and a 14 acre 2-age buffer removal. This was an area considered for leaving out fencing. Fenced area that previously had a drive through access. Vandalism led to creation of flap access. Prior to fencing red maple outgrew the deer's ability to utilize it. Looking to treat red maple to promote oak species. A multitude of tree species were observed in the fenced area.
District #10, Sproul State Forest	Rattlesnake Enduro Area	Brandywine Enduro Trail. In the Paddy Run Watershed Area, classified as an area of Exceptional Value. A 2011 section of trail with access blocked with logs. Two foot wide trail. Trail course changed through inspection and re-inspection by Forester.
District #10, Sproul State Forest	Rattlesnake Enduro Area	Brandywine Enduro Trail just used in July 2012. Not yet restored. Overstocked red pine stand with a basal area of about 170 ft^2 per acre. An uncommon stand on the State Forest. Access now blocked with logs.

APPENDIX III: List of stakeholders consulted (confidential)

List of FME Staff Consulted

Below are the list of stakeholders directly contacted during the on-site audit and those contacted by the audit team before, during, or after the visit and who provided feedback. All stakeholders lists associated with this FSC certification annual audit are maintained in the Rainforest Alliance U.S. Region Office (See Section 3.4 for details) and were not listed below due to their number.

List of other Stakeholders Consulted Name	Title	Contact	Type of Participation
Bodamer, Mark	PA DCNR-BOF, District #8, Clear Creek State Forest, Assistant District Forester	mbodamer@pa.gov	Field interview
Bowen, Rebecca	PA DCNR-BOF, Section Chief, Ecological Services	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 rebbowen@pa.gov	Opening meeting, field and office interviews, closing meeting
Briggs, Nate	PA DCNR-BOF, District #8, Clear Creek State Forest, Forest Technician	nbriggs@pa.gov	Field interview
Cassell, Seth	PA DCNR-BOF, Section Chief, Communications	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 717-783-0392 scassell@pa.gov	Opening meeting, e-mail contact, closing meeting
D'Amore, Doug	PA DCNR-BOF, District #10, Sproul State Forest, District Forester	ddamore@pa.gov	Field interview
Devlin, Dan	PA DCNR-BOF, State Forester	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 717-787-2105 ddevlin@pa.gov	Opening meeting, office interview, closing meeting
Eggen, Don	PA DCNR-BOF, Forest Health Manager	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 deggen@pa.gov	Opening meeting
Firestone, Chris	PA DCNR-BOF, Botanist, Ecological Services	570-724-8149 cfirestone@pa.gov	Field interview
Fitterling, Robert S.	PA DCNR-BOF, District #10, Sproul State Forest, Forester	rofitterli@pa.gov	Field interview

Gilbert, Carrie	PA DCNR-BOF, Botanist-Ecological Services	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 cagilbert@pa.gov	Field interview
Gilmore, Gary	PA DCNR-BOF, District #8, Clear Creek State Forest, District Forester	ggilmore@pa.gov	Field interview
Gundlach, Andy	PA DCNR-BOF, District #8, Clear Creek State Forest, Forest Technician	agundlach@pa.gov	Field interview
Haubrick, David	PA DCNR-BOF, District #8, Clear Creek State Forest, Program Specialist	dhaubrick@pa.gov	Field interview
Jones, Chris	PA DCNR-BOF, District #6, Gallitzin State Forest, Forester	chrijones@pa.gov	Field interview
Just, Emily	PA DCNR-BOF, Wildlife Ecologist-Ecological Services	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 emjust@pa.gov	Telephone interview
Keefer, Matt	PA DCNR-BOF, Assistant State Forester	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 717-214-3814 makeefer@pa.gov	Office and field interview, closing meeting
Lester, Mike	PA DCNR-BOF, Assistant State Forester-Forestry Services	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 717-783-7938 milester@pa.gov	Opening meeting, office interview, closing meeting
Long, John	PA DCNR-BOF, District #10, Sproul State Forest, Assistant District Forester	jtlong@pa.gov	Field interview
Maser, Mike	PA DCNR-BOF, District #6, Gallitzin State Forest, Assistant District Forester	mmase@pa.gov	Field interview
Miller, Scott	PA DCNR-BOF, Section Chief, Silviculture	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 scomiller@pa.gov	Opening meeting, field and office interviews
Moore, Chris	PA DCNR-BOF, District #10, Sproul State Forest, Forest Ranger	chrmoore@pa.gov	Field interview
Nelson, Mike	PA DCNR-BOF, District #6, Gallitzin State Forest, Forester	micnelson@pa.gov	Field interview

Petroski, Joe	PA DCNR-BOF, Section Chief, Geospatial Applications	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 jpetroski@pa.gov	Opening meeting, closing meeting
Plank, Chris	PA DCNR-BOF, Assistant State Forester	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 cplank@pa.gov	Closing meeting
Reyna, Rachel	PA DCNR-BOF, Section Chief, Rural and Community Forestry	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 rreyna@pa.gov	Office contact
Roeder, Zack	PA DCNR-BOF, Forest Resource Planner-Planning Section	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 zroeder@pa.gov	Opening meeting, field interview
Roth, Paul A.	PA DCNR-BOF, Section Chief, Resource Inventory& Monitoring	137 Penn Nursery Road Spring Mills, PA 16875-9621 814-364-5172 paroth@state.pa.us	Office interview, closing meeting
Salvato, Brian	PA DCNR-BOF, Silviculture Section, Program Specialist	bsalvato@pa.gov	Field interview
Schieb, Jake	PA DCNR-BOF, District #8, Clear Creek State Forest, Forester	jschieb@pa.gov	Field interview
Shultzaburger, Ellen	PA DCNR-BOF, Section Chief, Planning	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 eshultzaba@pa.gov	Opening meeting, e-mail contacts, field interview
Snyder, Dan	PA DCNR-BOF, District #6, Gallitzin State Forest, Forester	daniesnyder@pa.gov	Field interview
Sorgen, Dennis	PA DCNR-BOF, District #10, Sproul State Forest, Assistant District Forester	dsorgen@pa.gov	Field interview
Stauffer, Aura	PA DCNR-BOF, Wildlife Biologist	astauffer@pa.gov	Field interview
Stemmler, Terence	PA DCNR-BOF, District #6, Gallitzin State Forest, District Forester	155 Hillcrest Drive Ebensburg, PA 15931 814-472-1862 tstemmler@state.pa.us	Field interview
Swoger, Lee	PA DCNR-BOF, District #8, Clear Creek State Forest, Forester	lswoger@pa.gov	Field interview

Voorhees, Chad	PA DCNR-BOF, Forest Resource Planner-Planning Section	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 717-425-5368 chvorhees@pa.gov	Opening meeting, office and field interview, e-mail contacts, closing meeting
White, Randy	PA DCNR-BOF, Section Chief, Forest Fire Protection	Rachel Carson State Office P.O. Box 8552 Harrisburg, PA 17105-8552 ranwhite@pa.gov	Opening meeting

List of other Stakeholders Consulted

Name	Organization	Contact	Type of Participation	Follow -up Required[2]
Ali, Rocco	CNR Advisory Committee Member	roca_1@excite.com	E-mail contact	None
Allison, Steve	North American Wood Products, LLC	7007 SW Cardinal Lane, Suite 135 Portland, Oregon 97224 503-620-6655 503-799-9008 stevea@nawpi.com	E-mail contact	None
Anonymous	Private citizen	Bellefonte, PA	E-mail contact	None
Bennett, Nathan S.	Anadarko Petroleum Corporation, Regulatory Manager	33 West 3rd Street, Suite 200 Williamsport, PA 17701 570-244-4045 570-932-0776 nathan.bennett@anadarko.com	E-mail contact, telephone interview (conference call)	None
Caruso, Mike	Matson Lumber Company, FSC Certification Coordinator	132 Main St Brookville, PA 15825 814-849-5334	Telephone interview	None
Clark, Arthur	Sierra Club Pennsylvania Chapter, Oil & Gas Committee Co-chair, At-large Delegate, Chapter Executive Committee	717-458-2029 fsck100@gmail.com	E-mail contacts, telephone interview	None

[2]To indicate if the stakeholder has requested documented follow up on how their comments were addressed during the evaluation. TM shall provide public summary to stakeholders that request documented follow-up within 3 months of the closing meeting.

Craig, Bert	Kane Hardwood Division of Collins Pine Company, General Manager	Box 807 Kane, PA 16735 814-837-6941	Telephone interview	None
Diefenbach, Duane	Wildlife Ecology, U.S. Geological Survey Pennsylvania Cooperative Fish and Wildlife Research Unit, Leader and Adjunct Professor	Pennsylvania State University 404 Forest Resources Bldg. University Park, PA 16802 814-865-3992 drd11@psu.edu ddiefenbach@psu.edu	E-mail contacts	None
Drohan, Patrick	Assistant Professor of Pedology, APSS Department of Ecosystem Science and Management	The Pennsylvania State University 452 ASI Building University Park, PA 16802-3504 814-863-4246 padrohan@psu.edu	Telephone interview	None
Durgin, Philip R.	Legislative Budget and Finance Committee, Executive Director	Finance Building, Room 400A P.O. Box 8737 Harrisburg, PA 17105-8737 717-783-1600 pdurgin@lbfc.legis.state.pa.us	Office interview	None, unless he contacts RA and/or lead auditor for clarifications
Elliott, Lori	Executive Director Pennsylvania State Snowmobile Association, Snowmobile Advisory Committee	908 N. 2nd St. Harrisburg, PA 17102 717-41-6045 lori@wannerassoc.	E-mail contact	None
Ellis, Amy	Buehler Lumber Company	260 West Main St Ridgeway, PA 15853-1611 814-776-1121	Telephone interview	None
Eveland, John	Coalition of Concerned Sportsmen, Technical Advisor	412-601-0077	Telephone interviews	None
Harrion, Brad	American Hardwoods Industries, LLC, Blue Triangle Hardwood, Yard Manager	567 North Charlotte Ave Waynesboro, VA 22980 540-941-1463	Telephone interview	None

Hickman, Dennis	Co-owner and President, Hickman Lumber	P.O. Box 130 501 Main Street Emlenton, PA 16373 800-867-9441	Face-to-Face interview	None
Iannantuno, Jack	Eastern Pennsylvania Firearms Coalition, Co-Chair (among other groups)	610-730-1464 jack@indiconinc.com	Telephone interviews, e-mails contacts	Telephone calls and e-mails
Isaac, Bonnie L.	Collection Manager, Section of Botany, Carnegie Museum of Natural History, Vascular Plant Technical Committee	4400 Forbes Ave. Pittsburgh, PA 15213 (412) 622-3253 IsaacB@CarnegieMNH.Org	E-mail contact	None
Johnson, Nels	The Nature Conservancy, Pennsylvania Deputy State Director	717.232.6001	Telephone interview	None
Levavasseur, John	Hancock Forest Management. Allegheny Area Manager	P.O. Box 3304 202 East Main St. Smethport, PA 16749 814-887-9135 814-251-4982 jlevavasseur@hnrg.com	E-mail contact	None
Leventry, Justin N.	Governor's Advisory Council for Hunting, Fishing and Conservation, Governor's Sportmen's Liaison	Rachel Carson State Office P.O. Box 8767 Harrisburg, PA 17105-8767 717-772-9084 jleventry@pa.gov	Office interview	None, unless he contacts RA and/or lead auditor for clarifications
Lord, Bruce E.	Statistics Department, Assistant Professor	The Pennsylvania State University University Park, PA 16802 814-865-5212 bel@psu.edu	E-mail contacts	None
Martin, Chris	Anadarko Petroleum Corporation, Survey Land Manager for Pennsylvania and Ohio	33 West 3rd Street, Suite 200 Williamsport, PA 17701 chris.martin@ anadarko.com	Telephone interview (conference call)	None
Martin, Richard	Pennsylvania Forest Coalition, Coordinator	forestcoalition@aol.com	E-mail contact	None

Nelson, Dave	Glatfelter Pulp Wood Company	228 South Main St Spring Grove, PA 17362-1000 717-225-4711	Telephone Interview	None
Rosenberry, Chris	Pennsylvania Game Commission, Supervisory Wildlife Biologist	2001 Elmerton Avenue Harrisburg, PA 17110 717-787-5529 chrosenber.pa.gov	Telephone interview	None
Santucci, Randy	Unified Sportsmen of Pennsylvania, President	412-760-1492	Telephone interview	None
Schmidt, Jeff	Director Sierra Club PA Chapter, Director	jeff.schmidt@sierraclub.org 717-232-0101	E-mail contacts	None
Stout, Susan L.	USDA Forest Service, Northern Research Station, Project Leader	335 National Forge Road, P.O. Box 267 Irvine, PA 16329 814-563-1040 sstout@fs.fed.us	E-mails contacts	None
Tzilkowski, Wally	Professor of Wildlife, Retired	wmt@psu.edu	E-mail contact	None
Wasserman, John	Pennsylvania Forest Coalition	Tamarack, PA john@johnwasserman.com	E-mail contact	None

APPENDIX IV: Forest management standard conformance (confidential)

The table below demonstrates conformance or nonconformance with the Forest Stewardship Standard used for evaluation as required by FSC. The Rainforest Alliance Task Manager should provide guidance on which sections of the standard should be evaluated in a particular audit. Rainforest Alliance may evaluate only a subset of the criteria or principles of the standard in any one particular audit provided that the FME is evaluated against the entire standard by the end of the certificate duration. Findings of conformance or nonconformance at the criterion level will be documented in the following table with a reference to an applicable NCR or OBS. The nonconformance and NCR is also summarized in a NCR table in Section 2.4.All nonconformances identified are described on the level of criterion though reference to the specific indicator shall be noted. Criteria not evaluated are identified with a NE.

P & C	Conformance: Yes/No/ NE/NA	Findings	NCR OBS (#)
Principle 1: COMPLIANCE WITH LAWS AND FSC PRINCIPLES			
1.1	Yes	**Under 1.1.a.** The PA DCNR BOF was forth coming on outstanding complaints or investigations of important issues they are dealing with. There were no significant violations of any laws to report. There were three main items of concern: 1. The Pennsylvania Legislative Budget and Finance Committee, a joint committee of The Pennsylvania General Assembly, is looking into the "The Costs and Benefits of FSC Certification of DCNR Forests." This is a legal inquiry. 2. There is an issue related to the white-tailed deer and deer densitie particularly in the northern tier of the state. There is a perception t PA DCNR BOF is working with the Pennsylvania Game Commissi reduce the deer herd for a number of reasons, many unfounded. T are stakeholder issues relating to the DMAP program and the num DMAP allocations requested by the PA DCNR BOF. As a result, t an inquiry going on through a council titled the "Governor's Adviso Council for Hunting, Fishing and Conservation" on the deer issue r to the Pennsylvania Game Commission and the PA DCNR BOF. 3. There is a petition initiated by the Sierra Club going around concerning the use of Land and Water Conservation Fund lands and oil and gas leasing. Currently, this is an issue with the National Park Service related to the Land and Water Conservation Funds and how implementation of oil and gas leases are considered takings when there is such a large conversion of land and no funds are forthcoming to the fund to acquire lands to replace oil and gas development lands. The PA DCNR BOF State Forests, in regard to the oil and gas activity, could be drawn into this issue in the future. The PA DCNR is aware of discussions in this regard.	
1.2	NE		
1.3	Yes	**Under 1.3.a.** FME complies with relevant provisions of all applicable binding international agreements. Violations, outstanding complaints, or investigations in which the FME was involved were provided to the Rainforest Alliance during the annual audit. There were three	

		outstanding issues. See Indicator 1.1.a. There was an absence of evidence presented to, or otherwise brought to the attention of the auditors on any issues beyond those presented here.	
1.4	Yes	**Under 1.4.a.** There are no known situations where compliance with laws or regulations conflicts with FSC P&C compliance.	
1.5	Yes	**Under 1.5.a.** The FME currently has 34 full-time and 2 seasonal rangers employed specifically to prevent and mitigate illegal and unauthorized activities as well as provide for public safety through regular patrols. Additionally, the FME provides training for personnel classified as State Forest Officers, and this staff then also contributes to the monitoring related to illegal and unauthorized activities. Currently, there are 309 State Forest Officers FMU wide (See State Forest Officers 06112012.pdf). This document validates that the State Forest Officers and staff have been sworn in and are able to uphold state law on State Forest lands. The FME also has a significant number of gates, signage, clearly marked boundaries, and periodic staff presence on the forest to further secure its lands. **Under 1.5.b.** If illegal or unauthorized activities do occur, the proper actions are taken within the FME's jurisdiction under Pennsylvania state law. If any illegal or unauthorized activities occur outside of the FME's jurisdiction the case is handed over to the proper authorities. For 2012, citations were given for 224 infractions on the FMU's State Forests under their jurisdiction.	
1.6	NE		
Principle 2. TENURE AND USE RIGHTS AND RESPONSIBILITIES			
2.1	Yes	**Under 2.1.a.** The FME clearly has long-term rights to use and manage the FMU for the purposes described in its FMP. This has been legislatively mandated through various laws and acts. For example, The Department of Conservation and Natural Resources was created by the act of June 28, 1995 (P.L. 89, No. 18) (71 P.S. §§ 1340.101-1340.1103), known as the Conservation and Natural Resources Act. The Act, which is sometimes is referred to as Act 18, took effect on July 1, 1995. This gives the DCNR the legal authority authorizing the establishment and providing for the use and control of state forest land. Other uses of the land are established through varying legal agreements (e.g., campsite leases, gas and oil leases, surface use agreements, prospecting agreements). **Under 2.1.b.** The FME has procedures in place to identify and legally document established use and access rights associated with the FMU that are held by other parties. This process is described in its FMP. For timber sales Chapter V titled "Sale Design and Layout" is especially relevant. For example, when a timber sale is being planned the FME needs to determine if the sale is accessible. This includes public roads, weight restrictions, bonding requirements, seasonal hauling restrictions, the need for highway occupancy agreements, and any access needed to cross private land if necessary, and if so, whether landowners grant permission to cross the property.	

		Under 2.1.c. Boundaries on State Forests observed during the audit were clearly marked as viewed in the forest and on maps. Use rights such as recreational activities granted by special permit or for general recreation (e.g., use hiking trails and water courses) are clearly identified on the ground (e.g., through signage) and on maps. Prior to commencing forest management activities such as harvesting in the vicinity of these boundaries, these areas are identified through mapping and a pre-harvest consultation between the forester and the contractors.	
2.2	NE		
2.3	Yes	**Under 2.3.a.** Interviews with FME employees and stakeholders established that if disputes arise regarding tenure claims or use rights the FME initially attempts to resolve them through open communication, negotiation, accessing education material or third party opinions, field reviews, and/or mediation. If these good-faith efforts fail, federal, state, and/or local laws are employed to resolve such disputes. Specific references to this include a conflict resolution section in timber sale contracts and gas and oil leases. A document titled "Recreational User Conflict Resolution Principles" which is noted in the FMP outlines ways to minimize conflicts in this area as well. **Under 2.3.b.** The FME documents any significant disputes over tenure and use rights and presented several instances of such disputes, or the potential for such disputes, to the auditors. See also findings for Criterion 1.1 and 4.4.	
Principle 3. INDIGENOUS PEOPLES' RIGHTS			
3.1	NA	**Under 3.1.a.** There are no tribal lands relevant to the State Forest land under management. Thus tribal forest management planning and implementation carried out by authorized tribal representatives is not applicable. **Under 3.1.b.** There are no tribal lands relevant to the State Forest land under management. Therefore, there is no requirement to obtain informed consent regarding forest management activities from the tribes prior to commencement of forest activities.	
3.2	Yes	**Under 3.2.a.** There are no state forest lands adjacent to tribal lands or falling within watersheds that affect tribal lands. However, the FME did send letters to various tribes with a history in the state who may have a potential interest in the FME's forest planning and management. The letter requested input into the FMP and invited groups to participate in the identification of resources of interest such as culturally important sites. In general, there was little in the way of a response; however, the Eastern Delaware Nation did agree to participate in FME's Ecosystem Management Advisory Committee, although they haven't participated to date. **Under 3.2.b.** The FME takes a number of actions to ensure forest management does not adversely affect tribal resources should they exist in an	

		area of operation. Measures for protecting tribal resources are incorporated in the FMP and other policies and documents. For example, in their mandated “Environmental Reviews” for the initiation of any project on State Forest lands that may or will disrupt, alter, or otherwise change the environment, the FME is required to review and consider all relevant issues. This review specifically includes “Archeological Sites and Historic Sites.” The FME also has two documents titled “Archaeological Sites, Architectural and Cultural Resources” and “Archaeological Sites” that were provided to the auditors. The FME was made aware of most of these listed sites through communication with, and data provided by, the Pennsylvania Heritage and Museum Commission (PHMC). These files are referred to when operations are going to take place on a specific State Forest. There is also the ability to map sites should that be deemed appropriate, so forest workers can be informed of sensitive areas. For gas and oil activity, the FME follows the policies and procedures in the document titled “Guidelines for Administering Oil and Gas Activity on State Forest Lands” to ensure historical and cultural sites are receiving adequate protections.	
3.3	Yes	The FME has invited tribal representatives to consult in identifying sites of current or traditional cultural, archeological, ecological, economic or religious significance. In July 2009, the FME contacted a representative of the Eastern Delaware Nations, to request their review of the FME’s land base for customary use rights and significant sites. As of this audit, the FME had not yet received a response from the Eastern Delaware Nations. A representative had also been invited to participate as a provisional member of the FME’s EMAC. However, to date there has been no participation. Despite this lack of communication precautions are still taken by the FME. See Indicator 3.2.b.	
3.4	Yes	The FME does not receive or use tribal knowledge.	
Principle 4. COMMUNITY RELATIONS AND WORKERS' RIGHTS			
4.1	NE		
4.2	Yes	**Under 4.2.a.** As a state agency the FME is mandated to meet or exceed all applicable laws and/or regulations covering health and safety of employees and their families. There is a current statement titled “DCNR Safety and Health Policy Statement” which has been signed by the current Secretary of the DCNR. All employees are covered under the FME state health benefits and insurance options (See the document titled “Benefits Highlights & Contact Information).”The FME also has a safety program for its employees. For example, in an effort to promote safety awareness the FME implements the “Monthly Safety Tip Program.” District Foresters are asked each month to present and discuss a monthly tip, in addition to their already on-going daily safety awareness efforts. The FME also asks that staff document these meetings and the topics. They are also asked to maintain this documentation for auditing purposes. Documentation was provided to the auditors on safety training and records (See “DCNR Custom Injury Report” for the latter item).”	

		Under 4.2.b. The FME and its employees and contractors demonstrate a safe work environment. There is a written requirement in all contracts for health and safety standards to be met. Contracts, or other written agreements, include safety requirements. These were provided to the auditors (See the "DISTRICT TIMBER SALE CONTRACT"). Check boxes are included on the forester's "Timber Sale Inspection and Completion Report" form to ensure contractors use PPE and it is monitored weekly. There were no active forest operations visited during this audit; however, field visits found all FME staff equipped with appropriate safety equipment, which was also made available to the auditors. **Under 4.2.c.** The FME hires well-qualified service providers to safely implement the FMP.As noted on the "Timber Sale Inspection and Completion Report" from, wood buyers are required to provide proof that crew leaders have valid Pennsylvania SFI core level training or comparable training from another state. The "DISTRICT TIMBER SALE CONTRACT" also requires that qualified loggers follow all state and federal safety regulations.	
4.3	NE		
4.4	Yes	**Under 4.4.a.** The FME's social impact analysis is used to better understand the social impacts of their forest management activities and ensure they are addressed in the SFRMP and manifested in the implementation of their forest operations. This analysis is continually reviewed, especially during updates to its SFRMP, to determine if new social impacts are occurring that may need to be incorporated into forest management and planning. In addition to this effort, there are numerous FME advisory committees that have been set-up whereby citizens and special interest groups can provide inputs to further the FME's understanding of social impacts related to forest planning and management activities. The Citizens Natural Resource Advisory Committee (CNRAC), Recreation Advisory Committee (RAC), and Ecosystem Management Committee (EMAC), to name a few, all have representation from across the Commonwealth, and include people with varied backgrounds. Some committee meetings with external groups (e.g., CNRAC) are open to the public. There is also an FME wide Communications Committee. In their totality, these committees help the FME incorporate and respond to public inputs related to social impacts. As a result of the above processes, the FME is continuing to understand and address all issues related to the social impacts of its forest management activities and incorporating them into forest management planning and operations. There were other avenues for the FME to understand potential social impacts. For example, for historical and archaeological sites, if a previously unknown archaeological site location (e.g., a native American village site) is discovered on land administered by the FME, the discovery must be relayed to District management and the FME's Planning Section without delay for evaluation and possible listing with the Pennsylvania Bureau for Historical Preservation (BHP).Care is taken to minimize disturbance of any new discovery. While the FME documents all sites, they are not revealed in a public summary, since this information would jeopardize the resource.	**OBS 01/13**

		The FME also has a Planning and Feedback Process document which made known to the auditors which outlines environmental reviews for new projects to aid the FME in understanding, minimizing, and/or avoiding social impacts. On initiation of any project on State Forest lands that may or will disrupt, alter, or otherwise change the environment, a review and consideration of environmental review items is required. A formal written project review, addressing the environmental review items must be completed by the District Forester and approved by the State Forester. Projects include but are not limited to wetlands encroachment; in-stream alterations; disturbance activities in a natural area including insect and disease control; timber management in a wild area; ROW expansions or new construction (e.g., pipelines or major powerlines); surface mining; oil and gas leases (excluding gas storage); large-scale stone removals; subsurface disturbance to caves; addition of public-use roads to the state forest road system; land acquisitions/exchanges, new trail construction; and large blocks of artificial regeneration (i.e., monocultures >10 acres).Some projects, such as timber sales, have developed checklists to facilitate environmental reviews. Included in all checklists for project reviews are a number of specific items. This includes “Archaeological and Historic Sites,” along with several other categories that would be of importance to tribal representatives. Again, while the FME documents this latter process, specific sites and activities surrounding them are not revealed in a public summary, since this information would jeopardize the resource. **Under 4.4.b.** The FME’s SFRMP makes a clear statement that it encourages ongoing public inputs for consideration on state forest land timber management activities, harvesting levels, harvesting plans, and business processes as well as other activities. The auditors were provided with a summary document titled “State Forest Resource Management Plan 2007 Update Process, Summary of Public Comments” dated June 10, 2008 (previously completed in 2003).It can also be located on the FME’s web site at http://www.dcnr.state.pa.us/forestry/sfrmp/Public_Comment_Summary_2007.pdf. This document describes how public inputs were collected, analyzed, and incorporated into forest management planning and operations for a number of other key areas of concern. Major topics of concern in the public summary were titled Recreation (e.g., motorized and non-motorized);Deer; Energy (e.g., oil and gas); Forest Health (e.g., invasives, pests); Silviculture and Forest Management; Specially Designated Areas; Land Acquisitions; Conservation Landscapes; Community Involvement; Education, and Outreach; and the Planning and Public Input Process. For each of the above topics, public inputs are used to change planning and implementation, if it is deemed necessary by the FME staff. For example, if recreational activities are perceived to cause extensive damage to the forest (e.g., the Rattlesnake Enduro), the FME will address this issue with both the recreationists, the public, and on-the-ground steps for remediation. During the current audit, this process was viewed first hand by the auditors on the Sproul State Forest. For the Rattlesnake Enduro, the FME has a Special	

		Activities Agreement with the trail ride sponsor to repair all damage within 30 days. The route must be approved in advance by the FME. The FME charges a fee for the event that includes 8 hours of ranger patrol during the event and 16 hours for course inspection after the event to identify needs for remediation. For a given race, the FME obtains a security deposit of $1,000 to be held until August 30th of that year or until any damages are repaired. Trails are rotated over a 3-year period and trails in various stages of rehabilitation and vegetative regeneration were viewed by the auditors. It was also noted that established roads are used for the races when possible, and that new trials are developed in less sensitive areas, while other sections of the trail in the forest are permanently closed. Those with an interest in the Marcellus Project and O&G drilling in general can use traditional means employed by the FME and previously discussed above to contact the FME and voice their opinions and provide inputs in forest management. The FME was shown to be responsive to considering these concerns. **Under 4.4.c.** The FME has procedures in its Silviculture Manual, Chapter 5 addressing adjacent landowner notification of their forest management activities. When a timber sale boundary is also a FME forest boundary, the FME will make a "good faith" effort to notify adjacent landowners of pending timber sales. The FME describes good faith efforts as: 1) face-to-face communication, 2) a letter describing the sale and providing contact information, and 3) for unknown landowners, signage along property boundaries defining the timber sale and providing contact information. The FME's planning process typically begins six months in advance of an actual harvest operation and at least a 30 day notification will be provided. Sample notification documents (i.e., letters) for timber harvests were provided to the auditors. Additionally, timber sales and notifications of types of activities on state forests are available on the FME's public Web site. Notifications of forest activities on state forest lands also are provided to municipal watersheds, state parks, camp lessees, trail clubs, and pipelines, and electrical line concerns. Other individuals and concerns are also notified of forest activity. As stated in the SFRMP's Silvicultural/Timber Management section, if federal or state listed fauna or flora species, or habitat critical to their survival, either presently known or subsequently identified, occur within or adjacent to a proposed timber management project area, the FME's wildlife biologists or botanists are notified prior to commencement of additional work. Wildlife biologists or botanists determine what, if any, changes to the project are necessary to protect any floral or faunal species or habitat. Also stated in the SFRMP, if archeological sites, either known or subsequently identified, occur within a proposed timber management project area, the FME's Resource Planning and Information Section will be notified prior to commencement of any additional project work. The Section will coordinate assessment of the site and needed protection measures with the PHMC. Those affected by the Marcellus Project and O&G drilling are	

		apprised of activities via traditional means employed by the FME and those previously discussed above. The FME also has modified its procedures in the Silviculture Manual, Chapter V. Section V. to address notification of O&G lessees and adjacent landowners of FME forest management activities. The FME must send a timber sale prospectus to the O&G lessee for all timber sales prepared on the O&G lease. In many cases the District Foresters and O&G operators work together to notify stakeholders on planned activities. For example, in the 2010 draft document titled "Administering Oil & Gas Activities on State Forest Lands" it states that "In the event that gas production from a newly completed well or a well that is being serviced, is required to be vented to the atmosphere and flared for safety reasons, the operator will first notify the District Forester of its plans at least 10 days before the anticipated flaring operation, and will second make provision to notify all stakeholders, as specified by the District Forester, of the planned event and provide for the consideration of special events that may be planned on state forest or state park lands during this time frame. The goal is to eliminate "surprises" to the local community and provide for an uneventful operation." Procedures for notification of the Pennsylvania Fish and Boat Commission, PEMA, local fire departments, local county conservation offices, and possibly the Susquehanna River Basin Commission (SRBC) Inspector are outlined in the document in case there is a suspected pollution event, a road collision involving gas supply trucking, or any other event that may have the potential to release substances into local waterways, vernal pools, wetlands or onto the soil on state forest lands. The "Administering Oil & Gas Activities on State Forest Lands" document EXHIBIT C, STIPULATIONS FOR PROTECTION AND CONSERVATION OF STATE FOREST LANDS contains a section on Historical and Archaeological Sites, with notification procedures for District Foresters. If a planned O&G activity falls within an area with a known archaeological resource, the FME contacts the PHMC, who then provides instruction on what, if any, survey work is needed. As directed by PHMC, the FME has only been required to conduct Phase 1 survey work (i.e., site visit, background research, testing, analysis). Typically, resources may be potentially impacted when there is surface disturbance that extends below the plow level (e.g., O&G activity such as impoundments or drilling, road building). Protection measures are developed based on the survey results. The FME also will inform the public about these sales through various print media. The FME is required to advertise competitive lease sales in a minimum of three (3) newspapers of general circulation in the area(s) where the sale will occur, once a week, for three (3) consecutive weeks. A copy of a "***Bidders Notice for Sealed Bids 2008" was provided to the auditors.*** Typically, leases are very large, sometimes involving, tens of thousands of acres, and notification is done more by public notices in the newspaper than by other means. The FME also typically issues a press release highlighting the sale specifics and who to contact with questions. Press releases are picked up by the Associated Press, Reuters, and other international media outlets and have generally made the evening (television) news. The FME also advertises lease sales in the weekly ***Oil and Gas Journal*** and ***IHS Drilling Wire***	

		industry publications. The FME also has an even more targeted notification approach when addressing O&G issues as well. The FME developed a 2010draft document titled “Marcellus Shale Communications Strategy” whose main purpose is to maintain current efforts and initiate new ones to inform stakeholders of the Marcellus Project and receive inputs by those affected by O&G activities. These groups are primarily state forest visitors, recreationists, private landowners, and environmentally concerned citizens. The strategy has five goals directed toward: (1) explaining why there is O&G activity on state forests, (2) providing information on forest ecosystem impacts and FME mitigation activities, (3) providing information to users of the state forest on how O&G activity will impact them, (4) providing avenues for interested or affected parties to make complaints about O&G activity, and (5) proving private landowners information on protecting and restoring forest resources. To adequately address these notification efforts the FME will use a web site, brochures, a FAQ document, and FME staff. For example, the Marcellus Project web site is considered a primarily tool for providing information and soliciting inputs on O&G activities (See “Oil and Gas on State Forest Lands,” http://www.dcnr.state.pa.us/forestry/oil_gas.aspx). In addition, each District Forest has a person dedicated to working with oil and gas development, with an emphasis on being available to receive public comments and monitoring drilling areas. The “Oil and Gas on State Forest Lands” web site also informs the public concerning proposed O&G activity (See for example, “Oil and Gas Leasing Offering”, http://www.dcnr.state.pa.us/forestry/gas lease.aspx). This site has offerings by date and provides maps on locations. The web site also contains a section summarizing public inputs title “Summary of Public Comments on Natural Gas Leasing” (See http://www.dcnr.state.pa.us/forestry/O&G/Oil_gas_comments_summary.pdf). Beginning in 2008, all materials associated with a PA DCNR competitive lease sales, including the State Forest Environmental Review documents, were posted on the PA DCNR-Bureau of Forestry web site (i.e., http://www.dcnr.state.pa.us/ forestry/marcellus/pdfs/SFER_2008_LeaseSale.pdf). Through an examination of the SFRMP and associated documents related to the O&G issue (e.g., “Administering Oil & Gas Activities on State Forest Lands,” “Administering Oil & Gas Activities on State Forest Lands,” “Marcellus Shale Communications Strategy,” “Oil and Gas on State Forest Lands” web site), public comments in the SFRMP and on the web site at “Summary of Public Comments on Natural Gas Leasing,” field visits during the audit, and through stakeholder outreach it was determined that the FME is doing a credible job addressing notification procedures related to O&G activity. **Under 4.4.d.** The FME’s web site has been updated since the last audit (http://www.dcnr.state.pa.us/forestry/index.aspx) and this site provides a conduit for commenting on FME activities. The FME’s Bureau of Forest Directories can be found on the web site	

		(http://www.dcnr.state.pa.us/forestry/directory/index.htm) and this also includes the Central Office Directory and the Forest District Directory. Thus all FME members can be contacted and comments communicated at a low cost. In addition, the FME's public consultation for FMP revisions includes advertised and clear methods for the public to comment on the FMP which is posted on the FME's web site(http://www.dcnr.state.pa.us/forestry/sfrmp/) as a draft and then as a final revision. Many public meetings were held throughout the state for the public to attend and provide comments. A summary of this consultation can be found on the web site (http://www.dcnr. state.pa.us/forestry/sfrmp/Public_Comment_Summary_2007.pdf), and it includes details on important public issues and inputs and how they are used for forest planning, management, and in operations. The FME has also developed an e-mail database to more efficiently reach out to stakeholders who request information or updates. Individual entries are categorized by their expressed specific interest areas, so e-mail contacts will only go out to those listed for those categories. As a result, the interested public can return comments on current activities ongoing in the forest. Consultations are also facilitated for short-term projects. For example, the FME has procedures in its Silviculture Manual, Chapter 5 addressing adjacent landowner notification of their forest management activities. When a timber sale boundary is also a FME forest boundary, the FME will make a "good faith" effort to notify adjacent landowners of pending timber sales. For further details see Indicator 4.4.c. above. These efforts have been shown to provide opportunities for consultation between the FME and the public. Notifications of forest activities on state forest lands, which also promote consultations, also are provided to adjoining landowners, municipal watershed authorities, state parks, camp lessees, trail clubs, pipelines, and electrical line concerns. Other individuals and concerns are also notified of forest activity. As stated in the FMP's Silvicultural/Timber Management section, if federal or state listed fauna or flora species, or habitat critical to their survival, either presently known or subsequently identified, occur within or adjacent to a proposed timber management project area, the FME's wildlife biologists or botanists are notified prior to commencement of additional work. Wildlife biologists or botanists determine what, if any, changes to the project are necessary to protect any floral or faunal species or habitat. Also stated in the FMP, if archeological sites, either known or subsequently identified, occur within a proposed timber management project area, the FME's Resource Planning and Information Section will be notified prior to commencement of any additional project work. The Section will notify the PHMC and work to coordinate an assessment of the site and needed protection measures. Through an examination of the FMP, the process and public comments in regard to the FMP, field visits during the audit, and through stakeholder outreach it was determined that the FME is doing a credible job addressing significant concerns related to forest management actions, evaluating site disturbing activities, and further	

		incorporating these concerns into its forest management planning and operations. These opportunities are low cost, and readily accessible to the public and special interest groups. Stakeholders acknowledged that not all social concerns can be addressed given budget constraints and competing interests on the land base (e.g., recreation and gas drilling). However, most stakeholders commented that the FME and its personnel show a genuine interest in trying to address clientele concerns (e.g., those of recreationists and adjacent landowners). It was also recognized that political influences are also a reality for any public agency. There is evidence in public documents and stakeholder comments that public input has affected policy decisions (e.g. trail building, approaches to gas development, pursuit of wind development, set asides of wild areas), as well as more localized site-specific decisions. However, during the current audit, through stakeholder auditor contacts and auditor analysis of stakeholder lists provided by the FME, it was determined that certain individuals and groups were not made aware of programs and activities where public inputs were being requested by the FME. For example, certain groups (e.g., hunting organizations or associations, some enterprises within the gas and oil industry, environmental groups) were not included within the advisory group construct and thus felt they were missing opportunities to provide public inputs to management, planning, and operations. **See OBS 01/13**	
4.5	NE		
Principle 5. BENEFITS FROM THE FOREST			
5.1	NE		
5.2	NE		
5.3		**Under 5.3.a.** The FME monitors utilization and works with contractors to encourage good utilization of all timber sold. Although there was no ongoing forest management operations in the Districts visited during the audit, recently completed timber sales provided evidence that the FME and its contractors are doing a good job to minimizing the loss and/or waste of harvested forest products. **Under 5.3.b.** The FME has numerous manuals and polices related to protecting forest resources, not to mention various laws and regulations that need to be followed. For example, the “PA DCNR BOF Silviculture Manual” Chapter 1 provides guidelines on protecting the forest from on-site operations, in particular in regard to rutting and erosion. Although there were no ongoing forest management practices in the Districts visited during the audit, recently completed jobs provided evidence that harvest practices were managed to protect residual trees and other forest resources. There was no evidence of soil compaction, rutting, or erosion. Timber Sales Contracts include a penalty clause related to damage of residual trees. Residual trees on timber sales were not significantly damaged to the extent that health, growth, or values would be noticeably affected. Also, damage to NTFPs was not in evidence as a result of past management activities. Fuel Wood/Mineral Permits are issued by the FME and provide guidelines on how to treat NTFPs. In addition, harvest sites had adequate woody debris. Through interviews with staff and documentation it was determined that techniques and	

		equipment are being used to minimize impacts to vegetation, soil, and water in all cases discussed.	
5.4	NE		
5.5	NE		
5.6	Yes	**Under 5.6.a.** The State Forest Resource Management Plan 2007 Update (SFRMP 2007) includes a Silviculture/Timber Section which provides a description with links to supporting documents of the sustained yield harvest level calculations (i.e., Harvest Allocation Model), and the goals and objectives of BOF's management and desired future forest conditions. The SFRMP 2007 contains harvest and growth rate projections for each district as well as for the BOF's forest as a whole; SFRMP 2007 indicates BOF is currently harvesting less than projected growth and will be for the next 40 years. Silviculture Section Chief indicated that the sustained yield harvest level calculations (Harvest Allocation Model) for each district take into account all the requirements specified under Indicator 5.6.a. Calculations are based on documented growth rates using updated Continuous Forest Inventory (CFI) data, including acreages of size classes and species distributions, and take into account silviculture practices commonly used by BOF. Harvest level calculations also incorporate mortality data from the CFI data. In addition, harvest calculations only include acreage from the Multiple Resource and Commercial land base and do not include reserve areas (e.g., Natural Areas, Wild Plant Sanctuaries). **Under 5.6.b.** Harvests have always been below sustained yield harvest calculations. **Under 5.6.c.** Observations by auditors indicted that the rates and methods of timber harvests will lead to achieving desired conditions and improve the health of the forest. District Foresters rely on the SILVAH Analysis (a computerized decision-support system) to estimate seeding potential and stocking levels of a harvest site, which also takes into account levels of deer browsing. This helps foresters determine whether a site should be fenced or not. Not every harvested site is fenced, and often a monitoring period takes place to determine if fencing is necessary. Overall, dollars spent and installed fencing has decreased in recent years. **Under 5.6.d.** For NTFPs, none are harvested in significant commercial operations or where traditional or customary use rights may be impacted by such harvests. In other situations, the FME utilizes available information, and new information that can be reasonably gathered through its permit system, to set harvesting levels that will not result in a depletion of the non-timber growing stocks or other adverse effects to the forest ecosystem. For example, the FME monitors harvesting of NTFPs at the District level using a permit system for each type of NTPFs (e.g., rocks, firewood, sawdust, poles, specific species of plants). Samples of permits were provided to the auditors.	
Principle 6. ENVIRONMENTAL IMPACT			
6.1	Partial	**Indicator 6.1.a.2**	**NCR 01/13**

	No	The FME has a policy that Environmental Reviews, which include a PNDI search, will be conducted for all types of projects that will disrupt or alter the environment, such as impacts related to surface mining, and oil and gas leasing, or new trail construction. During the visit to District 10 (Sproul State Forest), auditors examined impacts related to the annual Brandywine Enduro motorcycle race. Although observations indicated that the impacts from the race may be relatively minor, the District Forester indicated that an Environmental Review or a PNDI search had not been conducted for new sections of the course that were located in undisturbed portions of the forest, where there was potential for a state-listed plant species to occur. **See NCR 01/13.**	
6.2	Yes	The FME does a good job protecting rare, threatened and endangered (RT&E) species across its land base. Prior to each timber sale, a timber sale prospectus is developed and reviewed by the FME's Ecological and Silviculture Sections, which includes information on the results of a Pennsylvania Natural Diversity Index (PNDI) search. The PNDI provides data on the known locations of all state and federally listed plants, animals, and natural communities that occur in Pennsylvania. The FME incorporates adequate protection measures for any known locations of RT&E species or natural communities as a result of the review process for each timber sale. The FME takes appropriate precautions when an RT&E species is known to occur on a site. The FME staff contacts the appropriate experts to determine management options. BOF buffers all vernal ponds and other unique habitats as part of their pre-harvest preparations. The FME has protected nearly 1,000,000 acres of forest land under the State Bioreserve System (SBS), which includes areas that contain HCVF attributes, such as Natural Areas, Wild Plant Sanctuaries, and Special Resource Management Areas. Most FME foresters are state-designated law enforcement officers to help control illegal hunting, fishing, trapping, and collecting of plants.	
6.3	Yes	As observed by the auditors, the FME maintains, enhances, and/or restores under-represented successional stages in the FMU that would naturally occur on the types of sites found on the FMU. Where old growth of different community types that would naturally occur on the forest is under-represented in the landscape relative to natural conditions, a portion of the forest is managed to enhance and/or restore old growth characteristics. The FME has protected or promotes old growth of different forest types, as it has designated on about 33% of its land base for the promotion and maintenance of old growth forests in the Natural Areas, Wild Areas, and areas in the Limited Management Zones. The FME works closely with PA Natural Heritage Program (NHP) and has identified and protected rare ecological communities in its Plant Sanctuaries and Natural Areas. Existing old growth forests have been identified and are protected in designated Natural Areas. The FME's management maintains habitat conditions for well-distributed species by protecting almost 33% of their forest lands in special management zones, as well as through their maintenance of stream management zones (SMZs) at harvest sites.	

		The FME has developed Aquatic Habitat Buffer Guidelines which detail buffer widths for various stream classes and aquatic habitats. These guidelines meet, and in some cases exceed, the FSC Streamside Management Zone (SMZ) requirements for the Appalachia Region. Observations during the audit indicated that the FME does a good job of protecting streams and avoiding stream crossing whenever possible. A primary objective of the FME is to achieve and maintain a balanced age-class distribution across its forest lands. The SFRMP 2007 provides quantitative data of its forest lands. The FME's forest management also seeks to maintain and enhance plant species diversity and composition. The FME often utilizes fences around harvested areas which protect and promote plant species diversity that otherwise would be impacted by deer browsing. Observations during the field visits verified that there is forest regeneration, forest structure, and species diversity, with the latter occurring in both the future overstory and in the understory for non-arboreal flora. The FME utilizes natural regeneration, but when planting is required, tree species are used that would naturally occur on the site, and seedlings are obtained from local sources. The only exception to this is on a few designated food plots where some non-invasive fruit trees have been planted to add species diversity and increase food for wildlife. Observations by the auditors indicated that the FME does a good job maintaining habitat components at its harvests sites, including leaving adequate live tree retention, and maintaining snags and down woody debris. While the FME has the option to develop a qualified plan to allow minor departure from the opening size limits during harvest as described in Indicator 6.3.g.1.According to the FME, there have not been any recent instances where this was necessary. Observations in the field did not uncover any opening size limit departures. Control of invasive species on State Forest lands follows IPM protocols. The FME looks at economic and environmental impacts, timing, and efficacy, with herbicide use as a last resort. Rarely are chemicals used in natural areas and plant sanctuaries. The FME has developed a Seeding Monitoring Protocol for areas that are seeded after a harvest to prevent, control, and monitor the spread of invasive species.	
6.4	Yes	The FME has documented the ecosystems that would naturally exist on State Forest lands, and assessed the adequacy of their representation and protection in the landscape. The FME is also involved in a variety of local and regional planning initiatives related to the landscape. These efforts include working with PA Wilds; working with county planners and municipalities who affect regional zoning and other policies; participation in watershed committees and projects (e.g., Aquatic Community Classification multi-agency project); participating in the development of utility (e.g., ROW design and contractual regulations), transportation, and economic development plans; working with state agencies, local governments,	

		funders, and non-profit organizations to strategically work on seven state Conservation Landscape Initiatives; helping private landowners develop plans for managing forest resources on their property (Forest Stewardship Program) and planning and timber harvests; and cooperating and sharing knowledge with various special interest groups (e.g., TNC). In addition, the FME funds research projects through university departments that aid in appropriately facilitating local and regional planning initiatives. Interviews with FME employees, FME documentation, and several stakeholder interviews confirmed that these activities are taking place. The FME has conducted an adequate Representative Sample Areas (RSA) assessment. The SFRMP 2007 provides quantitative data on the amounts of land for each common forest type that occurs in Pennsylvania's State Forests. The FME has a robust GIS and works closely with the PA NHP as well as numerous other agencies for identifying and protecting unique natural communities. The FME has done an excellent job of establishing RSAs that serve all three purposes described under Criterion 6.4. The FME's Planning Section Chief indicated that the FME's RSA assessment is reviewed every five years concurrent with the FMP revision.	
6.5	NE		
6.6	NE		
6.7	Yes	**Under 6.7.a.** All FME field staff and contractors have received training in hazardous materials clean-up. **Under 6.7.b.** The FME has developed Spill Response and Clean-up Procedures which have been provided to all the Districts in the event of a hazardous material spill. In addition, all contractors are required to have spill kits at harvest sites, as specified in the Timber Sales Contracts. **Under 6.7.c.** The FME's Timber Sales Inspection Sheets also include a Sanitation section which has check boxes for litter removal, evidence of oil spills, and spill kits on site. Filled out sheets were shown to the auditors. Field observations indicated that all harvest sites were clean, with no evidence of trash or oil leaks. The FME field staff interviewed indicated that contractors do not park their equipment near streams or other aquatic habitats.	
6.8	NE		
6.9	Yes	**Under 6.9.a.** BOF generally does not use exotic species in its management and has a policy that no invasive species will be used on State Forest lands. BOF relies on the PA Department of Conservation and Natural Resources (DCNR) Invasive Species List to determine what species are invasive and should not be used for management. BOF has developed a Seeding Monitoring Guideline for monitoring the impacts and spread of various seed mixes (both native and non-native) when used for management. **Under 6.9.b.** The FME does not use invasive, exotic species in their	

		management. Locations of all seed mixes used are documented and their impacts are monitored under the Seeding Monitoring Guidelines. **Under 6.9.c.** The FME does not use invasive, exotic species in their management. Locations of all seed mixes used are documented and their impacts are monitored under the Seeding Monitoring Guidelines. If adverse impacts of a seeding mix are detected during monitoring, BOF will take appropriate action to mitigate the effects.	
6.10	NE		
Principle 7. MANAGEMENT PLAN			
7.1	NE		
7.2	Yes	**Under 7.2.a.** The FME's FMP is revised every five years. The revision process is comprehensive and thorough. It incorporates internal reviews to identify areas that need updating, including comments from advisory committees and public input, both prior to and after the draft FMP is developed.	
7.3	Yes	**Under 7.3.a.** Interviews with the FME's staff indicated that they are highly qualified and trained to carry out the objectives of the FMP. For example, the FME requires at least one person on a crew to have a chemical applicators license when chemicals are applied on the forest. In addition, the FME requires at least one crew member be a trained fire-fighter when prescribed fire is used on State Forest lands. The FME also requires all contractors to be qualified and trained to implement their respective components of the FMP. For example, all timber crews are required to have at least one person SFI certified. In addition, the FME's foresters conduct pre-harvest meetings with the contractors to ensure that all BMPs are followed and that all unique features of a site are recognized and protected. Staff also partake in various training workshops and short courses. For example documentation was given to the auditors on "SILVAH:OAK, Training in Ecology and Silviculture of Mixed Oak Forests" which was provided by the USDA Forest Service to the BOF. SILVAH is used as a guideline when managing the State Forests. Documentation on other training events and participation by the FME's staff were provided to the auditors.	
7.4	Yes	**Under 7.4.a.** BOF's FMP and numerous other supporting documents are posted on its web site and available to the public at no cost. **Under 7.4.b.** The FME strives to ensure that the public has input, prior to, and after the draft FMP is developed. The FME holds public meetings across the state to receive input on the draft. Advisory committees can also review the draft and have inputs to the process. The public is also able to post comments on the FME's web site. The FME reviews all public comments and summarizes the comments on its web site.	
Principle 8. MONITORING AND ASSESSMENT			
8.1	NE		
8.2	Yes	**Under 8.2.a.1.** The FME has a comprehensive monitoring strategy that includes numerous protocols which address all the Indicators and	**OBS 02/13**

		requirements under Criterion 8.2. For example, all commercially harvested timber products are tracked, and a comprehensive inventory system is maintained and updated on a regular basis. Nearly all monitored elements of forest management accounted for under Criterion 8.2 are included in monitoring for gas and oil development. It is not necessary to monitor for some elements due to those elements being avoided during the siting process, (e.g., RT&E species and communities). **Under 8.2.a.2.** The loss of forest resources is monitored in a variety of ways including through the Continuous Forest Inventory (CFI) plots, Landscape Exams, and aerial monitoring of insect and disease outbreaks by the Forest Pest Management Division. Records of poaching and theft of timber are maintained at District offices. **Under 8.2.b.** The FME tracks and maintains records of timber harvests and NTFPs. For the latter there is a permitting system for each respective NTFP (e.g., rock, firewood, poles, posts). **Under 8.2.c.** The FME works closely with PA NHP and other state and federal agencies for monitoring RT&E species and natural communities. The FME also conducts PNDI searches prior to all timber sales and other site disturbing activities. HCVF areas are also monitored. Roads are monitored by field staff and maintenance crews within each district. In addition, one BOF staff member for each district is dedicated to monitoring impacts related to gas development (e.g., pipelines, roads, drill sites, etc.). **Under 8.2.d.1.** All active timber harvests and other site disturbing activities are monitored by weekly inspections to ensure that site specific plans and operations are properly implemented. Close-out of harvest sites is also monitored via a close-out inspection. Silviculture Section Chief indicated that regeneration surveys after harvests have been discontinued. However, it was unclear whether all stands are routinely visited after the harvests to ensure adequate regeneration is occurring. **See OBS 02/13**. **Under 8.2.d.2.** Observations indicated that all roads traveled during the audit were in excellent condition. Inspections of timber harvest and other site disturbing activities are monitored by weekly inspections and include road assessments. **Under 8.2.d.3.** The FME informally and formally monitors relevant socio-economic issues. They do not track the creation and/or maintenance of local jobs in a formal way. The FME does track timber sale volumes, which provides an indication of related jobs. The FME contributes to the development of jobs through its support of local economic development, but it is not possible for the number of jobs to be quantified due to varying and external factors. The FME monitoring of public responses to management activities is facilitated by public	

		reporting of timber sales and including information on how to contact the FME with feedback/input. Surveys of public satisfaction with management operations are periodically conducted, as are town hall meetings for public input on forest management decisions. Results of these surveys and meetings are formally recorded and kept on file at the District offices. **Under 8.2.d.4.** The FME monitors stakeholder responses. It has a Communications Section which documents and addresses all stakeholder responses that are received through the Districts, web site, or phone. The FME closely monitors all costs and revenues of its forest management activities. Various sections of BOF are responsible for tracking costs and revenues. The state Controller's Office oversees all financial transactions. **Under 8.2.d.5.** Currently, there are no sites of cultural significance which provide an opportunity to jointly monitor such sites with tribal representatives. Contacts have been made with tribal representatives but thus far there has been no response. **Under 8.2.e.** As a state agency, the FME maintains detailed records on the costs of forest management activities. Much of this information is available to the public. The state Controller's Office oversees all FME financial transactions.	
8.3	Yes	**Under 8.3.a.** When forest products are being sold as FSC-certified, the FME has written procedures that prevents mixing of FSC-certified and non-certified forest products prior to the point of sale. From time to time, the Bureau of Forestry offers sales of timber on behalf of other state agencies. Currently, no other state agency is FSC-certified. Sales for other agencies are kept separate and are always kept separate from the sale of State Forest timber. **Under 8.3.b.** When using Bureau of Forestry contracts, procedures call for clearly labeling them as "FSC-Certified" or "non FSC-certified" in the upper right-hand corner of the first page of the contract. For the former, FSC Pure appears on the contract, and for the latter, no certification number will appear on these contracts. Documentation was provided to the auditors.	
8.4	Yes	**Under 8.4.a.** The FME is engaged in a number of monitoring activities. Similar to procedures for forest management activities, the FME is able to identify and monitor known sites related to O&G activity through communication with, and data provided by, the PHMC. Database information provided by the PHMC is not shared with external parties. In the broadest context, the FME has been made aware that most archaeological and historical sites in the state are located in valley bottoms and in close proximity to rivers-areas where the FME generally does not extends leases for O&G activity. On a site-specific level, the FME has access to a database of historic sites. Data is in tabular format and references are made to compartments that have known archaeological sites. If a planned activity falls within	

		a compartment with an archaeological or historical site, maps are then consulted that show the general site location. This search is conducted for every planned forest activity. No sites of this nature were observed during the audit. For RT&E species, the Pennsylvania Natural Diversity Index (PNDI) is searched by the FME prior to any earth disturbance to determine the possible presence of RT&E flora and fauna species of concern. If RT&E species are in close proximity to a planned O&G site, the site is relocated and/or adequate buffers are put in place to protect species of concern. **Under 8.4.b.** The FME's FMP is revised every five years and the results of monitoring, which include stakeholder input as well as monitoring of natural resources, are incorporated into the revisions of the FMP. If monitoring efforts and results indicate that management objectives, including those necessary for conformance with the FSC-US Standard, are not being met or if changing conditions indicate that a change in management strategy is necessary, the FMP, operational plans, and/or other plan implementation measures are revised accordingly. This was evidenced by the SFRMP 2007, which includes a discussion and data on how results of monitoring were incorporated into the FMP.	
8.5	NE		
Principle 9. MAINTENANCE OF HIGH CONSERVATION VALUE FORESTS			
9.1	NE		
9.2	NE		
9.3	NE		
9.4	Yes	**Under 9.4.a.** The FME currently monitors all designated HCVFs. Monitoring procedures have been previously summarized in the document "PA BOF HCVF Monitoring Matrix.doc" (10-1-09). This process enabled the FME to clearly describe its annual monitoring procedures. Many HCVFs are informally monitored by field staff during daily field operations. All management projects conducted in the forests (e.g., timber harvest, gas or oil projects, new trail construction) are checked against the GIS database to ensure that there are no impacts with HCVFs. In addition, many HCVFs are monitored through the CFI at five-year intervals (e.g., Wild and Natural Areas). Other HCVFs are monitored according to a schedule (e.g., Plant Sanctuaries and Ecological Focus Areas; 20 sites monitored/year). The FME has recently developed the document, "2011 High Conservation Value Forest Analysis and Identification" which provides a new framework for monitoring and managing HCVFs. Currently, the FME is developing individual management plans for each HCVF, which will include a monitoring strategy. At the time of the audit, all management plans had not been completed. **Under 9.4.b.** It was the auditors' opinion that all HCVFs are adequately being monitored and that modifications in management are implemented when HCVF attributes are at risk. For example, in the Hemlocks Natural Area (designated because of its old growth hemlock) the FME determined that the hemlock wooly adelgid was threatening the integrity of the site. The FME modified its policy of no management in Natural Areas, so that some of the trees could be treated with an insecticide.	

Principle 10. PLANTATIONS			
10.1	NA		
10.2	NA		
10.3	NA		
10.4	NA		
10.5	NA		
10.6	NA		
10.7	NA		
10.8	NA		
10.9	NA		

APPENDIX V: Chain-of-Custody Conformance (confidential)

Note: This CoC Appendix is used for FMEs only selling standing timber, stumpage, logs, chips and/or non-timber forest products (NTFPs) produced within a FMU covered by the scope of the certificate.FME certificate scopes that include primary or secondary processing facilities shall include an evaluation against the full FSC CoC standard:FSC-STD-40-004.Refer to that separate report Appendix.

Definition of Forest Gate:(check all that apply)

☒	**Standing Tree/Stump:** FME sells standing timber via stumpage sales.
☒	**The Log Landing:** FME sells wood from the landing/yarding area.
☐	**On-site Concentration Yard:** Transfer of ownership occurs at a concentration yard under the control of the FME.
☐	**Off-site Mill/Log Yard:** Transfer of ownership occurs when offloaded at purchaser's facility.
☐	**Other:** *explanation*
Comments: None	

Scope Definition of CoC Certificate:

Does the FME further process material before transfer at forest gate? *(If yes then processing must be evaluated to full CoC checklist for CoC standard FSC-STD-40-004 v2.)* **Note: This does not apply to on-site production of chips/biomass from wood harvested from the evaluated forest area or onsite processing of NTFPs.**	Yes ☐No ☒
Comments: FME does not process material before transfer at the forest gate.	
Is the FME a large scale operation (>10,000 hectares) or a Group Certificate? *(If yes then CoC procedures for all relevant CoC criteria shall be documented.)*	Yes ☒No ☐
Comments: FME is a large-scales operation exceeding 10,000 hectares.	
Does non-FSC certified material enter the scope of this certificate prior to the forest gate, resulting in a risk of contamination with wood/NTFPs from the evaluated forest area (e.g. FME owns/manages both FSC certified and non-FSC certified FMUs)?	Yes ☒No ☐
Comments: CoC procedures specify that certified and non-certified wood must be separated. From time to time, the Bureau of Forestry offers sales of timber on behalf of other state agencies. Currently, no other state agency is FSC-certified currently. Sales for other agencies are kept separate and are always kept separate from the sale of State Forest timber. If using Bureau of Forestry contracts, procedures call for clearly labeling them as "non FSC-certified" in the upper right-hand corner of the first page of the contract and no certification number shall appear on these contracts.	
Does FME outsource handling or processing of FSC certified material to subcontractors (i.e. milling or concentration yards) prior to transfer of ownership at the forest gate?*(If yes a finding is required for criterion CoC 4.1 below.)*	Yes ☐No ☒
Comments: There is no outsourcing of FSC-certified materials to subcontractors prior to transfer at the forest gate.	
Does FME purchase certified wood/NTFPs from other FSC certificate holders and plan to sell that material as FSC certified?*(If yes then a separate CoC certificate is required that includes a full evaluation of the operation against FSC-STD-40-004 v2.).*	Yes ☐No ☒
Comments: FME does not purchase certified wood/NTFPs from other FSC certificate holders.	
Does FME use FSC and/or Rainforest Alliance trademarks for promotion or product labeling? *(If FME does not nor has no plans to use FSC/RA trademarks delete trademark criteria checklist below.)*	Yes ☒No ☐
Comments: FSC and/or Rainforest Alliance trademarks are used for promotional purposes only. There is no on-product labeling.	

Annual Sales Information

Total Sales/ Turnover	25,523,096 US$
Volume of certified product sold as FSC certified (i.e. FSC claim on sales documentation) (previous calendar year)	220,830 m3of sawtimber;101,335 m3 of round pulpwood
Total volume of forest products harvested from certified forest area during reporting period defined in Appendix I above.	See note below*

*****Note: There was $20,940,000 in sales of FSC-certified wood. Differences in values from the total value above to the value of FSC certified sales, is based largely on lands cleared for gas pads, which the FME does not sell as FSC certified, and the addition of firewood permits, timber sold for right-of-way clearings (assessed as damages), and miscellaneous invoices. The FME does not have a total volume for these sales, since gas clearings are mostly charged at $5,000 per acre, firewood is sold as cords, and miscellaneous invoices are calculated as board footage.

Chain-of-Custody Criteria *[FM-35 Rainforest Alliance Chain-of-Custody Standard for Forest Management Enterprises (FMEs)]*

1. Quality Management	
COC 1.1: FME shall define the personnel/position(s) responsible for implementing the CoC control system.	Yes ☒ No ☐
Findings: The primary person responsible for the CoC system is the Silviculture Section Chief who has been identified in the written CoC procedures provided to the auditors.	
COC 1.2: All relevant staff shall demonstrate awareness of the FME's procedures and competence in implementing the FME's CoC control system.	Yes ☒ No ☐
Findings: Administration and staff interviewed indicated awareness of the CoC system and their responsibilities. Because all contracts with CoC information are issued from the central office and CoC ends at the stump or landing, field foresters are not routinely involved in CoC responsibilities.	
COC 1.3: FME procedures/work instructions shall provide effective control of FSC certified forest products (including NTFPs) from standing timber until ownership is transferred at the forest gate. *Note: For **large scale operations (>10,000ha) and Group Entities**, CoC procedures covering all relevant CoC criteria shall be documented.* Including: a) Procedures for physical segregation and identification of FSC certified from non-FSC certified material. **(If applicable)** b) Procedures to ensure that non-FSC certified material is not represented as FSC certified on sales and shipping documentation. **(If applicable)** *c)* Procedures to include the FME's FSC certificate registration code and FSC claim (FSC 100%) on all sales and shipping documentation for sales of FSC certified products. *d)* Recordkeeping procedures to ensure that all applicable records related to the production and sales of FSC certified products (e.g. harvest summaries, sales summaries, invoices, bills of lading) are maintained for a minimum of 5 years. *e)* Procedures to ensure compliance with all applicable FSC/Rainforest Alliance trademark use requirements. **Note 1: In the case of group certificates, the Group Manager must ensure Group Members implement CoC control system as defined in documents procedures/work instruction.** **Note 2: In cases where it is not possible or practical to include the FME's certificate registration code on shipping documents, the FMEs procedures shall provide for a clear, auditable link between the material included in the shipment, a FMU included in the scope of the certificate and the applicable sales documentation (i.e. harvest or procurement contract) that includes the required information detailed in c) above.**	Yes ☒ No ☐
Findings: All procedures listed above from a) through e) are applicable and located in the document "Chain-of-Custody Procedures" dated 9-16-2009.	

2. Certified Material Handling and Segregation	
COC 2.1: FME shall have a CoC control system in place to prevent the mixing of non-FSC	Yes ☒ No ☐

certified materials with FSC certified forest products from the evaluated forest area, including: a) Physical segregation and identification of FSC certified from non-FSC certified material. b) A system to ensure that non-FSC certified material is not represented as FSC certified on sales and shipping documentation. **Note: If no outside wood/NTFP is handled by FME within scope of certificate, mark as N/A.**	N/A ☐
Findings: a) There is little to no risk of mixing at the forest landing; however, CoC procedures specify that FSC-certified and non-certified wood must be separated. b) From time to time, the Bureau of Forestry offers sales of timber on behalf of other state agencies. Currently, no other state agency is FSC-certified currently. Sales for other agencies are kept separate and are always kept separate from the sale of State Forest timber. If using Bureau of Forestry contracts, procedures call for clearly labeling them as “non FSC-certified” in the upper right-hand corner of the first page of the contract and no certification number shall appear on these contracts.	
COC 2.2: FME shall identify the sales system(s) or “Forest Gate”, for each FSC certified product covered by the Chain of Custody control system: i.e. standing stock; sale from log yard in the forest; sale at the buyer’s gate; sale from a log concentration yard, etc.	Yes ☒ No ☐
Findings: The FME's “Chain-of-Custody Procedures” identifies the "Forest Gates “used for each FSC-certified product covered in its CoC control system.	
COC 2.3: FME shall have a system that ensures that FME products are reliably identified as FSC certified (e.g. through documentation or marking system) at the forest gate.	Yes ☒ No ☐
Findings: Sales contracts are used to identify FSC-certified wood. Timber sale contracts include the FSC certificate code; and the designation “FSC Pure” has been added to new contracts issued after September 2009. A sample of sales contract titled "TREE ESTIMATE TIMBER STUMPAGE SALE CONTRACT" was provided to the auditors.	
COC 2.4: FME shall ensure that certified material is not mixed with non-FSC certified material at any stage, up to and including the sale of the material. **Note: If no outside wood is handled by FME within scope of certificate, mark as N/A.**	Yes ☒ No ☐ N/A ☐
Findings: From time to time, the FME offers sales of timber on behalf of other state agencies. Currently, no other state agency is FSC-certified. Sales for other agencies are kept separate and are always kept separate from the sale of State Forest timber. If using Bureau of Forestry contracts, procedures call for clearly labeling them as “non FSC-certified” in the upper right-hand corner of the first page of the contract and no certification number shall appear on these contracts.	

3. Certified Sales and Recordkeeping	
COC 3.1: For material sold with FSC claim the FME shall include the following information on sales and shipping documentation: a) FME FSC certificate registration code, and b) FSC certified claim: FSC 100% **Note: In cases where it is not possible or practical to include the FME’s certificate registration code on shipping documents, the FMEs shall ensure there is a clear, auditable link between the material included in the shipment, a FMU included in the scope of the certificate and the applicable sales documentation (i.e. harvest or procurement contract) that includes the required information detailed above.**	Yes ☒ No ☐
Findings: Following its CoC procedures the FME's sales contracts are used to identify FSC-certified wood. Timber sale contracts include the FSC certificate code; and the designation “FSC Pure” has been added to new contracts issued after September 2009. A sample of sales contract titled "TREE ESTIMATE TIMBER STUMPAGE SALE CONTRACT" was provided to the auditors.	
COC 3.2: FME shall maintain certification production and sales related documents (e.g. harvest summaries, invoices, bills of lading) for a minimum of 5 years. Documents shall be kept in a central location and/or are easily available for inspection during audits.	Yes ☒ No ☐
Findings: FME "Chain-of-Custody Procedures" require that records be kept for 7 years.	
COC 3.3: FME shall compile an annual report on FSC certified sales containing monthly	Yes ☒ No ☐

sales in terms of volume of each FSC certified product sold to each customer. This report shall be made available to Rainforest Alliance staff and auditors during regular audits and upon request.	
Findings: Records of sales are maintained in digital form on FME computers. Sales records can be summarized and printed for any period or product desired. A summary of sales and volumes for the last full calendar year of operation was provided to the audit team and included in the document titled "Pennsylvania Bureau of Forestry Forest Products Statistical Report 2011."	

4. Outsourcing	
COC 4.1: FME shall obtain approval from Rainforest Alliance prior to initiating outsourcing of handling (e.g. storage concentration yards) or processing of FSC certified material to subcontractors.	Yes ☐ No ☐ N/A ☒
CoC 4.2: FME control system shall ensure that CoC procedures are followed at subcontracted facilities for outsourcing and FME shall collect signed outsourcing agreements covering all applicable FSC outsourcing requirements per FSC--40-004 *FSC Standard for Chain of Custody Certification.* **Note 1: If FME outsources processing or handling of FSC certified material the outsourcing report appendix is required.** **Note 2: Check N/A If FME does not outsource processing or handling of FSC material.**	Yes ☐ No ☐ N/A ☒
Findings: There is no outsourcing on the part of the FME.	

5. FSC/Rainforest Alliance Trademark (TMK) Use Criteria

☐ **Check if section not applicable (FME does not, and does not plan to use FSC trademarks)** **Standard Requirement:** The following section summarizes the FME's compliance with FSC and Rainforest Alliance trademark requirements. Trademarks include the Forest Stewardship Council and Rainforest Alliance names, acronyms (FSC), logos, labels, and seals. This checklist is directly based on the FSC standard.FSC-STD-50-001 *FSC Requirements for use of the FSC trademarks by Certificate Holders.* References to the specific FSC document and requirement numbers are included in parenthesis at the end of each requirement.(Rainforest Alliance Certified Seal = RAC seal).	
General	
COC 5.1: FME shall have procedures in place that ensure all on-product and promotional FSC/Rainforest Alliance trademark use follows the applicable policies:	Yes ☒ No ☐
Findings: The document titled "Chain-of-Custody Procedures" has guidelines in place to ensure that promotional FSC/Rainforest Alliance trademark use follows all applicable policies. There is no on-product labeling.	
COC 5.2: FME shall have procedures in place and demonstrate submission of all FSC/Rainforest Alliance claims to Rainforest Alliance for review and approval prior to use, including" a) On-product use of the FSC label/RAC seal; b) Promotional (off-product) claims that include the FSC trademarks ("Forest Stewardship Council", "FSC", checkmark tree logo) and/or the Rainforest Alliance trademarks (names and seal) (50-001, 1.1.6).	Yes ☒ No ☐
Findings: a) FME does not use on-product labeling. b) All applicable procedures for promotional use of FSC/Rainforest Alliance trademarks are included in the document titled "Chain-of-Custody Procedures"A sample of a recent trademark use approved by the Rainforest Alliance on 7/28/2011 (Case: 00049690) was provided to the auditors. This approval permitted the use of the FSC logo on the Rothrock State Forest brochure.	
COC 5.3:FME shall have procedures in place and demonstrates that all trademark review and approval correspondence with Rainforest Alliance is kept on file for a minimum of 5 years:	Yes ☒ No ☐
Findings: FME CoC procedures specify that approval correspondence is kept on file for a minimum of 5	

years.

Off-product / Promotional

☐ **Check if section not applicable (FME does not, and does not plan to use the FSC trademarks off-product or in promotional pieces)**

Note: promotional use items include advertisements, brochures, web pages, catalogues, press releases, tradeshow booths, stationary templates, corporate promotional items (e.g., t-shirts, cups, hats, gifts).

When applicable to the FME's promotional/off-product use of the trademarks, the criteria below shall be met:	Yes ☒ No ☐

Findings: The Rainforest Alliance has reviewed all uses of trademarks for consistency with the following indicators. Samples to validate this were provided to the auditors.

COC 5.4: If the FSC trademarks are used for promotion of FMUs, FME shall limit promotion to FMUs covered by the scope of the certificate.

COC 5.5: In cases that the Rainforest Alliance trademarks are used (50-001, 6.2):

a) The FSC trademarks shall not be at a disadvantage (e.g., smaller size);

b) The FSC checkmark tree logo shall be included when the RAC seal is in place.

COC 5.6: If the FSC "promotional panel" is used, the following elements shall be included: FSC checkmark logo, FSC trademark license code, FSC promotional statement, FSC web site address (50-001, 5.1).

Note: the promotional panel is a prescribed layout with a border available to certificate holders on the FSC label generator site.

COC 5.7: In cases that the FSC trademarks are used with the trademarks (logos, names, and identifying marks) of other forestry verification schemes (SFI, PEFC, etc.), Rainforest Alliance approval shall be in place (50-001, 7.2).

COC 5.8: Use of the FSC trademarks in promotion of the FME's FSC certification shall not imply certain aspects are included which are outside the scope of the certificate (50-001, 1.9).

COC 5.9: Use of the FSC trademarks on stationery templates (including letterhead, business cards, envelopes, invoices, paper pads) shall be approved by Rainforest Alliance to ensure correct usage (50-001, 7.3, 7.4 & 7.5).

COC 5.10: In cases that the FSC trademarks are used as part of a product name, domain name, and/or FME name, R approval shall be in place (50-001, 1.13).

On-product

☒ **Check if section not applicable (FME does not, and does not plan to apply FSC labels on product)**

APPENDIX VI: Rainforest Alliance Database Update Form

Instructions: For each FSC certificate, Rainforest Alliance is required to upload important summary information about each certificate to the FSC database (FSC-Info).During each annual audit RA auditors should work with the certificate holder to verify that the information posted on FSC-Info is up to date as follows:

1. Print out current Fact Sheet prior to audit from FSC-Info web site or direct link to fact sheets (http://www.fsc-info.org)
2. Review information with the FME to verify all fields are accurate.
3.If changes are required (corrections, additions or deletions), **note only the changes** to the database information in the section below.
4.The changes identified to this form will be used by the RA office to update the FSC database.

Is the FSC database accurate and up-to-date? YES☐ NO☒
(if yes, leave section below blank)

Client Information (contact info for *FSC* web site listings)

Organization name			
Primary Contact		**Title**	
Primary Address		**Telephone**	
Address		**Fax**	
Email		**Webpage**	

Forests

Change to Group Certificate	**☐Yes☐ No**	**Change in # of parcels in group**	**total members**
Total certified area		**865,476Hectares**	**2,137,727 Acres**

Species (note if item to be added or deleted)

Scientific name	Common name	Add/Delete

Products

FSC Product categories added to the FM/CoC scope ***(FSC-STD-40-004a)***		
Level 1	**Level 2**	**Species**

APPENDIX O
Public Outreach

Gas Tours 2013

Date	Group	District	responsibility	BOF Attendees
1/22/13	Audubon Magazine	12	Coordinate from C.O.	Jeff Prowant, C.O. staff
3/22/13	Romanian Reverse Trade	20	Coordinate at district level	Dale Weaver, Rich Glinski
4/8/13	Penn College/Jersey Shore	12	Coordinate at district level	Jeff Prowant, Dave Danko
4/18/13	Mitsui	12	Coordinate at district level	Jeff Prowant, Anadarko
4/30/13	DEP Regional Directors	12	Coordinate from C.O.	Jeff Prowant, Arianne Proctor
5/9/13	Budget Office	12	Coordinate from C.O.	Jeff P., C.O. staff
5/31/13	N. Assoc. Geosci. Teachers	12	Coordinate from C.O.	Jeff P., C.O. staff
6/5/13	Department of Revenue + HR	12	Coordinate from C.O.	Jeff P., C.O. staff
6/19/13	Bureau of Topo/Geo	12	Coordinate from C.O.	Jeff P., C.O. Staff
6/20/13	Clinton/Centre Co. Gas Task Forces	10	Coordinate from C.O.	Doug D., C.O. staff
6/27/13	Clinton/Centre Co. Gas Task Forces	10	Coordinate from C.O.	Doug D., C.O. staff
7/26/13	U.S. Congressional N.G. Caucus	20	Coordinate from C.O.	Rich Glinski, C.O. staff
8/16/13	South African Delegation	20	Coordinate from C.O.	C.O. Staff
8/29/13	E.U. Ambassador	20	Coordinate from C.O.	C.O. Staff
9/16/13	French and Lithuanian Embassy	20	Coordinate from C.O.	C.O. Staff
9/18/13	APC Environmental Representatives	12	Coordinate from district level	Tom Casilio, Anadarko
10/17/13	Penn State Engineering Dept.	12	Coordinate from C.O.	Tom Casilio, C.O. staff
11/13/13	Harrisburg Patriot Reporters	20	Coordinate from C.O.	Rich Glinski, C.O. Staff
11/21/13	DEP/DCNR Interns	12	Coordinate from C.O.	Jeff P., C.O. staff
12/5/13	Philadelphia Inquirer Reporter	20	Coordinate from C.O.	Rich Glinski, C.O. staff

Marcellus Shale Presentations given by Bureau of Forestry for Public Outreach

Group/Interested Party	Date
Potter County	September 2008
DCNR Bureau of State Parks	June 2010
Chesapeake Bay Program	November 2010
Chesapeake Bay Commission	October 2010
Conservation and Natural Resources Advisory Council	October 2010
Department of Environmental Protection	March 2009
ECO	April 2009
Emergency Management Assistance Compact	June 2010
DCNR Executive Staff	January 2010
FDC	May 2010
Forest Policy Class, PSU	November 2010
Forestry Task Force	March 2010
Forest Stewardship Council	August 2010
PA Game Commission	September 2008
Hunter Roundtable	October 2010
PA Fish and Boat Commission	October 2010
PALTA Conference	June 2008 and April 2010
Association of Petroleum Geologists	April 2009
PCWC	September 2010
Penn Nursery	March 2009
PennDOT	February 2010
Pine Creek Rail Trail Association	September 2008
PITT	February 2010
PA Natural Heritage Program	November 2011
Potter County Natural Gas Task Force	July 2010
PA Recreation and Parks Society	March 2010

PA State Association of Boroughs	October 2010
PSU	November 2009
RAC	May 2010
Real Estate Sub-Committee	March 2010
RESCUE	September 2008
Society of Petroleum Engineers	February 2010
Society of Women Environmental Professionals	September 2008
The Nature Conservancy	October 2008
Wildlife Society	March 2010
Wilds Planning	January 2010

APPENDIX P
Response to Public Comments

TABLE OF CONTENTS

I.	**PUBLIC COMMENTS RECEIVED**	**1**
	Jason Gulvas, email	2
	Harvey Katz, email	4
	Brian MacWhinney, email	5
	Laura Dickey, email	6
	Simonne Roy, email	7
	Jim Hanks, email	8
	Laura Wheeland Steele, email	9
	Roy Siefert, email	10
	Carol Haaf, email	11
	Stephen Kunz, email	12
	Janine Grisez, email	13
	Laura Horowitz, email	14
	Mary Ann Leitch, email	15
	Bill Ferris, email	16
	Judith Parker, email	17
	Carol Fleischman, email	18
	Jim Rice, email	19
	Scott Mato, email	20
	Jack Miller, email	21
	Martha Kirby, email	22
	bvhbarb@pa.net, email	23
	Larry Falcone, email	24
	Susan Babbitt, email	25
	Chris Minich, email	26
	Sharon Furlong, email	27
	Elaine Futej, Citizens for Clean Pennsylvania Water, email	28
	Christine Brubaker, email	29
	Dick Martin, PA Forest Coalition, email	30

Dick Martin, PA Forest Coalition, email #2 31
Henry, email 32
Pennsylvania Archaeological Council, letter 33
Sharon Wushensky, email 35
Sandra Clark, email 36
Roger Smith, email 37
Pennsylvania Environmental Defense Foundation, letter 38
Emily Krafjack, letter 48
Kim Van Fleet, email 50
PennFuture, letter 52

II. RESPONSES TO PUBLIC COMMENTS 61

Dick Martin, PA Forest Coalition 61
Multiple Parties 62
Pennsylvania Archaeological Council 63
Pennsylvania Environmental Defense Foundation 64
Emily Krafjack 68
Kim Van Fleet 68
PennFuture 69

I. PUBLIC COMMENTS RECEIVED

The Environmental Assessment (EA) document was posted on the PA Bulletin for review and public comment from May 4 to June 18, 2019. Thirty-eight comments from the public were received during the public comment period as emails and letters. All comments received are documented below. No members of the public requested a public hearing.

From:	jason gulvas <jgulvas@yahoo.com>
Sent:	Thursday, June 6, 2019 2:50 PM
To:	NR, BRC Conversions
Subject:	[External] Comment on "Resolution of Conversions from Recreational Use on LWCF-Funded State Forest Land"

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

To Whom This May Concern:

I received this article recently and was given the email address above to make comments:

"Some State Forest lands were purchased with Federal LWCF (Land & Water Conservation Fund) dollars. Since gas drilling has caused some of that land to be lost to hunting & trapping, DCNR must remediate those losses.

Oddly, a proposal is in the works to remediate the effects of natural gas leases in five State Forests by buying land far from our forests. That smells of politics, not conservation.

The proposal does nothing to address the harmful effects of the thousands of wells drilled in our State Forests. Since the Feds must approve the "mitigation plan", I am asking you to weigh in and demand that the mitigation must be by purchasing new State Forest land and add it to those Forest Districts that had sustained the loss or recreational value from gas drilling.

Please emphasize that purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else does nothing to maintain the quality of our forests.

The mitigation must occur where the damage occurred. The harm was done in State Forests and the reparations should be in those same State Forests. They should purchase replacement lands and add them to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests."

This begs the question, "why buy a property in far-away Chester County, that is ALREADY

PROTECTED AS A PRESERVE"? Wouldn't it actually be less protected as State Forest property, still susceptible to resource extraction and development, which is why the purchase is compelled in the first place? This actually seems to be a step backward if conservation is the goal of a preserve. Also, given the increased property value in Southeast Pennsylvania, DCNR and the public get more land for the money by keeping the purchase near the rural State Forests.

Even if the Strawbridge 2 property is somehow more immune to development, the overall effect is still one of forest fragmentation. Surprisingly, gas development is sited by DCNR as a benefit: "[f]or example,

wildlife watchers and hunters may experience an increase in the frequency and diversity of the wildlife present in newly created herbaceous openings." I believe that current ecological modeling points far more often to the numerous detrimental impacts of forest fragmentation caused by power lines and gas wells.

Surely a wetland or other excellent piece of property, currently helpless and vulnerable, near

Moshannon or Elk, etc., can be gathered into the protective fold of State Forest auspices, rather than one far away and already salvaged from the maw of development. I know of an extraordinary wetland and meandering river bottom near Elk and/or Moshannon that fits perfectly this description; I would be happy to share its location as a potential remediation exchange.

Has DCNR ever considered Audubon of Pennsylvania's and The Nature Conservancy's findings submitted in their "Pennsylvania Energy Impact Assessment" paper? See page 27-28:

http://www.nature.org/media/pa/tnc_energy_analysis.pdf

Maybe less land would lose its "recreational value" if DCNR insured that wells were located on "existing anthropogenic openings, old fields, or agricultural fields" within or adjacent to the state forest boundary. Perhaps total clear cutting is the preferred policy in order to sell some of the timber to recoup cost? But this is a different issue; why IS clear-cutting such a obvious feature of gas development?

I hope you will take a moment to respond at your earliest possible convenience, and I thank you ahead of time.

Sincerely,

Jason Gulvas

From: Harvey Katz <katzhm@verizon.net>
Sent: Tuesday, June 11, 2019 2:57 AM
To: NR, BRC Conversions
Subject: [External] Destroying state forest land by the natural gas industry.

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

RA-NRBRC

I work with watershed associations and I am recommending that they abandon the restoration and mitigation approach recommended by the PA state agencies. Instead, replace it with the process of determining how to recognize and measure what you still have left. That is wetlands, (ground water) springs and forested lands that that are still available and work towards protecting these "What you have left" properties and find ways to protect them (through conservation easements) or buy them and add them, as protected lands, to your watershed. Also, identify all deforested or cleared lands that are on a two degree or greater slope and work toward making them forested lands again, since this category of land is particularly susceptible to water erosion. On a longer range time level, I am also advising the watershed associations to focus on topsoil build up. Most of the higher elevation areas in Lycoming County lack topsoil. Historically, the original topsoil, as a result of the 1840 through 1930 deforestation period is now in the Cheasapeake Bay or trapped behind the Susquehanna River dams.

Harvey M. Katz, Ph.D. research aquatic ecologist.

From: Brian MacWhinney <macw@andrew.cmu.edu>
Sent: Monday, June 3, 2019 2:22 PM
To: NR, BRC Conversions
Subject: [External] forest conversions

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

The damage done to our forests by fracking should be remediated in the area where the damage occurred. That is the whole point of state forests.

—Brian MacWhinney, Pittsburgh

From: Laura Y. Dickey <laura.dickey@acps.k12.va.us>
Sent: Tuesday, June 4, 2019 9:47 AM
To: NR, BRC Conversions
Subject: [External] Forest lands and gas rights

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Laura Y. Dickey

As a teacher I am constantly amazed at the lack of logic, and common sense our government exhibits.

Please save land in our own country, in our own states, and in our own counties for out door recreation and relaxation.

Our students are in buildings, home and school, way too much already for health.

The earth is our livelihood, it is our very survival. I have known this since I was in elementary school, and I am now in 60's. Why are we still ignoring the obvious?

Politics makes it both difficult, and amusing to teach.

From: Simonne Roy <simonne@simonneroy.com>
Sent: Thursday, June 6, 2019 1:13 AM
To: NR, BRC Conversions
Subject: [External] Forest mitigation

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Dear Sir or Madam,
As a Pennsylvania artist, frequent hiker and lifetime resident of PA, I am urging you to preserve our forests by acquiring the new land for the forests damaged by natural gas leases in the Loyalsock, Sproul, Moshannon, Tiadagton and Tioga forests. The mitigation must occur where the damage was done, not elsewhere by buying land far from the forests. -Simonne Roy

--
Simonne Roy, Artist
simonne@simonneroy.com
Website
Find me on Instagram and
Facebook
Sign up for my Newsletter

From: j. hanks <hanks.j.v@gmail.com>
Sent: Tuesday, June 4, 2019 1:46 PM
To: NR, BRC Conversions
Subject: [External] Gas lease land remediation

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Greetings -
Please remediate the lands "lost" due to gas leases where these losses occurred. In other words, replace the lost forest lands by expanding the lands in which the leases occurred, not by expanding lands somewhere else. Regards,
Jim

From: Yahoo Update <ljs447@hotmail.com>
Sent: Monday, June 3, 2019 4:42 PM
To: NR, BRC Conversions
Subject: [External] Keep the reparations where they belong!

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

I have been made aware that dollars allocated for mitigation from the gas well drilling in Tiadaghton and Tioga State Forests may be used to purchase land downstate. We need the land or reparations to be attached to the State Forests that were affected here in the Northern Tier. Those of us who live with the inconvenience and damage of the fracking boom are tired of seeing the benefits go to the population centers. Please protect the beautiful Pennsylvania Wilds. Thank you,

Laura Wheeland Steele

274 High Street, Troy, PA 16947

From: Roy Siefert <rsiefert2@juno.com>
Sent: Saturday, June 8, 2019 9:07 PM
To: NR, BRC Conversions
Subject: [External] Land & Water Conservation Fund

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

The mitigation for conversion of forest land to non forest must occur where the damage occurred. The harm was done in State Forests and the reparations should be in those same State Forests. They should purchase replacement lands and add them to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests to preserve the ecological integrity of our core forests.

Additionally, core forest land should not be leased in the future for surface development of any kind for non forest uses.

"We need not only play-grounds and parks, but we need woods—great, wide, far-reaching woods." -- Mira Lloyd Dock

May The Forest Be With You

Roy Siefert
114 Ally Close Hill Rd
Middlebury Center, PA 16935
570 485-9435 Cell

From: Carol Haaf <outlook_C63E3C5CD585E52F@outlook.com>
Sent: Tuesday, June 4, 2019 7:29 AM
To: NR, BRC Conversions
Subject: [External] Mitigation of damage to forests from drilling and fracking

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

The proposal does nothing to address the harmful effects of the thousands of wells drilled in our State Forests. The mitigation must be by purchasing new State Forest land and add it to those Forest Districts that had sustained the loss or recreational value from gas drilling.

Purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else does nothing to maintain the quality of our forests.

The harm was done in State Forests and the reparations should be in those same State Forests. They should purchase replacement lands and add them to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests.

From: Steve Kunz <spkunz@aol.com>
Sent: Monday, June 10, 2019 10:58 AM
To: NR, BRC Conversions
Subject: [External] Preserve State Forest Habitat - Mitigate Where the Loss Occurs

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

I oppose a new proposal to mitigate the loss of State Forest land in places far from the State Forest where it was lost. The current proposal does nothing to address the harmful effects of the thousands of wells drilled in our State Forests. I demand that the mitigation be made by purchasing new State Forest land and adding it to those Forest Districts that sustained the loss or recreational value from gas drilling.

Purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else but where the loss occurs does nothing to maintain the quality of our forests.

The mitigation must occur where the damage occurred. The harm was done in State Forests and the reparations should be in those same State Forests. Replacement lands should be purchased and added to Sproul, Loyalsock, Moshannan, Tiadaghton, and Tioga State Forests.

Thank you for this opportunity to comment.

Mr. Stephen Kunz

1015 Brookwood Drive

Phoenixville (Chester Co.), PA 19460

610-935-1495

spkunz@aol.com

From: Janine Grisez <jgrisez7@yahoo.com>
Sent: Monday, June 3, 2019 8:45 AM
To: NR, BRC Conversions
Subject: [External] Proposal to remediate the effects of natural gas leases

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

This proposal does nothing to address the damage of wells drilled in State forests. Mitigation must be by purchasing new State Forest land & add it to the forests that had sustained loss of recreation from gas drilling.
Purchasing land in Chester County does nothing to repair losss in our State Forests – mitigation must occure where the damage occurred.

Thank you,

Janine Grisez
Pittsburgh PA

From: Laura Horowitz <12newmoons@gmail.com>
Sent: Tuesday, June 4, 2019 8:55 AM
To: NR, BRC Conversions
Subject: [External] protect our state forests

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

To Whom It May Concern:

Some State Forest lands were purchased with Federal LWCF (Land & Water Conservation Fund) dollars. Since gas drilling has caused some of that land to be lost to recreation such as hiking, hunting, birding and wildlife-watching, DCNR must replace it.

Oddly, a proposal is in the works to remediate the effects of natural gas leases in five State Forests by buying land far from our forests. I don't understand how that would address the loss of the original land. The proposal does nothing to address the harmful effects of the thousands of wells drilled in our State Forests. Instead, mitigation must be by purchasing new State Forest land and add it to those Forest Districts that had sustained the loss or recreational value from gas drilling.

Purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else does nothing to maintain the quality of our forests. The mitigation must occur where the damage occurred. The harm was done in State Forests and the reparations should be in those same State Forests. They should purchase replacement lands and add them to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests. Help preserve our State Forest habitat.

Sincerely,

Laura Horowitz

6544 Darlington Road

Pgh PA 15217

From: MAL <artbymal@comcast.net>
Sent: Monday, June 3, 2019 6:59 PM
To: NR, BRC Conversions
Subject: [External] Remediate Plan - Forests

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Some State Forest lands were purchased with Federal LWCF (Land & Water Conservation Fund) dollars. Since gas drilling has caused some of that land to be lost to recreation such as hiking, hunting, birding and wildlife-watching, DCNR must replace it.

You Can't Remediate Damage to State Forests by Buying Land in Chester County

The proposal does nothing to address the harmful effects of the thousands of wells drilled in our State Forests. I demand that the mitigation must be by purchasing new State Forest land and add it to those Forest Districts that had sustained the loss or recreational value from gas drilling.

Purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else does nothing to maintain the quality of our forests.

The mitigation must occur where the damage occurred. The harm was done in State Forests and the reparations should be in those same State Forests. They should purchase replacement lands and add them to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests.

Sincerely,

Mary Ann Leitch

526 Reed St

Philadelphia Pa 19147

From: Bill Ferris <bkferris@kuhncom.net>
Sent: Sunday, June 2, 2019 6:41 AM
To: NR, BRC Conversions
Subject: [External] Remediation

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Hello, I believe that remediation land purchases should be in same area at the wells drilled on state forestes not in Philadelphia. First legislature and governor took payments away from state forests and now they want to give remeidation to chester county?????? Bill Ferris

From: Judith Parker <jdthprk@aol.com>
Sent: Monday, June 3, 2019 9:53 AM
To: NR, BRC Conversions
Subject: [External] Replace forest lands

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

It is vital that the lands bought to mitigate damage done to state forests by fracking actually be contiguous to the state forests. Buying land in Chester may be wise for other reasons but will not remediate our state forests. Our state forests need land to compensate for the damage done by building wells. Please take care of our state forests.

Judith Parker

2317 Naudain St

Philadelphia PA 19146

From: Dr. Marmot <carol.fleischman@gmail.com>
Sent: Monday, June 3, 2019 2:32 PM
To: NR, BRC Conversions; PA Governor's Office
Subject: [External] Replacing Pennsylvania State Forest Land

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

To whom it may concern:

As a Pennsylvania resident who, along with my family, has hiked and canoed extensively in Pennsylvania State Forest lands, and on behalf of my good friends who for generations have enjoyed hunting in Pennsylvania State Forests, I am making the following observations:

Our beautiful state forests provide unique recreational opportunities. They boost local economies in a healthy fashion, as visitors utilize local outfitters, guides, gun shops, restaurants, hotels, and stores. The forest provides an essential habitat for many kinds of wildlife. Forest riparian areas and streams are important parts of our watersheds. Forest land is also very important in mitigating climate change, because the masses of trees sequester carbon. If our forests are reduced to pockets of woodland here and there, they do not provide any of the above benefits.

In my view, it is terrible that we have valued short term, temporary profits over the long-term survival of these critically important lands, by permitting fracking to occur in our state forests. These lands, which belong to all Pennsylvanians, must be replaced with contiguous woodland! Any proposal to "replace" forest land by buying other parcels of land in Chester County is a cynical misuse of taxpayer money. It is wrong to do this. I urge you to consider the consequences.

Sincerely,

Carol Fleischman

From: JAMES RICE <elainejimrice@comcast.net>
Sent: Saturday, June 8, 2019 8:24 PM
To: NR, BRC Conversions
Subject: [External] Resolution of LWCF-Funded State Forest Land

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

To Whom It May Concern:

"Politics in the name of conservation" describes this dishonesty.

Philadelphia and its surrounding counties carried the governor to a second term. He did not win a majority in any of the Northern Tier counties of Pennsylvania.

So the governor and his hired hands decided that replacement land in this matter does not have to be near where the damage occurred in the northern counties.

They decided that property outside of Philadelphia in Chester County satisfies the requirement. It does not. Mitigation should be near the State Forests in the Northern Tier counties of Pennsylvania.

Now please tell me where I can find and read the comments submitted to this purely partisan political plan.

Thanks for your time, awaiting your reply.

Jim Rice, Harrisburg PA

From: Scott Mato <scottomato@gmail.com>
Sent: Tuesday, June 4, 2019 11:25 AM
To: NR, BRC Conversions
Subject: [External] State Forest Lands

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

The companies responsible for the damage to public lands must be forced to remediate the problems they created. If the company no longer exists, then a fossil fuel tax on existing fossil fuel extraction and distribution companies should be instituted to pay for remediation; the costs should not be passed on to consumers either by the companies raising prices or the state and local goats. imposing a tax on the people of PA to pay for it.

Purchasing land in Chester County or anywhere else is a separate issue from remediating existing problems caused by the fossil fuel extraction and distribution industries. Moreover, purchasing land must ensure that it is conserved/preserved and protected from the fossil fuel and extraction industries.

Scott

From: Jack Miller <jmiller1018@yahoo.com>
Sent: Friday, June 7, 2019 8:25 AM
To: NR, BRC Conversions
Subject: [External] State Forest Midigation

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Greetings, I am writing to comment on the purchase of lands to mitigate the damage done to our state forests by the leases to gas drilling and fracking. Purchasing lands away from the damaged areas does not mitigate the area of the damage. All lands purchased to mitigate the damage in a particular state forest must become a part of that forest.
Thank you,
Jack D. Miller

From: Kirby,Martha <mk56@drexel.edu>
Sent: Tuesday, June 4, 2019 9:51 AM
To: NR, BRC Conversions
Subject: [External] State forest mitigation should take place where the damage occurred

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else does nothing to maintain the quality of our forests.

The mitigation must occur where the damage occurred.
The harm was done in State Forests and the reparations should be in those same State Forests. Purchase replacement lands and add them to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests.

M Kirby
Philadelphia

From: bvhbarb@pa.net
Sent: Monday, June 3, 2019 11:03 AM
To: NR, BRC Conversions
Subject: [External] state forest replacement funds

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Compensation funds must be used to purchase state forest lands to replace those lost to fracking activities!

From: Larry Falcone <larryfal@gmail.com>
Sent: Tuesday, June 4, 2019 10:25 AM
To: NR, BRC Conversions
Subject: [External] State Forests

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Please expand our state forests when replacing the impact of drilling on our state forests

From: Susan Babbitt <philad49@att.net>
Sent: Monday, June 3, 2019 6:00 PM
To: NR, BRC Conversions
Subject: [External] Undo Damage Where Damage Was Done

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Greetings:

Apparently, it has been suggested that one can make up for the effects of natural gas leases in five State Forests by buying land far from our forests.

However, that would not address the harmful effects of the thousands of wells drilled in our State Forests. Since the Feds must approve the

"mitigation plan", please ask that the mitigation be done by purchasing new State Forest land and adding it to those districts that had sustained the loss or recreational value from gas drilling. To have the desired effect, the land must be bought where the damage was done, in the state forests. Replacement lands should be added to these forests: Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga.

Thank you for your attention.

Sincerely, Susan Babbitt 19107

From:	Chris Minich <mystyryman7@yahoo.com>
Sent:	Monday, June 3, 2019 6:48 PM
To:	NR, BRC Conversions
Subject:	[External] You Can't Remediate Damage to State Forests by Buying Land in Chester County

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Some State Forest lands were purchased with Federal LWCF (Land & Water Conservation Fund) dollars. Since gas drilling has caused some of that land to be lost to recreation such as hiking, hunting, birding and wildlife-watching, DCNR must replace it.

Oddly, a proposal is in the works to remediate the effects of natural gas leases in five State Forests by buying land far from our forests. That smells of politics, not conservation.

The proposal does nothing to address the harmful effects of the thousands of wells drilled in our State Forests. Since the Feds must approve the "mitigation plan", I am asking you to weigh in and demand that the mitigation must be by purchasing new State Forest land and add it to those Forest Districts that had sustained the loss or recreational value from gas drilling.

Please emphasize that purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else does nothing to maintain the quality of our forests.

The mitigation must occur where the damage occurred.

The harm was done in State Forests and the reparations should be in those same State Forests. They should purchase replacement lands and add them to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests.

Help preserve our State Forest

From: Sharon Furlong <sfurlong5@verizon.net>
Sent: Tuesday, June 4, 2019 7:25 AM
To: NR, BRC Conversions
Subject: [External] mitigation lands

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

I am sending you this comment to urge you not to buy lands in a totally removed place from the State Forests where lands are being destroyed due to extractive industries and their leases. It makes no sense at all to get land that is geographically removed from the place of damage as a way of mitigating this same damage. Losses to the Pennsylvania citizens from the reckless leasing of our own Public lands should not be compounded by such an inane action. The inability to hike, hunt, fish and breathe clean air would remain unresolved by such an approach. In addition, even thinking about this is another insult to us, the Citizens who pay taxes to support this land who have now been the helpless witnesses to its destruction from the fossil fuel industry. None of this should ever have happened. These places were not set up as future repositories of private industry to rape and pillage at their will. Yet, this has happened and now we have to deal with this half hearted attempt at addressing this wrong by getting non contiguous land in Chester. Since when are we paying you to come up with such outlandish notions of fairness and good stewardship?

Sharon Furlong, Spokesperson

Bucks Environmental Action

Bucks County Sierra Club

215-322-0492

Feasterville, Pa. 19053

From:	CleanPaH2O <cleanpah2o@gmail.com>
Sent:	Wednesday, June 5, 2019 8:58 PM
To:	NR, BRC Conversions
Subject:	[External] Resolution of Conversions from Recreational Use on LWCF-Funded State Forest Land

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Hello,

Thank you for allowing us to comment on this extremely foolish conversion of the public land found in the Loyalsock, Moshannon, Sproul, Susquehannock, and Tioga State Forests.

Mitigation should occur adjacent to, or near these beautiful public forests in the Northern Tier region of Pennsylvania.

Converting land from northern Pennsylvania counties into suburban Philadelphia land reeks of politics, not conservation.

Recently DCNR and PENNVEST facilitated a $50 million loan to an out-of-state private timber company in order to purchase 60,000 acres of timberland in northern Pennsylvania.

DCNR had time to engineer this sweetheart deal, at 1% interest, from a taxpayer-subsidized state program, but could not find the time to locate enough northern timberland to satisfy the requirements of the Land and Water Conservation Act.

Ownership of the property in Chester County (sought by DCNR) resides with the Conservation Fund. Unless the mission of this environmental nonprofit has changed, we see no need to continue this bizarre transaction.

Mitigation must occur where the damage occurred. Replacement lands should be found adjacent to, or near the Loyalsock, Moshannon, Sproul, Susquehannock, and Tioga State Forests.

Thanks again - Elaine Futej

--

Citizens for Clean Pennsylvania Water

From: Forest Coalition <forestcoalition@aol.com>
Sent: Tuesday, June 4, 2019 8:46 PM
To: NR, BRC Conversions
Cc: Ccbsailing@aol.com
Subject: [External] Public comment

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

From: ccbsailing@aol.com
To: forestcoalition@aol.com
Sent: 6/4/2019 10:40:44 AM Eastern Standard Time
Subject: Fwd: Federal LWCF dollars and DCNR Mitigation

Please forward due to email failure
Thanks

-----Original Message-----
From: Christine Brubaker <ccbsailing@aol.com>
To: RA-NRBRC_CONVERSIONS <RA-NRBRC_CONVERSIONS@pa.gove>
Sent: Tue, Jun 4, 2019 10:38 am
Subject: Federal LWCF dollars and DCNR Mitigation

Public Comment Posting

The land and water mitigation must occur where the damage was done in the PA state forests.

DCNR must be told to replace lands damaged in the five state forests by the gas drilling, well pads and road infrastructure also in those same forest areas. The quality of our forests should not be reduced and if they are; they must be restructured to replace the losses.

I suggest you count the number of wells already drilled and match that number with the same amount acre by acre of new land.

Christine C. Brubaker
22 Birch Ct
Lancaster, PA 17603
717-872-8971

From: Forest Coalition <forestcoalition@aol.com>
Sent: Monday, June 3, 2019 6:31 PM
To: NR, BRC Conversions
Cc: SycamoreSpringsFarms@earthlink.net
Subject: [External] Public Comment : DCNR plan re LWCF tracts

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov. Hello,

Since one cannot replace State Forest habitat by purchasing land in Chester County, I feel that you must mitigate the loss of LWCF tracts by purchasing land that will be added to the State Forests which were damaged.

Any other use outside of the affected State Forests completely fails to remediate the damage. And it does not even make economic sense, because the value of the lost LWCF tracts is less than 5% of the purchase price of the Chester County lands.

Dick Martin
Coordinator

www.PaForestCoalition.org
Mission: Good Stewardship of our Public Lands

From: Forest Coalition <forestcoalition@aol.com>
Sent: Saturday, June 8, 2019 9:09 PM
To: NR, BRC Conversions
Subject: [External] Public Comment re LWCF lands

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

It is exceedingly odd that there is a plan to purchase lands in Chester County to compensate for the loss of LWCF tracts in State Forests.

You must replace the lost land use with the purchase of new lands in the five State Forests which had sustained the damage.

Dick Martin
Coordinator

www.PaForestCoalition.org
Mission: Good Stewardship of our Public Lands

From: Henry <henrynco@comcast.net>
Sent: Saturday, June 8, 2019 3:06 PM
To: NR, BRC Conversions
Subject: [External]

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Mitigation of State Forests MUST be adjacent to the affected area.

PENNSYLVANIA ARCHAEOLOGICAL COUNCIL

President: Ira Beckerman, Ph.D., RPA
Vice President: Mike Stanilla, MA, RPA
Secretary-Treasurer: Hannah Harvey, MA, RPA

June 5, 2019

Thomas Ford, Director
Bureau of Recreation and Conservation
400 Market Street
Rachel Carson State Office Building, 5th Floor
Harrisburg, PA 17101-2301

Dear Mr. Ford:

The Pennsylvania Archaeological Council is providing comment on the **Environmental Assessment Resolution of Conversions from Recreational Use on Land and Water Conservation Fund-Funded State Forest Land**, [49 Pa.B. 2257], issued Saturday, May 4, 2019.

It is our interpretation that the conversion of LCWF-funded lands from recreational use to another use is itself a Federal Action subject to Section 106 of the National Historic Preservation Act. This interpretation is buttressed by the **National Park Service Land and Water Conservation Fund State Assistance Program Federal Financial Assistance Manual**, Volume 69 (October 1, 2008), in particular Chapter 8.e on Conversion of use, specifically 8.e.3.f (p.8-7). In addition, your own Administrative Policy, **Bureau of Recreation and Conservation,** Administrative Policy/Grant Guidelines, Conversion of Property Interests Acquired or Developed with Federal Land and Water Conservation Funds (LWCF) (dated December 2, 2010) requires Section 106 review for converted property. Although the Environmental Assessment cites the DEP permitting process in the consideration of historic and archaeological resources (p. 12-13), that process under the State History Code is by no means a substitute for a Section 106 review, neither in degree of due diligence or in consultative process.

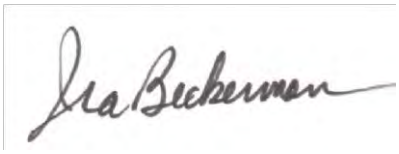
Stating that a DEP review determined a no or low probability for archaeological resources is not the same as there being no archaeological sites present. A Section 106 review likely would have called for an archaeological survey, at least in tracts that had a high or moderate probability of archaeological sites. As conversion of recreational use to an industrial use would have natural resource impacts, so would these conversions likely have adverse archaeological impacts/effects, should archaeological sites be present. Where mapping was available in Appendix K – DEP Permits – we were able to determine most tracts listed in Table 2 of the EA had areas with high or moderate probability areas under the current Statewide Archaeological Predictive Model. A notable exception was Tract 594, Pad 3. The size of the total impacts – 138 acres – is large enough to suggest that archaeological sites may have been present in at least some of the impacted areas.

Given our understanding that the conversions of these LCWF parcels was a Federal Action and Section 106 was not conducted, we recommend that DCNR through the National Park Service follow ***36 CFR 800.9(b): Agency foreclosure of the Council's opportunity to comment***. Specifically, the Advisory Council on Historic Preservation should be notified and given the opportunity to comment, as well as the

State Historic Preservation Officer. In all likelihood, we would expect Section 106 to be initiated and the process followed to its conclusion. Should Section 106 be opened, we would like to become a consulting party.

We are sympathetic with your efforts to make good on the conversion of LCWF land in 2008-2011, and think that replacement recreational land in another part of the state could be a suitable solution for some of the natural resources affected. Unfortunately, archaeological sites are not the same as wetlands or recreational areas, and are not fungible from one place to the next. Once they are lost, they are lost. If you have any questions, please contact me, at ibeckerman@verizon.net, or at (717) 798-0298.

Sincerely,



Ira Beckerman, President

Cc: Andrea MacDonald, Deputy SHPO

From: Sharon Wushensky <s.wushensky@gmail.com>
Sent: Friday, June 7, 2019 10:24 AM
To: NR, BRC Conversions
Subject: [External]

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

The mitigation plan to remediate the effects of natural gas leases in our state forests is unacceptable. The mitigation must be made by purchasing new State Forest land and adding it to those Forest Districts that had sustained the loss or recreational value from gas drilling.

Purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else does nothing to maintain the quality of our forests.

The mitigation must occur where the damage occurred.

The harm was done in State Forests and the reparations should be in those same State Forests. Replacement lands should be added to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests.

Thank you.

From: Sandra Clark <sandra.clark18@verizon.net>
Sent: Tuesday, June 4, 2019 10:20 PM
To: NR, BRC Conversions
Subject: [External] State Forest Lands

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Some State Forest lands were purchased with Federal LWCF (Land & Water Conservation Fund) dollars. Since gas drilling has caused some of that land to be lost to recreation such as hiking, hunting, birding and wildlifewatching, DCNR must replace it.

The proposal in the works to remediate the effects of natural gas leases in five State Forests by buying land far from our forests is NOT conservation.

The proposal does nothing to address the harmful effects of the thousands of wells drilled in our State Forests. Since the Feds must approve the "mitigation plan", I am asking you to weigh in and demand that the mitigation must be by purchasing new State Forest land and add it to those Forest Districts that had sustained the loss or recreational value from gas drilling.

Purchasing land in Chester County does not repair the loss in our State Forests. Buying land anywhere else does nothing to maintain the quality of our forests.

The mitigation must occur where the damage occurred. The harm was done in State Forests and the reparations should be in those same State Forests. They should purchase replacement lands and add them to Sproul, Loyalsock, Moshannan, Tiadaghton and Tioga State Forests.

Sandra Clark

From: rjsphoto <rjsphoto@ptd.net>
Sent: Monday, June 3, 2019 7:36 PM
To: NR, BRC Conversions
Subject: [External] Preserve State Forest Habitat

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Think globally.... Act locally .... Protect the environment...

Roger

Roger Smith, Stills Photographer

105 Cardinal Drive

Palmerton Pa. 18071

610-554-2926

[mailto:rjsphoto@ptd.net | rjsphoto@ptd.net]

June 12, 2019

Thomas Ford, Director

DCNR Bureau of Recreation and Conservation

400 Market Street

Harrisburg, PA 17101-2301

RE: Environmental Assessment Resolution of Conversions from Recreational Use of Land and Water Conservation Fund-Funded State Forest Land

Dear Mr. Ford:

The Pennsylvania Environmental Defense Foundation (PEDF) has reviewed the abovecaptioned Environmental Assessment prepared by the Pennsylvania Department of Conservation and National Resources (DCNR) to support its proposed replacement of State Forest land converted to industrial use in the Pennsylvania Wilds with farm land in Chester County. As you know, this Environmental Assessment includes approximately 4,450 pages and was made available by DCNR to the public for a 45-day review period on May 4, 2019 (49 Pa.B. 2257).

PEDF has determined that DCNR's proposal violates its fiduciary duties as trustee under Article I, Section 27 of the Pennsylvania Constitution (Section 27) and its responsibilities under the federal Land and Water Conservation Fund Act (LWCF Act), 54 U.S.C. §§ 200301-200310. The basis for this determination is set forth below.

The State Forests and State Parks in Pennsylvania are public natural resources owned by the people of Pennsylvania, not the Commonwealth, under the Pennsylvania Constitution. The Pennsylvania Supreme Court has stated that these public lands are part of the trust established in 1971 when the people of Pennsylvania amended their Constitution to include Section 27.[1] DCNR, as the Commonwealth agency authorized to manage these public trust resources, must carry out this function consistent with its constitutional fiduciary duties as a Commonwealth trustee under Section 27.

DCNR is required under Section 27 to conserve and maintain the public natural resources of Pennsylvania's State Parks and Forest for the benefit of the people of Pennsylvania, both current and

[1] *See Pennsylvania Environmental Defense Foundation v. Commonwealth*, 161 A.3d 911 (Pa. 2017); copy provided as **Attachment A**.

future generations. DCNR's fiduciary duties as trustee of these resources prohibit it from authorizing industrial oil and gas development that depletes, degrades and diminishes the public natural resources in northcentral Pennsylvania without remedying the harm to those resources. DCNR's attempt to remedy such harm by acquiring land in an area completed removed from the harmed resources violates its trustee duties under Section 27.

Under the LWCF Act, the federal government provides money through grants to acquire and develop land for public outdoor recreation use. The recipient of such money must commit to dedicate the lands acquired or developed with LWCF assistance to such use in perpetuity. DCNR's use of LWCF assistance to support public outdoor recreation use of our State Parks and Forests is consistent with its fiduciary duties under Section 27, provided that the recreation use does not degrade, deplete or diminish these public natural resources.

Land dedicated to public outdoor recreation use under the LWCF Act can only be converted to another use with approval of the National Park Service (NPS), which DCNR did not obtain. This failure is a violation of DCNR's fiduciary duties under Section 27. Now DCNR is attempting to obtain after-the-fact approval of its conversion of LWCFprotected land without complying with the requirements imposed to obtain such approval.

Specifically, the LWCF Act allows approval of a conversion "only if the Secretary [of the U.S. Department of the Interior] finds it to be in accordance with the then-existing comprehensive statewide outdoor recreation plan and only on such conditions as the Secretary considers necessary to ensure the substitution of other recreational properties of at least equal fair market value and of reasonably equivalent usefulness and location."[2] DCNR fails to meet all of these requirements.

Nothing in Pennsylvania's Statewide Comprehensive Outdoor Recreation Plan (SCORP) sanctions the conversion of our State Parks and Forests in the northcentral region of Pennsylvania known as the Pennsylvania Wilds to industrial use and replacement of these recreation resources with acquisitions in another part of the State. To the contrary, the plan recognizes the importance of the outstanding public outdoor recreation available on these public lands to the local economies in this region. The State Forest and Parks of the Pennsylvania Wilds, as well as its public game lands, encompass more than two million acres – comparable to Yellowstone National Park – and are home to Pennsylvania's most valuable forest, water, fish, and wildlife resources, including the largest elk herd in the northeast and some of the darkest skies in the country. The remote rugged mountainous terrain of this region makes it a tourist destination for the entire northeast.

DCNR's assertion that the SCORP supports its proposed replacement of converted public outdoor recreation land in the Pennsylvania Wilds with the acquisition of the Strawbridge farm in Chester County is disingenuous. While the Strawbridge farm in Chester County may be an important local recreational resource in southeastern Pennsylvania that should be preserved, it cannot replace the lost recreational resources of the Pennsylvania Wilds.

To establish that LWCF replacement property is of "equivalent usefulness and location", DCNR is required to evaluate the property to be converted "to determine what recreation needs are being fulfilled by the facilities that exist and the types of outdoor recreation resources and opportunities available."[3] DCNR must then evaluate the property being

[2] 54 U.S.C. § 200305(f)(3); note that the Secretary of the Department of the Interior (DOI) has delegated the authority to approve conversions to the Director of the National Park Service (DOI Manual, Chapter 1, Part 245, § 1.1(C.)(7).

[3] 36 C.F.R. § 59.3(b)(3).

proposed for substitution "in a similar manner to determine if it will meet recreation needs which are at least like in magnitude and impact to the user community as the converted site."

DCNR's limited analysis of the outdoor recreation resources and opportunities lost in the Pennsylvania Wilds as a result of the LWCF conversions is inadequate. The large intact forests of the Pennsylvania Wilds provide a wilderness experience that has become increasingly rare in the northeast. One of the most significant impacts to public outdoor recreation from the conversion these public lands to industrial use is the loss of these large intact forest tracts. If DCNR had completed a fair evaluation of this loss, the inadequacy of the Strawbridge property to replace this loss would have been obvious. While NPS does not require replacement property to be directly adjacent to or close by the converted site, it generally expects the replacement property to serve the same community or area as the converted site. The Strawbridge property will not serve the public outdoor recreation needs of the Pennsylvania Wilds.

In addition to this fundamental flaw in DCNR's Environmental Assessment, it also fails to adequately address other basic requirements, including those set forth below.

- **Inadequate Evaluation of Land Subject to LWCF Restrictions**: The information provided in Table 1 is inadequate to assess the extent to which State Parks and Forests in the northcentral region of Pennsylvania were acquired or developed with LWCF assistance and, therefore, subject to the LWCF recreational use restriction. The table should include all LWCF grants awarded for projects in the Pennsylvania Wilds, including State and local parks, not solely State Forest projects. State and local park recreational facilities can be impacted by oil and gas development occurring on adjoining State Forest land.

  In Table 1, the project description for each grant should identify the location of the project or explain how the project benefited public outdoor recreation in the vicinity of the project. In addition, the 6(f)(3) boundary map identifying the project area subject to the LWCF protections for each grant should be provided in the public record supporting the Environmental Assessment. The LWCF regulations state that this area, in many instances "exceeds that actually receiving L&WCF assistance so as to assure the protection of a viable recreation entity."[4] The

extent of the LWCF recreational use restriction on public lands in the Pennsylvania Wilds should be based on the overall extent to which LWCF assistance benefitted these public lands. DCNR has clearly used a narrow approach to identify grants and areas subject to the LWCF restrictions and provides no explanation of how the "State Forest LWCF Areas" shown on the map included in Appendix B were established. The State Forest land identified by DCNR as subject to the LWCF restrictions appears to be strategically located to avoid the State Forest tracts leased for oil and gas development and, thus, avoid the need to replace State Forest land converted to industrial use.

[4] 36 C.F.R. § 59.1.

- **Inadequate Evaluation of LWCF Acreage Converted by Industrial Oil and Gas Development**: The converted acreage identified by DCNR in Table 2 fails to document the full extent of recreational land converted by industrial oil and gas development. DCNR limits the acreage subject to conversion to the physical footprint of gas well pads or gas infrastructure (impoundments, compressors, roads) constructed to support the gas development. The impact to public outdoor recreation use is much greater than the physical footprint of these oil and gas facilities. The network of gas well pads, pipelines, impoundments, roads and other associated infrastructure diminish the value of an entire leased tract for public outdoor recreation use. To fully evaluate the extent of the conversion, the overall extent of industrial development must be evaluated.

  For example, DCNR has identified 8 conversion areas on Tract 100 located in Pennsylvania's Loyalsock State Forest located just north the Trout Run (*see* **Attachment B – Tract 100 Conversions**). DCNR asserts that only 101.64 acres of the 8,891 acres in Tract 100 have been converted from outdoor public recreation use. Tract 100 consists of steep mountainous ridge and valley terrain. Every ridge on this tract has been converted to industrial use for well pads, compression stations, impoundments and expanded and new roads. DCNR does not explain why land converted to industrial use for gas development on the northern portion of Tract 100 have not been included in the conversion analysis (see areas circled in red on Attachment B; see also the Tract 100 boundaries as included in the State Forest Oil and Gas Lease for this tract (**Attachment C**). DCNR also fails to acknowledge that gas development is ongoing. DCNR estimated in its 2018 Shale Gas Monitoring Report (page 4) that only 30-35% of the gas development on leased State Forest tracts has been completed.[2] Even with the current level of gas development, Tract 100 is no longer suitable for pubic outdoor recreation use. Significantly more than 100 acres of LWCF-protected land has been impacted; in fact, a strong argument can be made that this entire track should be replaced given the extent of industrial development that has been authorized on this State Forest tract.

[2] DCNR has included its 2014 Shale Gas Monitoring Report in Appendix A to its Environmental Assessment, but does not include its most recent 2018 report. The Environmental Assessment should be based on the most recent information available to DCNR on impacts to the State Forest from shale gas development.

After re-evaluating the extent to which LWCF restrictions should be imposed on the public lands in the Pennsylvania Wilds, a much more thorough analysis of the industrial develop occurring and likely to occur on those tracts must be completed to determine the appropriate acreage of replacement land necessary.

- **Failure to Consider Replacement Land in the Pennsylvania Wilds as an Alternative**: DCNR fails to consider reasonable alternatives in its Environmental Assessment to address the conversion of the LWCF-protected public outdoor recreation properties. The three alternatives considered include (1) no action; (2) removing the oil and gas infrastructure from the LWCF-protected properties in the Pennsylvania Wilds (an alternative that DCNR knows would be impossible to implement); and (3) acquiring the Strawbridge property in Chester County. DCNR fails to consider the most reasonable and obvious alternative(s), which would be to acquire replacement public outdoor recreation property(ies) in the Pennsylvania Wilds.

  DCNR has acknowledged in its 2014 and 2018 Shale Gas Monitoring Reports that one of the most significant impacts from the shale gas development on State Forest land in the Pennsylvania Wilds is the loss of large intact core forest. These core forest areas provide a wilderness experience that has become increasingly rare in the northeast. DCNR briefly mentions this loss at the end of its discussion of impacted recreation, but then somehow dismisses this impact by making the circular assertion that "none of the gas development sites impacted these unique recreational experiences" (EA, page 6-7). The acquisition of additional core forest land similar in nature to the recreation resource converted must be evaluated by DCNR to fulfill its obligation to replace the converted State Forest land with property of equivalent usefulness and location.

- **Failure to Adequately Consider the Environmental Impacts of Shale Gas Development on the Converted LWCF State Forest Land**: DCNR leased over 130,000 acres of State Forest in the Pennsylvania Wilds for oil and gas development in 2009-2010, including the land subject to the LWCF protections at issue. This leasing was done in response to pressure from the General Assembly and the Governor's office to generate money for general government operations due to shortfalls in tax revenue. DCNR was not given the time or resources to fully inventory the natural resources on the State Forest tracts to be leased prior to leasing. As a result, DCNR was forced to prepare environmental reviews to support the leasing without a baseline inventory of the natural resources that would be impacted in the Pennsylvania Wilds and without any comprehensive understanding of the new shale gas industry it was about to authorize.

  While DCNR maintains the Pennsylvania Natural Diversity Inventory (PNDI) and relies on that inventory in its Environmental Assessment, that inventory only contains information from surveys conducted in limited areas across the State, primarily areas subject to development pressure in more populated regions. The State Forests in the Pennsylvania Wilds, which contain Pennsylvania's largest tracts of intact forest and many of its most rare and sensitive species, has

been protected from development and, therefore, complete surveys of its natural resources have not been conducted and included in the PNDI.

DCNR has made some effort post-leasing to begin to understand the impacts of the shale gas development on the State Forests in the Pennsylvania Wilds. DCNR published its first Shale-Gas Monitoring Report in 2014 to explain this effort and some initial baseline findings. DCNR published its second Shale Gas Monitoring Report in 2018. However, as noted above, DCNR has failed to consider the findings of its latest monitoring efforts in its Environmental Assessment. Summarized below are some of the key findings of the 2018 Shale Gas Monitoring Report that DCNR must address in its Environmental Assessment.

As noted above, on the State Forest land leased for oil ang gas development in the Pennsylvania Wilds, DCNR estimates that only 30 to 35 percent of the allowable shale gas development has occurred to date and that full development could result in as many as 1,475 wells on State Forest land. 2018 Shale Gas Monitoring Report[3] (page 4). Shale gas development in our State Forests since 2008 has converted 1,770 acres of State Forest land from forest to shale gas infrastructure (*id.* at 43), including constructing and operating 265 infrastructure pads (*id.* at 50), constructing 260 miles of new roads and expanding scenic State forest roads to industrial corridors (*id.* at 44); and constructing 188 miles of gas pipeline corridors (*id.* at 55). DCNR reports that "noticeable changes to the forest landscape are evident" with the largest increase overall resulting from "an additional 9,913 acres of forest edge." *Id.* at 64.

Shale gas development has caused greater fragmentation of our State Forest. Since 2008, our core State Forests have lost 15,134 acres of large intact forest blocks, which are unfragmented forest blocks of more than 500 acres.[7] *Id.* at 67. The fragmentation of these large forest blocks resulted in increases in the category of smaller core forest blocks in almost all State Forest Districts, with the Loyalsock State Forest (where most of the reported LWCF conversion has reportedly occurred) experiencing a 41.3% increase of smaller core forest blocks of 250-500 acres and a 30% increase in core forest blocks than 250 acres in size. *Id.*

DCNR has begun to monitor the impacts to water quality from gas development to assess the health our State Forest ecosystems. *Id.* at 79. Approximately 3,500 miles of stream traverse State Forest land within the core shale gas forest districts, "including many of the best-know fishing and boating waters in Pennsylvania." *Id.* DCNR states that "maintaining and protecting the quality of water in these streams is one of the bureau's highest priorities." In the State Forest core shale gas districts, "most of the streams (> 70%) are first-order streams," which

[3] This report is available on DCNR's website at http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20033642.pdf. [7] The monitoring report uses the metric unit of hectares. Large forest blocks are those containing more than 200 hectares, which is equivalent to 247 acres (1 hectare = 2.47 acres).

"means that the steams on state forest land are generally small, headwater streams that can be influenced greatly influenced greatly by the surrounding forest" and "have the potential to affect many others downstream." *Id.* Over 85% of the streams in the State Forest core shale gas districts are classified as either exceptional value or high quality. *Id.*

at 80.

The main concerns regarding water quality in areas subject to shale gas development "are from chemicals and salts that can be spilled during transportation or during drilling activities." *Id.* at 81-82. Other concerns include "increases in water temperature, soil, sedimentation, and turbidity from construction of infrastructure and roads improved to accommodate heavy hauling." *Id.* Fracturing fluids "can pose a potential spill risk during transportation or during well development operations." *Id.* Macroinvertebrates were surveyed in 37 stream segments to assess stream health and over one third of these segments (13) fell outside of the range of tolerance for their classification. *Id.* at 78.

The monitoring of forest health has documented the spread of invasive species in the State Forest. DCNR surveyed 238 infrastructure pads associated with oil and gas development in the core shale gas districts and observed invasive species at all but 29 of these pads. *Id.* at 78. Implementation of an early detection and rapid response program "has detected 71 populations of high-threat invasive species." *Id.* DCNR observes that from 2011 to 2016, "it is evident from the pad surveys that many invasive plant species populations have spread to new sites on state forest land and populations first found from 2011-2013 have expanded at many sites." *Id.* at 130. DCNR further states that the "proliferation and colonization of invasive plant species is one of the greatest threats to the health and viability of state forest ecosystems." *Id.* at 138.

The State Forests of the Pennsylvania Wilds were established over 100 years ago as a result of the devastating degradation that resulted from the clear-cutting of the virgin forests in the late 1800s and early 1900s. While a century of regeneration has certainly improved the condition of our State Forests, recovery from the legacy of past degradation continues. As the 2014 and 2018 Monitoring Reports begin to document, the degradation of our State Forests from the new shale gas development has at a minimum slowed and, in some instances, reversed that recovery. DCNR's Environmental Assessment fails to fully evaluate this impact.

- **Failure to Adequately Evaluate the Cumulative Impact of Conversions Resulting from Shale Gas Development**: While acknowledging that shale gas development has diminished and altered recreational use of the State Forest in the Pennsylvania Wilds, DCNR fails to fully evaluate that impact. Rather, DCNR's cumulative analysis largely describes its efforts to understand, minimize and justify those impacts. Without a thorough and comprehensive evaluation of the impacts of the authorized shale gas development on pubic outdoor recreation use of the State Forest in the Pennsylvania Wilds, DCNR cannot complete an accurate analysis of the cumulative impacts.

DCNR's assertion that the cumulative impacts to recreational use are minimal based on forest stewardship certification (FSC) audits prepared during the early years of shale gas development is flawed. As the audits themselves state, DCNR is only required to ensure that the FSC Standard is met for activities that occur within the scope of the certificate, which is forest management. The 2011 report states that "once it has been determined that forest is being converted (for utility easements, gas well pads, communication towers, etc.) the land is no longer being managed for forestry and the FSC standard is no longer applicable for the actual conversion activities (the actual clearing of the forest)" (page 4). The FSC Standard has no relevance to the analysis of lost public outdoor recreation use on converted State Forest land or DCNR's fiduciary duties to conserve and maintain these public lands under Article I, Section 27 of the Pennsylvania Constitution.

DCNR's 2014 recreational visitor survey found that 35% of the visitors to the Sproul State Forest and 23% of the visitors to the Susquehannock State Forest believed that activities related to shale gas development had changed their recreational experience. Primary impacts were related to increased road traffic, poor driving behavior, roads being blocked or areas made inaccessible to the public.

DCNR's cumulative impact analysis must provide a full evaluation of these impacts on public outdoor recreation use.

- **Failure to Properly Assess the Value of the Unique State Forest Land Converted to Industrial Use**: DCNR's attempt to use a real estate appraisal based on small converted sites rather than the large tracts of intact State Forest land lost in the Pennsylvania Wilds is inappropriate for all the reasons discussed above. DCNR retained a real estate appraiser to assess the value of 17 narrowly defined conversion sites that in total comprise 138.37 acres. As discussed above, 101.64 of those acres are from eight conversion sites located on Tract 100, which fragment this previously intact 8,891-acre tract of forest in the Loyalsock State Forest (*see* **Attachment B**).

  An appraisal based on recent sales of private property averaging less than 150 acres in size, often without subsurface rights, cannot provide a valid estimate of the cost to replace 8,891 acres of previously intact State Forest tract owned in fee by the people of Pennsylvania. The total appraised value of the eight converted sites on Tract 100 is $479,000, which equates to less than $54 per acre for the loss of the public outdoor recreation value on what was a large intact tract of State Forest in the Pennsylvania Wilds. DCNR must evaluate the true appraised value of Tract 100 and other large intact State Forest tracts in the Pennsylvania Wilds that no longer provide the unique type of recreational experience previously offered by these public lands to ensure the substitution of other recreational properties of at least equal fair market value and of reasonably equivalent usefulness and location.

- **Failure to Provide Adequate Public Outreach on Replacing Converted State Forest Land in the Pennsylvania Wilds**: DCNR contends in its Environmental Assessment that site tours and

presentations by Bureau of Forestry staff between 2008 and 2013 somehow satisfy its obligation to seek input from people that recreate in the Pennsylvania Wilds on DCNR's proposal to substitute the Strawbridge farm in Chester County for converted LWCF land in the Pennsylvania Wilds. DCNR made no effort to actually engage the public in developing this proposal. The only notice that DCNR provided was published in the Pennsylvania Bulletin (Pennsylvania's equivalent to the Federal Register), which few, if any, people who recreate in the Pennsylvania Wilds receive. Even though DCNR has State Parks and extensive recreational facilities in the Pennsylvania Wilds, it provided no outreach to the public at any of these facilities on this proposal. DCNR did not publish any information about this proposal in local newspapers in the Pennsylvania Wilds. If DCNR had actually engaged the recreational community in the Pennsylvania Wilds, it would never have made this proposal because the recreational users would demand that DCNR replace the converted LWCF land in their State Forests in the Pennsylvania Wilds with equivalent intact forest land in this region.

DCNR's contention that it has engaged in public outreach related to this proposal shows its lack of understanding of transparency at best and its intentional deception of the public at worst. When DCNR begins again in its efforts to evaluate how best to replace the converted LWCF land in the Pennsylvania Wilds, as it must, DCNR needs to engage in a robust discussion with the people that recreate in the Pennsylvania Wilds to develop a proposal that complies with its fiduciary duties under Article I, Section 27 of the Pennsylvania Constitution and federal law.

In conclusion, DCNR cannot proceed replace public land in the Pennsylvania Wilds that was supposed to be protected in perpetuity for public outdoor recreation use with farm land in Chester County. DCNR's proposal does not comply with the requirements for replacing converted LWCF land under federal law. By advancing a proposal that does not remedy the harm that has occurred to public outdoor recreation use of our public lands in the Pennsylvania Wilds, DCNR has violated its fiduciary duty under Article I, Section 27 of the Pennsylvania Constitution to conserve and maintain the public natural resources of these public lands.

PEDF looks forward to the opportunity to work with DCNR to develop a new proposal to address the loss of outdoor public recreation use in the Pennsylvania Wilds that complies with its constitutional and statutory duties.

Sincerely,

John E. Childe, Esq.

Counsel for PEDF

960 Linden Lane

Dauphin, Pa. 17018

717-743-9811

Attachments

cc: National Park Service, Pacific West Region

Cindy Adams Dunn, DCNR Secretary

Audrey F. Miner, DCNR Chief Counsel

PEDF Comments – LWCF State Forest Conversion Proposal

Page 10

Mr. & Mrs. David R. Krafjack
1155 Nimble Hill Road
Mehoopany PA 18629
570-637-0972

June 14, 2019

Mr. Thomas Ford, Director
Bureau of Recreation and Conservation
400 Market Street
Rachel Carson State Office Building
5th Floor
Harrisburg PA 17101-2301
RA-NRBRC_CONVERSIONS@pa.gov

Re: Proposal to replace leased drilling lands with purchased land in Chester County

Dear Mr. Ford:

I am totally and categorically opposed to replacing leased unconventional natural gas drilling lands with lands outside the unconventional natural gas drilling drilling area. Lands impacted by natural gas development must not be replaced by lands outside of the unconventional natural gas play. DCNR needs to be directly offsetting these lands by the purchase of and protection of lands that are within the unconventional natural gas play. Residents that live within the unconventional natural gas play must not be excluded from recreational opportunities nearby their communities with a trade of having to travel further to populated areas for respite. Please understand, our communities have been directly altered including the state forest lands and at times that precludes any respite from the industrial activity's impacts within our communities and near our homes. We need to have access to state forest lands that provide such opportunities, and not have to drive hours to populated areas to obtain them. Please understand our communities are smaller and we generally have no desire to travel to greater populated areas for respite; simply, it doesn't provide that.

Regarding the Chester County location, Chester County is one of the leading Pennsylvania counties when it comes to open space, preserved farm land and parks. In fact, just this week the Pennsylvania Agricultural Land Preservation Board took action approving preservation of farms in Chester County. Chester County has an Open Space Preservation program that is outlined on their website. It seems there is no need to displace voluntarily leased lands with lands outside the unconventional natural gas play area.

DCNR would be wise to properly maintain and create peaceful recreational opportunities within the unconventional natural gas play areas. Being awoken early in the morning to the sound of logging

trucks is not our idea of a properly maintained forested recreational area, but that is what we experienced at Colton Point State Park. DCNR was logging in the nearby Tioga State Forest and logging trucks were running loudly near what one would expect to be a primitive and peaceful campsite. Trails in the Loyalsock State Forest are sorely missing trail signs and are overgrown. People easily get lost in such areas of neglected forest. There are plenty of actions that can be taken in the unconventional natural gas play forested areas if DCNR had a mind to maintain recreational opportunities. And, DCNR could determine a plan to slowly begin purchasing oil, gas and mineral rights on owned lands or purchase such available properties within the play that are available for sale.

The Pennsylvania border as some downstate may be surprised to know, doesn't end at RT80. North of RT80 there are actually state forest lands, state parks, and yes, small cities, towns, and rural areas people call home. We want the opportunity to recreate on state lands near their homes. DCNR needs to get going protecting these lands and expanding to replace the voluntarily leased lands **within** the counties of the unconventional natural gas play. This is reasonable; these lands were essentially taken from us. This is just one more example, whether it is the lack of pipeline safety regulations on rural gathering lines or the outplacement of state forest lands each indicates that the state government has an affinity to act as if land above RT80 is the hinterlands and no one lives there, that somehow, we are deserving of less. The truth of the matter is DCNR has a duty to **all** the residents of Pennsylvania, not just those that live south of RT80 or outside the unconventional natural gas play.

I know for a fact that during 2017 the Mehoopany Creek Watershed Association contacted DCNR regarding a viable purchase of a large tract of land along the North Branch Susquehanna River that would be a suitable replacement purchase for these lost leased lands. http://www.propertyline.com/listing/emarket_report/996478 You'll find that this parcel of land that is currently for sale within Windham Township, Wyoming County has great potential as state forest lands. The land has 1100+ acres and is said to include all mineral rights. With nearly 2 miles of riverfront, boating and fishing opportunities are endless along with ideal locations for hiking and camping. The property also provides DCNR with opportunity for unlimited research on the North Branch Susquehanna River along with protecting the existing riparian buffer. This land has been for sale for a while. It's not that often such a parcel becomes available that would make such a wonderful recreational setting. And, as an added plus, Wyoming County is one of the very few that lacks either a state forest or state park within the county. DCNR has an opportunity to finally fill this void in Wyoming County with this potential purchase. DCNR has the opportunity to protect this land and increase economic opportunities for small mom and pop businesses that would serve such a property's visitors. This land presently is not protected; it is owned by a corporation seeking a buyer who will exploit it. I ask that DCNR seriously look at this property and its potential and purchase it rather than land in Chester County which is already protected by The Conservation Fund.

Best Regards,

Emily Krafjack

From: kvanfleet@pa.net
Sent: Tuesday, June 18, 2019 3:27 PM
To: NR, BRC Conversions
Subject: [External] Comments on forest habitat replacement

ATTENTION: This email message is from an external sender. Do not open links or attachments from unknown sources. To report suspicious email, forward the message as an attachment to CWOPA_SPAM@pa.gov.

Thomas Ford,
Director, Bureau of Recreation and Conservation
400 Market Street
Rachel Carson State Office Building, 5th Floor
Harrisburg, PA 17101-2301

Dear Mr. Ford,

I strongly object to the proposal of DCNRs environmental assessment in acquiring lands in Chester County Pennsylvania to mitigate the loss of and damage to forest lands in Sproul, Loyalsock, Moshannon, Tiadaghton and Tioga State Forests as a consequence of unconventional gas extraction.

As an ornithologist and ecologist who has established point count locations, conducted numerous bird surveys and characterized habitats over the past 20 years in a number of our state forests I have an extensive knowledge of the forest bird communities within particular locales including Sproul, Loyalsock, Moshannon, Tiadaghton and Tioga State Forests. These forests occur at higher elevations, are located in different physiographic regions of the state and contain dissimilar underlying geologies and surface soils than those found in the Piedmont Province of the state. As a result forest species composition (both fauna and flora) in these regions varies widely from what is found in the lower elevation Piedmont region encompassing Chester County. In addition numerous bird species listed as Pennsylvania State Species of Conservation Concern as well as several others listed as either State Threaten or Endangered occur in the higher elevation forests mentioned above.

These birds along with other fauna and flora of these higher elevation habitats are critical components of healthy functioning ecosystems. Finally, Although there are some shared generalist species those that are listed and are more specialized in their ecological requirements will not automatically appear in a location over one hundred miles away in Chester County just because land is acquired there. This is not a case of ?if you build it they will come.? As such, it is ludicrous to think that by acquiring lands in Chester County the agency can somehow replace or mitigate the damage to and loss of a forest habitat in the above mentioned locations or that somehow it?s possible to recreate what was lost in a totally different location. Instead DCNR should focus on acquiring forested lands in the same area where the

original forests are lost thus ensuring suitable resource availability to displaced members of the forest community.

I also oppose this proposal as a citizen of Pennsylvania. According to the State Constitution the forests of PA are a public resource that are owned by the people of the state, not the Commonwealth nor any of its agencies. The role of DCNR is to manage these resources for the benefit of its citizens both present and future generations not private interests. If forest habitats are lost and degraded in the north-central region of the state due to gas extraction activities then it is incumbent upon DCNR to replace those lands in the same area as where the loss or damage occurs. This will ensure that those who live in or regularly visit this region of the state can continue to access and enjoy the use of an equivalent amount of public forested lands.

Reparations should occur where the damage is done not where an an easy out presents itself. It's time for

Pennsylvania's Department of Conservation and Natural Resources do its job of conservation.

Sincerely,

Kim Van Fleet

429 pisgah State Rd.

Shermans Dale, PA 17090

PennFuture

June 18, 2019

Via First Class Mail and Email

Thomas Ford, Director
Bureau of Recreation and Conservation
PA Department of Conservation and Natural Resources
400 Market Street
Rachel Carson State Office Building, 5th Floor
Harrisburg, PA 17101-2301
RA-NRBRC_CONVERSIONS@pa.gov

Re: Public Comment on Conversion of LWCF State Forest Lands – Environmental Assessment Resolution of Conversions from Recreational Use on Land and Water Conservation Fund-Funded State Forest Land 49 Pa. Bull. 2257 (May 4, 2019)

Dear Mr. Ford:

On behalf of Citizens for Pennsylvania's Future ("PennFuture"), please accept these public comments on the Pennsylvania Department of Conservation and Natural Resources' ("DCNR" or "Department") "Environmental Assessment Resolution of Conversions from Recreational Use on

Northeast: 425 Carlton Road Suite 1 Mount Pocono, PA 18344
Southeast: 1429 Walnut Street Suite 400 Philadelphia, PA 19102
Central: 610 North Third Street Harrisburg, PA 17101
Southwest: 200 First Avenue Suite 200 Pittsburgh, PA 15222
Website: www.pennfuture.org

Land and Water Conservation Fund-Funded State Forest Land" as noticed in the May 4, 2019 *Pennsylvania Bulletin*, 49 Pa. Bull. 2257. The report upon which these comments are based is entitled "Environmental Assessment: Resolution of Conversions from Recreational Use on LWCF-Funded State Forest Land" and is dated April 11, 2019 ("LWCF Well Pad Conversion EA").

PennFuture is a state-wide, member-supported, public interest environmental organization dedicated to leading the transition to a clean energy economy in Pennsylvania and beyond. PennFuture strives to protect our air, water and land, and to empower citizens to build sustainable communities for future generations. PennFuture has long been dedicated to improving and protect our public lands, including state forests, across Pennsylvania through advocacy, public outreach and education, and litigation.

On March 4, 2019, PennFuture commented on DCNR's "Environmental Assessment of Acquisition of Land to be Acquired by the Department for the Purpose of Resolving Multiple LWCF Conversions" as noticed in 49 Pa. Bull. 284 (January 19, 2019). Our comments on that Environmental Assessment ("EA"), which only looked at the proposed replacement property in Chester County, were highly critical of DCNR's process, procedures, and analysis, concluding that DCNR failed to comply with the Land and Water Conservation Fund ("LWCF") Act, regulations, and National Park Service ("NPS") guidance, as well as the National Environmental Policy Review Act ("NEPA").[4] PennFuture's March 4, 2019 public comments are fully incorporated herein.[5]

DCNR's actions on the LWCF Well Pad Conversion EA once again fail to comply with both NEPA and the LWCF Act, regulations, and the guidelines in the NPS LWCF State Assistance Program Manual. Specifically, DCNR:

- Failed to seek NPS approval of the conversions before allowing LWCF state forest land to be converted to industrial shale gas development;

- Failed to provide an opportunity for meaningful public comment under NEPA;

- Failed to consider appropriate NEPA alternatives;

[4] PennFuture notes that the Department has responded to PennFuture's March 4, 2019 public comments by "request[ing] that PennFuture review the draft 'Resolution of Natural Gas Conversions on LWCF State Forest Land Environmental Assessment that has been Developed by the Department and will be available for public comments . . . The Gas Conversion EA may help address concerns enumerated in PennFuture's March 4, 2019 letter." LWCF Well Pad Conversion EA, Appendix J, at 20. While we acknowledge that DCNR's LWCF Well Pad Conversion EA does address our previous comments that DCNR must undertake, at a minimum, an EA of the well pad conversion of state forest land, it does not address or alleviate any of PennFuture's other concerns stated in our previous public comments, including but not limited to the problems with DCNR's selection of replacement property over 200 miles from the converted lands. DCNR's response also highlights the convoluted nature of DCNR's EA process for these LWCF 6(f)(3) conversions which has made for a confusing and illogical analysis and record.

[5] *See* LWCF Well Pad Conversion EA, Appendix J, at 5-19 (PennFuture's March 4, 2019 public comments reproduced in full).

- Failed to undertake the requisite "hard look" under NEPA and inappropriately segmented its NEPA analysis; and

- Failed to conduct an EIS for the conversion of LWCF state forest land to industrial gas development.

DCNR must ensure that for all future conversions of LWCF state forest lands to natural gas extraction facilities and appurtenances, it appropriately follows both the letter and spirit of both LWCF and NEPA by requesting NPS approval and taking a hard look at the environmental consequences of such an act (through an EIS) prior to allowing the conversion to take place.

I. DCNR FAILED TO TIMELY REQUEST APPROVAL OF THE CONVERSIONS OF LWCF STATE FOREST LAND TO INDUSTRIAL NATURAL GAS FACILITIES

The LWCF is a federal program designed to promote outdoor recreation in America.[6] To realize this goal, the LWCF program provides states with federal funding to acquire or develop lands on the condition that the land will only be used for "public outdoor recreation uses."[7] Any change of LWCF land to non-outdoor recreational uses, whether temporary or permanent, must undergo the "conversion" process, which requires replacement of all converted land (i.e., the LWCF land removed from outdoor recreational use purposes) with substitute property. Conversions are only permitted with the approval of NPS in accordance to 54 U.S.C. § 200305(6)(f)(3); 36 C.F.R. § 59.3; and the procedures set forth in the NPS's LWCF State Assistance Program Manual[8] ("LWCF Manual").

States are required by law to obtain NPS approval prior to converting any LWCF land: "No property acquired or developed with assistance under [LWCF] shall, without the approval of the Secretary, be converted to other than public outdoor recreation use."[9] The LWCF Manual sets forth in detail the formal process that must be followed for conversions.[10]

A conversion of LWCF land to a non-recreational use can only be approved by NPS if (1) it is consistent with the then existing comprehensive statewide outdoor recreation plan and (2) it provides for the substitution of other suitable replacement properties "of at least equal fair market value and of reasonably equivalent usefulness and location" to the converted land.[11] The LWCF Manual further states that generally all 6(f)(3) conversions, as they are also known, are subject to NEPA environmental impact review, requiring at least an EA that examines the environmental impacts of both the conversion

---

[6] *See* National Park Service, Land and Water Conservation Fund webpage, https://www.nps.gov/subjects/lwcf/index.htm (last visited March 4, 2019).
[7] 54 U.S.C. § 200305(b).
[8] NPS, Land And Water Conservation Fund State Assistance Program Manual (2008), https://www.nps.gov/subjects/lwcf/upload/lwcf_manual.pdf (hereinafter, "LWCF Manual").
[9] 54 U.S.C. § 200305(6)(f)(3); 36 C.F.R. § 59.3(a).
[10] *See, generally,* LWCF Manual Chs. 4 and 8.
[11] 54 U.S.C. § 200305(6)(f)(3); 36 C.F.R. § 59.3(b).

from recreational use in the LWCF lands and to the development of the replacement parkland.[12] Thus, a conversion approval must consist of approval of both the converted land and the replacement land as a whole.[13] Consequently, failure to assess the environmental impacts to the converted land is a fatal deficiency in conversion EAs and proposals.

If an unauthorized – i.e., unapproved – conversion is discovered by NPS, NPS shall request the non-outdoor recreational activity "cease immediately" and notify the state that it must preclude the project sponsor from "proceeding further with the conversion, use, or occupancy" of the land pending NPS review of the conversion proposal.[14] Approval by NPS, however, is not automatic for conversions: "This approval is a discretionary action and should not be considered a right of the project sponsor."[15] The proposal process for these unauthorized conversions is not distinguished from timely proposals in any statute or regulation, as such, it shows that neither Congress nor NPS intended to create separate requirements for untimely conversion proposals. Thus, an after-the-fact conversion proposal should be as similar to a timely proposal as possible and should be assessed under the same standards.

Here, DCNR clearly failed to follow the LWCF regulations in that the agency has waited a decade or more to request NPS approval of the conversion of LWCF state forest land to industrial gas facilities. DCNR allowed these well pads to be constructed – and thus LWCF lands to be converted to non-recreational lands – without NPS approval. These unauthorized conversions were also allowed to operate and DCNR allowed for new unauthorized conversions of LWCF state forest lands contrary to the rules set forth in NPS's LWCF Manual. Moreover, DCNR's discretion to disapprove a proposed natural gas conversion seems to have been compromised by this unwarranted and unnecessary delay. Indeed, DCNR has offered no explanation let alone a rational justification for failing to follow the requirements of the LWCF Act and regulations with respect to the unauthorized conversions of state forest land to industrial shale gas facilities.

II. DCNR'S ENVIRONMENTAL ASSESSMENT IS INCONSISTENT WITH THE LETTER AND THE SPIRIT OF NEPA

A. DCNR'S UNTIMELY AND CONVOLUTED NEPA ANALYSIS PRECLUDED MEANINGFUL PUBLIC INVOLVEMENT

In 1970, NEPA was established in recognition of our human impact on the environment around us.[16] NEPA guarantees that federal agencies account for the environmental costs of their actions, promoting environmental protection through the procedural process.[17] While not outcome

[12] LWCF Manual at Ch. 4-6 (emphasis added).
[13] *See Weiss v. Sec'y of U.S. Dep't of Interior*, 459 F. App'x 497 (6th Cir. 2012) (considering the "proposed conversion and substitution," or "land swap," as a whole).
[14] LWCF Manual at Ch. 8-11.
[15] *Id.* at Ch. 4-6.
[16] 42 U.S.C. §§ 4331, *et seq.*; *see also* Congressional White Paper, 19th Cong., Congressional White Paper on a National Policy for the Environment (1968); *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 348 (1989) ("Section 101 of NEPA declares a broad national commitment to protecting and promoting environmental quality.").
[17] *See Robertson*, 490 U.S. at 349 (citing *Kleppe v.Sierra Club*, 427 U.S. 390, 409 (1976)); *Weinberger v. Catholic Action of Hawaii/Peace Educ. Project*, 454 U.S. 139, 143 (1981).

determinative, NEPA's goal is to foster informed decision-making within the federal agencies, and as a corollary ensure citizen involvement within the process.[18] As the CEQ's website states briefly:

> The ultimate goal of the NEPA process is to foster excellent action that protects, restores, and enhances our environment. This is achieved through the utilization of environmental assessments (EAs) and environmental impact statements (EISs), which provide public officials with relevant information and allow a "hard look" at the potential environmental consequences of each proposed project.[19]

Critically, public involvement is an integral part of the analysis of the potential environmental impacts of a federal agency action under NEPA. As the Supreme Court recognized, one of NEPA's goals is to give "the public the assurance that the agency 'has indeed considered environmental concerns in its decisionmaking process,' . . . perhaps more significantly, provide[] a springboard for public comment."[17] When agencies fail to properly prepare an EA and/or an EIS, as DCNR has done here, they frustrate the purpose of NEPA by allowing the agency to make a decision without recognizing the environmental detriments of the proposed action and denying the public its right to be involved in the process. The Supreme Court in *Robinson* stated:

> NEPA ensures that the agency will not act on incomplete information, only to regret its decision after it is too late to correct. Similarly, the broad dissemination of information mandated by NEPA permits the public and other government agencies to react to the effects of a proposed action at a meaningful time.[20]

In this case, DCNR's actions are not only contrary to the statutory and regulatory requirements, but also raise serious public policy concerns. For example, a 6(f)(3) conversion necessarily includes <u>both</u> the conversion of the LWCF land to non-outdoor recreational use and the replacement of the converted LWCF lands with property of at least equal fair market value and reasonably equivalent usefulness.[21] Thus, it is uncontroverted that the NEPA analysis must likewise consider <u>both</u> the environmental impacts of the conversion of the LWCF lands and the replacement of that land with different property. Indeed, many agencies in other states have clearly been able to understand and comply with this very basic

---

[18] *Weinberger*, 454 U.S. at 143 (NEPA serves twin aims of "inject[ing] environmental considerations into the federal agency's decisionmaking process" and "inform the public that the agency has considered environmental concerns"); *see Robertson*, 490 U.S. at 349 ("[NEPA gives the public the assurance that the agency 'has indeed considered environmental concerns in its decisionmaking process,' . . . perhaps more significantly, provides a springboard for public comment") (quoting *Baltimore Gas & Elec. Co. v. Nat'l Resources Def. Council, Inc.*, 462 U.S. 97 (1983)). *See, generally,* CEQ, A Citizen's Guide to the NEPA (2007), https://ceq.doe.gov/docs/getinvolved/Citizens_Guide_Dec07.pdf.

[19] CEQ, National Environmental Policy Act "Welcome" page, https://ceq.doe.gov/ (last visited March 4, 2019).

[17] *Robertson*, 490 U.S. at 349.

[20] 490 U.S. at 349.

[21] *See* LWCF Manual at Ch. 4-5.

understanding of LWCF conversions and NEPA.[2223] Here, however, and perhaps as a direct result of DCNR's failure to timely seek approval of the well-pad conversions at issue, DCNR's LWCF Well Pad Conversion EA (like it's Strawbridge Replacement EA) is only half the requisite analysis. Separating these analyses leads to a confusing presentation of the issue for the public to comment on.[24] Moreover, as a result, NPS and the public are prevented from reviewing complete information in a way and at a time that is meaningful. Thus, the very purposes of NEPA are being frustrated by DCNR's failure to appropriately and timely undertake the required NEPA analysis.

B. DCNR Failed to Consider Appropriate Alternatives Under NEPA

NEPA requires that reasonable alternatives of the proposed agency action be considered. Yet the "alternatives considered" section of the LWCF Well Pad Conversion EA sets up a false alternatives analysis prescribed by DCNR's failure to timely act on its NEPA and LWCF 6(f)(3) conversion analysis.

Essentially, DCNR removes the necessarily analysis of alternatives to converting the outdoor recreational use of LWCF state forest land to industrial natural gas well pads, including the critical "no alternatives" analysis which should have been to not convert the state forest land to industrial uses.[25] Instead, DCNR presents the fallacy that the "no action" analysis is to "not resolve the outstanding conversions, and therefore, not meet the purpose and need of the proposed action."[26] Additionally, 36 CFR § 59.3(b)(1) requires that all practical alternatives to the conversion have been considered. But because of DCNR's failure to appropriately undertake the NEPA analysis before the conversions occurred, the two other alternatives proposed are ludicrous in their extremity: either tear out all the

---

[22] *See, e.g.,* NYS Office of Parks, Recreation and Historic Preservation, Environmental Management Bureau, *Final Environmental Assessment for Conversion of a Portion of Fort Niagara State Park for adaptive re-use of Historic Buildings and acquisition of replacement lands at Bear Mountain State Park* (March 2013), *available at* https://parks.ny.gov/inside-our-agency/documents/FortNiagara/FortNiagaraStateParkConversion.pdf; City of Westfield, Massachusetts, *Environmental Assessment, Cross Street Playground, Westfield, Massachusetts* (March [23]), *available at* https://www.cityofwestfield.org/DocumentCenter/View/2247/Environmental-AssessmentFINAL; Roaring Fork School District RE-1, *Draft NEPA Environmental Analysis of the Proposed Land Exchange for 6F Designation in Glenwood Springs, Colorado* (Sept. 26, 2017), *available at* http://www.gwsco.gov/DocumentCenter/View/3039/DRAFT-NEPA-Environmental-Assessment-of-ProposedVogellar-Park-Land-Exchange-?bidId; City of Yakima Parks and Recreation, *NEPA Environmental Assessment, RCO Conversion at Chesterly Park* (April 2017), *available* at https://yakimaparks.com/assets/EA-Chesterly-Parkand-Replacement-Park.pdf; Minnesota Department of Natural Resources, *Environmental Assessment, Conversion of*
Land and Water Conservation Fund Lands in Lake Bronson State Park for the Sale of Lots within the Lakeside Subdivision, Kittson County, Minnesota (February 2015), *available at* https://files.dnr.state.mn.us/input/environmentalreview/lake-bronson/ea.pdf.

[24] Indeed, even if such a separation of analyses were permitted or helpful, DCNR's release of the Strawbridge Replacement EA before its analysis of the environmental impacts of the actual conversion from natural gas well pads put the cart before the horse and resulted in a terribly convoluted presentation of the proposed action and attendant environmental impacts for pubic comment.

[25] *See, e.g.,* City of Yakima Parks and Recreation, *NEPA Environmental Assessment, RCO Conversion at Chesterly Park* (April 2017), *available* at https://yakimaparks.com/assets/EA-Chesterly-Park-and-Replacement-Park.pdf, at 15 ("Under the No Action alternative, no conversion of 6(f)(3) protected properties would take place.").

[26] LWCF Well Pad Conversion EA at 4. Note that this, in turn, suffers from the erroneous description of the proposed action which fails to acknowledge the conversion of LWCF lands to well pads.

well pads and attendant infrastructure or find some replacement property for the recreational usefulness that was lost years ago.[27]

The consequence of DCNR's delayed NEPA analysis is that it has failed to consider the true alternatives to converting LWCF state forest land to industrial shale gas development and extraction sites.

C. DCNR Failed to Take a "Hard Look" at the Significant Environmental Impacts of the Conversion of State Forest Lands to Industrial Shale Gas Facilities

DCNR's NEPA analysis of the relevant 6(f)(3) conversions of LWCF state forest lands to industrial natural gas well pads suffers from several procedural problems which complicates matters. First, DCNR failed to seek approval from NPS prior to allowing LWCF state forest land to be converted. Therefore, the well-pad conversions at issue here are retroactive conversions. This in-and-of-itself raises procedural and timing issues, which many of DCNR's NEPA problems stem from. Second, DCNR seems to have segmented its NEPA analysis of the natural gas extraction that occurs within its LWCF state forest lands into arbitrary, smaller segments (e.g., well pads, pipelines, etc) in violation of NEPA. By doing so, DCNR has artificially minimized the potential impacts of the conversions and failed to take the appropriate "hard look" at the potential environmental impacts, thereby erroneously claiming no need for an EIS.

DCNR's own *Shale Gas Monitoring Report* (July 2018) acknowledges that "[t]he development of traditional and alternative forms of energy may not be consistent with the LWCF protection of land for public outdoor recreational use."[28] PennFuture believes that the environmental impacts of the conversion of LWCF state forest lands to industrial shale gas development facilities results in a significant impact that warrants a full EIS. Through the EIS analysis, DCNR would take the necessary hard look at a variety of permanent and temporary, direct, indirect, and cumulative impacts of the 6(f)(3) conversions.

Natural gas extraction activities cause some of the most significant impacts on Pennsylvania's state forest resources. These extraction activities include, but are not limited to, the construction and operation of well pads to extract shale gas, the development of roads to access well pad sites, and the construction of pipelines and related infrastructure to move natural gas from the wells to market. The environmental impacts of these activities are significant and can include, for example, air and water contamination from leaks; forest fragmentation caused by pipeline and road construction; erosion, sedimentation, and stormwater runoff from construction and maintenance; adverse impacts to threatened and endangered species habitat; increased invasive species; loss of wetland functions and values within project area; and adverse impacts to the aesthetic and recreational enjoyment of those who live near or visit the impacted state forest.

Because DCNR unnaturally segmented its environmental analysis of LWCF 6(f)(3) conversions for well pads from the other interconnected and appurtenant natural gas infrastructure that runs through

[27] *Id.*

[28] LWCF Well Pad Conversion EA, Appendix A, *Shale Gas Monitoring Report*, at 11.

the LWCF state forest lands, the agency avoided having to fully analyze the real environmental impacts from shale gas development within Pennsylvania's LWCF state forests.[29] A well pad cannot be viewed in isolation; shale gas development represents a permanent change of land use that will impact recreational opportunities for generations. Natural gas development facilities and operations must be viewed comprehensively because the individual structures effect change to a much larger area. For example, the interconnected well pads, gathering lines, compressor stations and road construction represent an obvious loss of recreational opportunities and environmental impacts both individually and cumulatively, direct and indirect. Additionally, activities that effect change are not limited to the physical structure (e.g., security that is a part of shale gas development means the public is precluded from using a substantial area beyond the physical infrastructure, and heavy vehicle traffic reduces both the opportunity and enjoyment of the outdoor experience). This infrastructure will remain active for generations (e.g., the addition of wells to pads over time, and re-fracking of existing wells will extend the period of impact for many years). And the impacts are both direct and indirect (e.g., aside from the obvious loss of opportunities associated with the construction of well pads, forest fragmentation caused by road construction will reduce the amount of core forests available to wildlife and birds, which in turn will cause a loss of wildlife and bird viewing experiences).

By delaying the NEPA analysis for the shale gas development and extraction industry until after all infrastructure and facilities were built, and by separating the NEPA analysis of the well pads from the environmental analysis of the entirety of the shale gas extraction and development projects, DCNR has created an inappropriate NEPA review situation in which it has failed to take the requisite hard look at the environmental impacts of the conversion of LWCF state forest lands to industrial natural gas development.[30] For all these and other reasons, a proper NEPA analysis (both in timing and in scope) should have resulted in the 6(f)(3) conversions at issue here being analyzed under NEPA using the full and complete EIS process.

III. CONCLUSION

In conclusion, DCNR's environmental analysis for the retroactive well pad conversions is inconsistent with both the letter and spirit of NEPA and LWCF.

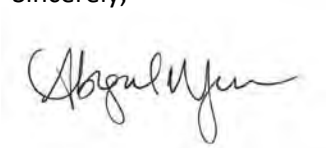
DCNR must ensure that for all future conversions of LWCF state forest lands to natural gas extraction facilities and appurtenances, it appropriately both requests NPS approval and takes a hard look at the environmental consequences of such actions prior to allowing the conversion to take place.

Thank you for your consideration of these comments. Should you wish to discuss anything PennFuture has raised in these comments or DCNR's processes and procedures for allowing natural gas extraction on LWCF state forest lands, please do not hesitate to contact me at jones@pennfuture.org or 570-216-3313.

[29] DCNR also avoided this by failing to conduct the required NEPA analysis before allowing the conversions to go forth and the gas extraction to begin on LWCF state forest lands.

[30] Obviously, this environmental analysis is supposed to be completed before any of the potential environmental impacts occur.

Sincerely,



Abigail M. Jones, Esq. Staff
Attorney

Cc: State and Local Assistance Programs
National Park Service
1849 C Street, NW, Org-2225 Washington,
D.C. 20240

II. RESPONSES TO PUBLIC COMMENTS

Commenter: Dick Martin, PA Forest Coalition

Dick Martin Comment 1	Your agency failed to consider the best alternative – to purchase replacement lands in the State Forests which were adversely affected by DCNR's gas leases of 2008 and 2010. While DCNR can't put the Genie back in the bottle and reestablish the core forests lost by fragmentation, they can and must purchase new lands to add to the forest districts which have been devastated.
Response to Comment 1	***Large contiguous tracts of land are difficult to acquire; the Strawbridge property was available at the time the DCNR was looking for replacement land for these conversions and met the Department's land acquisition priorities. The purchase of Strawbridge was reviewed as part of the Departments statewide conservation and recreation grant program, ranked highly and was selected as a priority acquisition. Public support for this acquisition was sought and received by the Department.*** ***Department priorities for land acquisition include:*** ***1. Provide recreational opportunities for communities -Strawbridge is close to large population centers*** ***2. Protect critical habitat for species of special concern – Strawbridge contains habitat for threatened and endangered species identified in the area*** ***3. Protect and enhance our water resources – Strawbridge contains approximately 2.5 miles of Big Elk Creek within the property*** ***4. Climate resilient landscapes*** ***In addition, private land owners in northcentral PA have been hesitant to sell to the DCNR based on a view that there is already too much public land (reduces tax base). DCNR does have condemnation authority and could execute such authority, however, it is highly undesirable to do so especially in northcentral PA where there is an abundance of public land. For example, Lycoming County contains approximately 195,119 acres of state-owned land (this includes state parks, forests and gamelands) and a population of approximately 115,398; Chester County only has approximately 8,150 acres of public land and a population of approximately 514,652. Lycoming County contains 1.7 acres of state-owned land per resident; Chester County contains 0.016 acre of state-owned land per resident. Chester County is the third fastest growing county in the state in terms of population. Chester County is also the #1 county in need of access to water (streams, creeks, lakes, etc.) for public recreation (determined by the Trust for Public Lands in 2019).*** ***The NPS will decide if the Strawbridge property is acceptable replacement land in terms of recreational usefulness. The DCNR will continue to make investments in northcentral PA that facilitate access and public use when and where appropriate.***
Dick Martin Comment 2	Please explain why the conversion areas on Tract 100 located in PA's Loyalsock State Forest show only 101.64 acres of the 8,891 acres in Tract 100 as converted from the intended outdoor public recreation use. Every ridge on this tract has been converted to industrial use for well pads, compression stations, impoundments, pipelines and new roads. The areas of Seneca's pads D, B, M and E, two water impoundments and the Trout Run compressor station should be included in the areas lost due to conversion to industrial use on Tract 100.

<table>
<tr><td>Response to Comment 2</td><td>The conversion areas were defined as the footprint of the gas pad/compressor infrastructure and any dedicated roads/access created to develop the sites. Only these areas within the official 6(f) boundaries are conversions. Recreation still occurs around the infrastructure. The definition of a conversion from the NPS's LWCF manual was used to make this determination. The conversion areas were not determined to be larger, in part, because DCNR wants as much land to remain LWCF protected as possible. When a conversion occurs, that land is removed from the official LWCF 6(f) boundary and is no longer subject to the protections LWCF affords.
Only areas that have been converted to non-recreational use within the defined LWCF 6(f) boundaries can be conversions. Areas impacted by gas infrastructure outside of the 6(f) boundaries have been considered in the cumulative impacts analysis but cannot be included in the conversion analysis/process: the conversion requirements apply only to the officially defined LWCF 6(f) boundaries.</td></tr>
<tr><td>Dick Martin Comment 3</td><td>DCNR's limited analysis of the outdoor recreation resources and opportunities lost in the PA Wilds as a result of the LWCF conversions is inadequate.</td></tr>
<tr><td>Response to Comment 3</td><td>Although the DCNR was not required to analyze the entire PA Wilds, a more thorough analysis of cumulative impacts to the forests has been added to the cumulative impact section of the EA. The purpose of the Gas Site Environmental Assessment is to evaluate impacts to recreation within the LWCF funded areas only, given the federal action is the conversion of LWCF funded land to non-recreational use.
Field reconnaissance completed during site inspections (2018) of the converted gas sites and two road segments revealed no identified impact to recreation within the surrounding area. Minimal recreational activities were identified during the inspection periods and scenic road driving allowed the passing travelers to easily travel through the state forest system without any disruption from the converted gas sites. Separately, accessibility improvements were identified at the converted sites due to improved parking access and recreational hunting access to the state forests.
The following table summarizes recreational activities that can and cannot be completed within the area of the conversions:
<table>
<tr><th>Recreational Activities Available</th><th>Recreational Activities Not Available</th></tr>
<tr><td>Hiking</td><td>ATV riding</td></tr>
<tr><td>Hunting</td><td>Camping</td></tr>
<tr><td>Star gazing</td><td></td></tr>
<tr><td>Horse-back riding</td><td></td></tr>
<tr><td>Cross-country skiing</td><td></td></tr>
<tr><td>Mountain biking</td><td></td></tr>
<tr><td>Dog sledding</td><td></td></tr>
<tr><td>Snowmobile riding (two road segments)</td><td></td></tr>
<tr><td>Scenic Road driving (two road segments)</td><td></td></tr>
<tr><td>Wildlife watching</td><td></td></tr>
<tr><td>Snowshoeing</td><td></td></tr>
<tr><td>Bird watching</td><td></td></tr>
<tr><td>Photographing wildlife</td><td></td></tr>
</table></td></tr>
</table>

Dick Martin Comment 4	Claiming that the purchase of the Strawbridge farmland in Chester County compensates for the loss of Tract 100 and other gas leases is an affront to the public and ignores DCNR's duty under Article 1, Section 27 of our State Constitution.
Response to Comment 4	***Article 1, Section 27 of the Pennsylvania Constitution states the following:*** ***"The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic, and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people".*** ***The Gas Site Environmental Assessment was performed to address the loss of recreational opportunities in the identified acreage. The DCNR believes that the recreational loss of 138.37 acres in the affected state forests accounts for less than a 1% loss of recreational opportunities. On the other hand, the addition of the Strawbridge property in Chester County will increase the recreational opportunities available to the people by much greater than 1%. Moreover, the DCNR manages Tract 100 and all of its leases on Commonwealth land consistent with its trustee obligations pursuant to Article 1, Section 27 of the Pennsylvania Constitution.***

<u>Commenter: Multiple Parties (31 Comments)</u>

Multiple Parties (31) Comments	Can't replace land lost in northcentral PA/PA Wilds with land in Chester County.
Response to Comment	***Large contiguous tracts of land are difficult to acquire; the Strawbridge property was available at the time the DCNR was looking for replacement land for these conversions and met the Department's land acquisition priorities. The purchase of Strawbridge was reviewed as part of the Departments statewide conservation and recreation grant program, ranked highly and was selected as a priority acquisition. Public support for this acquisition was sought and received by the Department.*** ***Department priorities for land acquisition include:*** ***5. Provide recreational opportunities for communities -Strawbridge is close to large population centers*** ***6. Protect critical habitat for species of special concern – Strawbridge contains habitat for threatened and endangered species identified in the area*** ***7. Protect and enhance our water resources – Strawbridge contains approximately 2.5 miles of Big Elk Creek within the property*** ***8. Climate resilient landscapes*** ***In addition, private land owners in northcentral PA have been hesitant to sell to the DCNR based on a view that there is already too much public land (reduces tax base). DCNR does have condemnation authority and could execute such authority, however, it is highly undesirable to do so especially in northcentral PA where there is an abundance of public land. For example, Lycoming County contains approximately 195,119 acres of state-owned land (this includes state parks, forests and gamelands) and a population of approximately 115,398; Chester County only has approximately 8,150 acres of public land and a population of approximately 514,652. Lycoming***

	County contains 1.7 acres of state-owned land per resident; Chester County contains 0.016 acre of state-owned land per resident. Chester County is the third fastest growing county in the state in terms of population. Chester County is also the #1 county in need of access to water (streams, creeks, lakes, etc.) for public recreation (determined by the Trust for Public Lands in 2019). ***The NPS will decide if the Strawbridge property is acceptable replacement land in terms of recreational usefulness. The DCNR will continue to make investments in northcentral PA that facilitate access and public use when and where appropriate.***

Commenter: PA Archaeological Council

PA Archaeological Council Comment 1	Conversion of 6(f) land is a Federal Action subject to Section 106…DCNR was required to consult and the EA cites the DEP permitting process in consideration of historical and archaeological resources. Not adequate.
PA Archaeological Council Comment 2	Given our understanding that the conversions of these LCWF parcels was a Federal Action and Section 106 was not conducted, we recommend that DCNR through the National Park Service follow ***36 CFR 800.9(b): Agency foreclosure of the Council's opportunity to comment***. Specifically, the Advisory Council on Historic Preservation should be notified and given the opportunity to comment, as well as the State Historic Preservation Officer. In all likelihood, we would expect Section 106 to be initiated and the process followed to its conclusion. Should Section 106 be opened, we would like to become a consulting party.
Response to Comments 1 & 2	***The NPS federal action addressed with this environmental document is assessing the equivalency of the conversions to the replacement land as measured by fair market value, location, and recreational usefulness, not the construction of the gas sites. At the time of construction of the gas sites, there was no federal action; therefore, the gas activity was only subject to the permitting requirements of the DEP and not NEPA.*** ***The "Guidelines to Administering Oil and Gas Activity on State Forest Lands, 2016" clearly states DCNR's approach to well pad site selection included the review of cultural resources. Completion of background research through the review of the Pennsylvania Historic and Museum Commission's (PHMC) Cultural Resource Geographic Information System (CRGIS) data, as well as the National Register of Historic Places database was reviewed for known cultural sites. Furthermore, a field view was completed by the project applicant's design team to identify potential cultural sites. Any potential impacts were coordinated with the PHMC.*** **At the time of the permit authorization process, project applicants followed the DEP permitting process to achieve cultural clearance (aboveground cultural resources and archaeological resources).** ***In addition to the well pad permits, the ESCGP-3 permit requirements indicate "the permittee shall protect archaeological specimens and historic resources in accordance with applicable State and Federal laws" as referenced in the ESCGP-3, 2018 guidelines.*** **Appendix K documents the DEP authorization document "Coordination of a Well Location with Public Resources". Applicants were required to respond to the question, "Will the well be located**

	within 200-feet of any historical and archaeological sites listed as federal or state historic sites"? Applicants completed that permit based on coordination requirements of a cultural review form with the PA Historic and Museum Commission. Completion of those documents were the legal responsibility of the well pad contractor. **The DCNR has identified these sites as conversions and is coordinating all Section 106 of the National Historic Preservation Act (NHPA) requirements through the NPS. Consulting party coordination will be completed through the NPS's public outreach process to ensure the NEPA portion of the Section 106 process has been followed. As such, the DCNR has followed State Law and is continuing to follow the federal requirements through coordination with the NPS public outreach process.**

Commenter: Pennsylvania Environmental Defense Foundation (PEDF)

PEDF Comment 1	PEDF has determined the DCNR's proposal violates its fiduciary duties as trustee under Article I, Section 27 of the Pennsylvania Constitution (Section 27) and its responsibilities under the federal Land and Water Conservation Fund Act (LWCF Act), 54 U.S.C. §§ 200301-200310. The basis for this determination is set forth below.
PEDF Comment 2	Land dedicated to public outdoor recreation use under the LWCF Act can only be converted to another use with approval of the National Park Service (NPS), which DCNR did not obtain. This failure is a violation of DCNR's fiduciary duties under Section 27. Now DCNR is attempting to obtain after-the-fact approval of its conversion of LWCF-protected land without complying with the requirements imposed to obtain such approval…
Response to Comment 1 & 2	***The DCNR Bureau of Forestry manages state forest land for a variety of uses other than recreation, such as timber, plant and animal habitats, and minerals. Act 18 (Conservation and Natural Resources Act) created in 1995 authorizes the department to arrange and execute contracts or leases in the name of the Commonwealth for the mining or removal of any valuable minerals that may be found in state forests. At the time of the Marcellus Shale natural gas development, the DCNR believes that natural gas infrastructure did not constitute a conversion, because forests are multi-purpose and recreational opportunities still remained on the affected state forests. The DCNR now believes that even this minimal loss of recreational opportunity constitutes a conversion. The purpose of this EA is to correct these historical actions which DCNR now believes to be a conversion on LWCF funded land.*** ***Conversions are usually resolved after-the-fact. Resolving conversions is DCNR acting as a responsible steward.*** ***Article 1, Section 27 of the Pennsylvania Constitution states the following:*** ***"The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic, and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people".*** ***This EA satisfies the DCNR's LWCF conversion obligations and demonstrates DCNR's adherence to its trustee obligations pursuant to Article 1, Section 27.***

<table>
<tr><td>PEDF Comment 3</td><td>DCNR’s limited analysis of the outdoor recreation resources and opportunities lost in the Pennsylvania Wilds as a result of the LWCF conversions is inadequate…</td></tr>
<tr><td>Response to Comment 3</td><td>Although the DCNR was not required to analyze the entire PA Wilds, a more thorough analysis of cumulative impacts to the forests has been added to the cumulative impact section of the EA. The purpose of the Gas Site Environmental Assessment is to evaluate impacts to recreation within the LWCF funded areas only, given the federal action is the conversion of LWCF funded land to non-recreational use.
Field reconnaissance completed during site inspections (2018) of the converted gas sites and two road segments revealed no identified impact to recreation within the surrounding area. Minimal recreational activities were identified during the inspection periods and scenic road driving allowed the passing travelers to easily travel through the state forest system without any disruption from the converted gas sites. Separately, accessibility improvements were identified at the converted sites due to improved parking access and recreational hunting access to the state forests. The following table summarizes recreational activities that can and cannot be completed within the area of the conversions:
<table>
<tr><th>Recreational Activities Available</th><th>Recreational Activities Not Available</th></tr>
<tr><td>Hiking</td><td>ATV riding</td></tr>
<tr><td>Hunting</td><td>Camping</td></tr>
<tr><td>Star gazing</td><td></td></tr>
<tr><td>Horse-back riding</td><td></td></tr>
<tr><td>Cross-country skiing</td><td></td></tr>
<tr><td>Mountain biking</td><td></td></tr>
<tr><td>Dog sledding</td><td></td></tr>
<tr><td>Snowmobile riding (two road segments)</td><td></td></tr>
<tr><td>Scenic Road driving (two road segments)</td><td></td></tr>
<tr><td>Wildlife watching</td><td></td></tr>
<tr><td>Snowshoeing</td><td></td></tr>
<tr><td>Bird watching</td><td></td></tr>
<tr><td>Photographing wildlife</td><td></td></tr>
</table></td></tr>
<tr><td>PEDF Comment 4</td><td>Inadequate Evaluation of Land Subject to LWCF Restrictions…</td></tr>
</table>

Response to Comment 4	***Table 2 was added to the EA document to further explain the specific work that was funded by the three LWCF grants associated with the conversions. In Table 2 you will see that all three grants were used to rehabilitate state forest roads and bridges due to severe deterioration. The repairs made to these roads in the 1970's and 1980's when the LWCF grants were awarded are now beyond their useful life and have been repaired and upgraded since. Appendix B contains the official LWCF 6(f) boundaries determined by the NPS in 1990 based on the recreational units served by each road that was improved.*** ***The purpose of this EA is to document the conversion of LWCF state forest land due to historical natural gas infrastructure development. Adding LWCF grant information for all state parks and local parks in northcentral PA was not viewed as pertinent information for this analysis. The LWCF grants funded work in other parts of the state, not just northcentral PA.***
PEDF Comment 5	Inadequate Evaluation of LWCF Acreage Converted by industrial oil and gas development…
Response to Comment 5	***The conversion areas were defined as the footprint of the gas pad/compressor infrastructure and any dedicated roads/access created to develop the sites. The definition of a conversion from the NPS's LWCF manual was used to make this determination. Only these areas within the official 6(f) boundaries are conversions. Recreation still occurs around the infrastructure. The conversion areas were not determined to be larger in part because DCNR wants as much land to remain LWCF protected as possible. When a conversion occurs, that land is removed from the official LWCF 6(f) boundary and is no longer subject to the protections LWCF affords. Only areas that have been converted to non-recreational use within the defined LWCF 6(f) boundaries can be conversions. Areas impacted by gas infrastructure outside of the 6(f) boundaries have been considered in the cumulative impacts analysis, however, cannot be included in the conversion analysis/process. The conversion requirements apply only to the officially defined LWCF 6(f) boundaries.***
PEDF Comment 6	Failure to consider replacement land in the PA Wilds as an alternative: DCNR fails to consider reasonable alternatives in its Environmental Assessment to address the conversion of the LWCF-protected outdoor recreation properties. … The acquisition of additional core forest land similar in nature to the recreation resource converted must be evaluated by DCNR to fulfill its obligation to replace the converted State Forest land with property of equivalent usefulness and location.

Response to Comment 6	***Large contiguous tracts of land are difficult to acquire; the Strawbridge property was available at the time the DCNR was looking for replacement land for these conversions and met the Department's land acquisition priorities. The purchase of Strawbridge was reviewed as part of the Departments statewide conservation and recreation grant program, ranked highly and was selected as a priority acquisition. Public support for this acquisition was sought and received by the Department.*** ***Department priorities for land acquisition include:*** ***9. Provide recreational opportunities for communities -Strawbridge is close to large population centers*** ***10. Protect critical habitat for species of special concern – Strawbridge contains habitat for threatened and endangered species identified in the area*** ***11. Protect and enhance our water resources – Strawbridge contains approximately 2.5 miles of Big Elk Creek within the property*** ***12. Climate resilient landscapes*** ***In addition, private land owners in northcentral PA have been hesitant to sell to the DCNR based on a view that there is already too much public land (reduces tax base). DCNR does have condemnation authority and could execute such authority, however, it is highly undesirable to do so especially in northcentral PA where there is an abundance of public land. For example, Lycoming County contains approximately 195,119 acres of state-owned land (this includes state parks, forests and gamelands) and a population of approximately 115,398; Chester County only has approximately 8,150 acres of public land and a population of approximately 514,652. Lycoming County contains 1.7 acres of state-owned land per resident; Chester County contains 0.016 acre of state-owned land per resident. Chester County is the third fastest growing county in the state in terms of population. Chester County is also the #1 county in need of access to water (streams, creeks, lakes, etc.) for public recreation (determined by the Trust for Public Lands in 2019).*** ***The NPS will decide if the Strawbridge property is acceptable replacement land in terms of recreational usefulness. The DCNR will continue to make investments in northcentral PA that facilitate access and public use when and where appropriate.***
PEDF Comment 7	Failure to adequately consider the environmental impacts of shale gas development on the converted LWCF state forest land…
Response to Comment 7	***The NPS conversion process only considers the recreational uses/opportunities being converted and replaced, which is the purpose of this EA. The federal NEPA action is specific to the conversion of recreational land and the fact that the conversion must assess the equivalency of the recreational resources. However, the DCNR enhanced the cumulative impact section to address some of the concerns raised.***
PEDF Comment 8	Failure to adequately evaluate the cumulative impact of conversions resulting from shale gas development…DCNRs cumulative impact analysis must provide a full evaluation of these impacts on public outdoor recreation use.
Response to Comment 8	***The NPS conversion process only considers the recreational uses/opportunities being converted and replaced, which is the purpose of this EA. However, the DCNR enhanced the cumulative impact section of the EA to address some of the concerns raised.***

PEDF Comment 9	Failure to properly assess the value of the unique state forest land converted to industrial use…
Response to Comment 9	***The appraisal of the defined converted sites follows the NPS's guidelines for conversions in that the Uniform Appraisal Standards for Federal Land Acquisition (Yellow Book Appraisal) must be used. A Yellow Book appraisal determines the value of land for its highest and best use. The converted areas were determined to be the footprint of the gas pad/compressor infrastructure and any roads developed to provide access.***
PEDF Comment 10	Failure to provide adequate public outreach on replacing converted state forest land in the PA wilds…
Response to Comment 10	***The NPS requires conversion-related environmental assessments be posted for public comment for a period of no less than 30 days. This document was posted in the PA Bulletin for a 45-day comment period. The DCNR's 45-day public comment period exceeds the NPS requirements and therefore constitutes adequate public outreach.*** ***In addition, the purchase of the Strawbridge replacement land was reviewed as part of the Department's statewide conservation and recreation grant program, ranked highly and was selected as a priority acquisition. Public support for this acquisition was sought and received by the Department.*** ***Documenting the consideration of other replacement properties is outside of the scope of the federal action and is therefore not a requirement of the conversion analysis. This is why replacement land selection was not included in the EA document.***
PEDF Comment 11	In conclusion, DCNR cannot proceed to replace public land in the Pennsylvania Wilds that was supposed to be protected in perpetuity for public outdoor recreation use with farm land in Chester County. DCNR's proposal does not comply with the requirements for replacing converted LWCF land under federal law. By advancing a proposal that does not remedy the harm that has occurred to public outdoor recreation use of our public lands in the Pennsylvania Wilds, DCNR has violated its fiduciary duty under Article I, Section 27 of the Pennsylvania Constitution to conserve and maintain the public natural resources of these public lands.

Response to Comment 11	***Large contiguous tracts of land are difficult to acquire; the Strawbridge property was available at the time the DCNR was looking for replacement land for these conversions and met the Department's land acquisition priorities. The purchase of Strawbridge was reviewed as part of the Departments statewide conservation and recreation grant program, ranked highly and was selected as a priority acquisition. Public support for this acquisition was sought and received by the Department.*** ***Department priorities for land acquisition include:*** ***1. Provide recreational opportunities for communities -Strawbridge is close to large population centers*** ***2. Protect critical habitat for species of special concern – Strawbridge contains habitat for threatened and endangered species identified in the area*** ***3. Protect and enhance our water resources – Strawbridge contains approximately 2.5 miles of Big Elk Creek within the property*** ***4. Climate resilient landscapes*** ***In addition, private land owners in northcentral PA have been hesitant to sell to the DCNR based on a view that there is already too much public land (reduces tax base). DCNR does have condemnation authority and could execute such authority, however, it is highly undesirable to do so especially in northcentral PA where there is an abundance of public land. For example, Lycoming County contains approximately 195,119 acres of state-owned land (this includes state parks, forests and gamelands) and a population of approximately 115,398; Chester County only has approximately 8,150 acres of public land and a population of approximately 514,652. Lycoming County contains 1.7 acres of state-owned land per resident; Chester County contains 0.016 acre of state-owned land per resident. Chester County is the third fastest growing county in the state in terms of population. Chester County is also the #1 county in need of access to water (streams, creeks, lakes, etc.) for public recreation (determined by the Trust for Public Lands in 2019).*** ***The NPS will decide if the Strawbridge property is acceptable replacement land in terms of recreational usefulness. The DCNR will continue to make investments in northcentral PA that facilitate access and public use when and where appropriate.*** ***DCNR believes that in its review relating to the issuance of the leases and its ongoing management and oversite of the leases that we are upholding our trust responsibilities relating to Article 1, Section 27. In addition, the conversion and replacement land proposals further demonstrate the Agencies commitment to upholding our responsibilities under Article 1, Section 27. The above law reflects the most basic approach to upholding the environmental values set forth as land managers and stewards of the environment.***

Commenter: Emily Krafjack

Emily Krafjack	Totally and categorically opposed to replacement land outside the area…Property is available in Windham Township, Wyoming County.
Response to Comment	***The Pinchot State Forest – District Forester determined that there were no suitable tracts of replacement land available for purchase in this region. As of September 2019, there were no available tracts of land for purchase in Wyoming County of at***

	least 1,000 acres in the last five years. DCNR Bureau of Forestry continually evaluates potential land purchases as properties become available. If they are consistent with Department policy, and funds are available, it is purchased. The DCNR believes the Strawbridge replacement land will offer greater recreational usefulness to a larger population. The DCNR continues to protect and add lands for state management and continues to manage lands for improved public access (fee acquisitions and easements).

Commenter: Kim Van Fleet

Kim Van Fleet	Bird habitat, forest fragmentation and location of replacement land.
Response to Comment	***Forest fragmentation did occur through the management of natural gas resources and DCNR is aware the creation of edge habitat may affect biodiversity and ecosystem health. At the time of site selection, Best Management Practices (BMP) were used to locate new infrastructure near adjacent infrastructure where possible. Regarding impacts to bird species of State Concern, project applicants were required to complete a PNDI database search as part of the DEP permit authorization process. All conflicts with state threatened and endangered species were resolved prior to the construction of the gas well pads.*** ***Large contiguous tracts of land are difficult to acquire; the Strawbridge property was available at the time the DCNR was looking for replacement land for these conversions and met the Department's land acquisition priorities. The purchase of Strawbridge was reviewed as part of the Departments statewide conservation and recreation grant program, ranked highly and was selected as a priority acquisition. Public support for this acquisition was sought and received by the Department.*** ***Department priorities for land acquisition include:*** ***1. Provide recreational opportunities for communities -Strawbridge is close to large population centers*** ***2. Protect critical habitat for species of special concern – Strawbridge contains habitat for threatened and endangered species identified in the area*** ***3. Protect and enhance our water resources – Strawbridge contains approximately 2.5 miles of Big Elk Creek within the property*** ***4. Climate resilient landscapes*** ***In addition, private land owners in northcentral PA have been hesitant to sell to the DCNR based on a view that there is already too much public land (reduces tax base). DCNR does have condemnation authority and could execute such authority, however, it is highly undesirable to do so especially in northcentral PA where there is an abundance of public land. For example, Lycoming County contains approximately 195,119 acres of state-owned land (this includes state parks, forests and gamelands) and a population of approximately 115,398; Chester County only has approximately 8,150 acres of public land and a population of approximately 514,652. Lycoming County contains 1.7 acres of state-owned land per resident; Chester County contains 0.016 acre of state-owned land per resident. Chester County is the third fastest growing county in the state in terms of population. Chester County is also the #1***

	county in need of access to water (streams, creeks, lakes, etc.) for public recreation (determined by the Trust for Public Lands in 2019). ***The NPS will decide if the Strawbridge property is acceptable replacement land in terms of recreational usefulness. The DCNR will continue to make investments in northcentral PA that facilitate access and public use when and where appropriate.***

Commenter: PennFuture

PennFuture Comment 1	DCNR failed to timely request approval of the conversions of LWCF state forest land to industrial natural gas facilities.
Response to Comment 1	***The purpose of this EA is to correct an action which DCNR now believes to be a conversion on LWCF funded land. At the time of the natural gas development, it was believed that natural gas infrastructure did not constitute a conversion. The DCNR Bureau of Forestry manages state forest land for a variety of uses other than recreation such as timber, plant and animal habitats, and minerals. Act 18 (Conservation and Natural Resources Act) created in 1995 authorizes the department to arrange and execute contracts or leases in the name of the Commonwealth for the mining or removal of any valuable minerals that may be found in state forests.*** ***Conversions are usually resolved after-the-fact. Resolving conversions is DCNR acting as a responsible steward.***
PennFuture Comment 2	DCNR's EA is inconsistent with the letter and the spirit of NEPA. DCNR's untimely and convoluted NEPA analysis precluded meaningful public involvement.
Response to Comment 2	***The Strawbridge replacement land EA was advanced first to NPS as the acquisition timing and NPS rules required that the package be submitted in advance of the property being taken into full ownership by the Commonwealth. For this reason, out of necessity DCNR prepared two EA documents. The complete Strawbridge EA is included as an Appendix for this EA document. The Strawbridge replacement property will also be used as replacement land for other conversions throughout the state, not just the gas site conversions.***
PennFuture Comment 3	DCNR failed to consider appropriate alternatives under NEPA. If the conversion process occurred at the time of natural gas infrastructure construction, an alternative would have been to not convert LWCF land.
Response to Comment 3	***The purpose of this EA is to correct an action which DCNR now believes to be a conversion on LWCF funded land. At the time of the natural gas development, it was believed that natural gas infrastructure did not constitute a conversion. The DCNR Bureau of Forestry manages state forest land for a variety of uses other than recreation such as timber, plant and animal habitats, and minerals. Act 18 (Conservation and Natural Resources Act) created in 1995 authorizes the department to arrange and execute contracts or leases in the name of the Commonwealth for the mining or removal of any valuable minerals that may be found in state forests.*** ***Conversions are usually resolved after-the-fact. Resolving conversions is DCNR acting as a responsible steward.*** ***Regardless of the timing of the EA submission, the NPS does not have federal jurisdiction of the state's authority to approve or disapprove the construction of gas***

	infrastructure. Conversion consultation with NPS prior to construction of the gas infrastructure would not have prevented the action. The non-conversion alternative was not addressed in the NEPA document because the NPS does not have the authority to dictate what a grantee can do with their own property. They can suggest or request the conversion not occur, but they cannot prevent it. Therefore, NPSs only decision when it comes to the federal action is to approve the conversion analysis and replacement land or not.
PennFuture Comment 4	DCNR failed to take a "hard look" at the significant environmental impacts of the conversion of state forest lands to industrial shale gas facilities.
Response to Comment 4	***The conversion areas were defined as the footprint of the gas pad/compressor infrastructure and any dedicated roads/access created to develop the sites. Only these areas within the official 6(f) boundaries are conversions. Recreation still occurs around the infrastructure. The definition of a conversion from the NPS's LWCF manual was used to make this determination. The conversion areas were not determined to be larger in part because DCNR wants as much land to remain LWCF protected as possible. When a conversion occurs, that land is removed from the official LWCF 6(f) boundary and is no longer subject to the protections LWCF affords. Only areas that have been converted to non-recreational use within the defined LWCF 6(f) boundaries only can be conversions. Areas impacted by gas infrastructure outside of the 6(f) boundaries have been considered in the cumulative impacts analysis, but cannot be included in the conversion analysis/process. The conversion requirements apply only to the officially defined LWCF 6(f) boundaries.*** ***The analysis in the cumulative impacts section of the EA has been enhanced, however, the NPS conversion process only considers the recreational uses/opportunities being converted and replaced which is the purpose of this EA.*** ***If the gas infrastructure development was considered a federal action at the time of construction, NPS would still only be able to approve the EA based on recreational impacts and the replacement of land and recreational utility. The EA would still be written the same way. The federal action is the loss of recreational land and replacement of that land and recreational utility.*** ***In terms of a "hard look" at significant environmental impacts due to gas infrastructure development, all state and federal laws have been adhered to. The DEP permitting process, the DCNR Oil and Gas Guidelines, the State Forest Environmental Reviews, apply to all shale gas infrastructure, and these permits and reviews address the environmental impacts of the infrastructure. This EA for NPS is designed to only address the loss of recreational opportunities.***