EROSION & SEDIMENTATION CONTROL PLAN

Well Pad Upgrade

James City Injection Well 38282

Highland Township
Elk County
Pennsylvania

Owner/Operator:
Seneca Resources Corporation
51 Zents Boulevard
Brookville, PA 15825

Published: June 2019

Prepared By:

SENECA RESOURCES

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E & S PLAN FACT SHEET

For

SENECA RESOURCES CORPORATION

Project Name: James City Injection Well 38282 Pad Upgrade

Township: Highland

County: Elk

USGS Topographic Quadrangle: James City

Location: From the intersection of US 6 and PA 66 in Kane, take PA 66 south for approx. 3 miles. At top of James City hill, turn left onto Lamont Rd (T 319) and travel approx. 0.6 miles. Turn right onto access road and travel approx. 0.4 miles to pad area.

Latitude: 41.612484

Longitude: -78.822049

Stream Name & Chapter 93 Stream Classification:

UNT to Wolf Run: HQ-CWF (High Quality-Cold Water Fishes)

Pennsylvania One Call System, Inc.
Call 3 Business Days Before you Dig!
1-800-242-1776 or 8-1-1
POCS Serial No.:_____
Date: _____

PROJECT DESCRIPTION

This project will utilize the existing access road. A rock construction entrance will be installed at Lamont Rd (see map) The existing access road will be graded, crowned and stoned from Lamont Rd to the pad area (approx. 2,500 feet). Extra stone will be installed at the gas line crossing along the access road (noted on map). Filter sock will be installed around the entire pad area and above any delineated wetland (see inset map). The existing pad will not be expanded due to wetlands. A tower will be constructed on the existing pad. The existing well equipment (tanks and production facilities) will be removed. All disturbed areas will be seed and mulched upon completion of work or on an as-needed basis

Proper precautions will be taken to reduce disturbance. Earth disturbance will be kept to within the pad area. Disturbed areas will be stabilized immediately or upon temporary cessation of earth disturbance activity (approx. 2 to 3 weeks).

TOPOGRAPHY

Appendix 1 includes the James City USGS Quadrangle Map, depicting the site's general topography. Generally, flat terrain surrounds the area of the proposed construction activity.

SOILS

Maps generated using the Soil Data Mart shapefiles portray the location of the soil types along the project length. These pertinent soil properties are included as part of *Appendix 3.* The site consists of Cavode silt loam (CaB) at 3 to 8 percent slopes, Cookport channery loam (CpB) at 0 to 8 percent slopes (very stony) and Wharton silt loam (WaB) at 3 to 8 percent slopes. Methods put forth to minimize or enhance these soil types to perform adequately and minimize the potential for environmental impacts include careful consideration of soil limitations.

STREAM CHARACTERISTICS

Located within the Allegheny River Basin, one stream exhibits topographical potential to receive waters from the project site:

UNT to Wolf Run: HQ-CWF (High Quality-Cold Water Fishes)

EROSION AND SEDIMENTATION CONTROLS

Implemented during pre-construction, throughout construction, and for the duration of the post-construction, proper BMPs, in accordance with the Pennsylvania Department of Environmental Protection (PADEP), ensure minimization of the project's potential effect on the environment.

BMP INSTALLATION AND SITE CONSTRUCTION SEQUENCE

1. Pre-Construction

Before construction begins, field-mark limits of disturbance and environmentally sensitive areas. The contractor is responsible to familiarize himself completely with the erosion and sediment control measures included in this Plan.

2. Staging Area

The staging area will be located at the entrance to the access road.

3. Handling of Hazardous Materials

All fuels, oils, chemicals, or other hazardous materials used throughout the project must be stored and transported in tightly sealed containers. In staging areas, stationary tanks, placed in secondary containment, will store fuels. If a tank leaks, the responsible party will transfer contents to another tank. Remove any associated standing liquids caught by secondary containment measures as well as any obviously contaminated soils upon removal of the empty tank; backfill the excavated areas with clean soil.

4. Access Roads

The project will utilize the existing access road.

5. Restoration and Re-vegetation

Permanent restoration and re-vegetation measures serve to control erosion and sedimentation by establishing a vegetative cover that protects the soil and by using mechanical structures that can divert or slow runoff and trap sediment. The contractor will restore all disturbed portions of the construction limits and supplemental work areas, as approved and shown in these documents.

Complete final grading as soon as practical, weather permitting. The construction area's grading should leave the soil in conditions proper for planting. After completing grading, remove excess rock and similar materials from the construction limits along with accumulated construction debris.

All disturbed areas should be seeded at a rate of forty (40) pounds-per-acre with the seed

mixture 1+3 at a minimum. Details related to the recommended seed mixtures can be found in *Table 11.4* and *Table 11.5* below.

Seed mixtures were selected based on adaptability for specific use, longevity, ability to regenerate, maintenance requirements, wildlife habitat, and aesthetic values. Seed percentages are based on one-hundred (100) pound bags. If broadcast or hydro-seeding methods are used, apply seed at double the recommended seeding rates.

a. *Temporary Site Preparation:* Apply one (1) ton of agricultural-grade limestone per acre, plus 10-10-10 fertilizer at the rate of five-hundred (500) pounds per acre, and work in where possible. After seeding, mulch with hay or straw at a rate of three (3) tons per acre for the disturbed area.

b. *Permanent Site Preparation:* Apply six (6) tons of agricultural-grade limestone per acre, plus 10-20-20 fertilizer at the rate of one-thousand (1000) pounds per acre, and work in where possible. After seeding, mulch with hay or straw at a rate of three (3) tons per acre for the disturbed area.

6. Monitoring and Maintenance

Ensure proper functioning of E&S facilities with conducted monitoring and maintenance of erosion control measures. Verification of the site's integrity, as to properly functioning E&S controls, follows routine inspections, weekly, and after each runoff event. Where there is a need for sediment removal to re-establish the functionality of an installed E&S measure, combine the removed sediment with on-site fill. Immediately stabilize all disturbed areas using permanent seeding measures. Suitable permanent stabilization adheres to the guidelines of a minimum seventy (70) percent perennial vegetative cover or other permanent non-vegetative cover with a density sufficient to resist accelerated surface erosion and subsurface characteristics to resist sliding and other movements.

7. Recycling and Disposal of Materials

All soil disturbed at the site will either be used as part of the Erosion and Sedimentation Control Plan or graded back into the surrounding landscape. All stone used will be non-toxic. Dispose all other material removed from the site at a location approved by PADEP.

8. Geological Formations

Natural occurring geologic formations or soil conditions that may have the potential to cause pollution during earth disturbance activities and include BMPs will be avoided or will have minimal potential pollution and impacts from such formations.

Table 11.4 Recommended Seed Mixtures

Mixture Number	Species	Seeding Rate – Pure Live Seed[1]	
		Most Sites	Adverse Sites
1[2]	Spring oats (spring), or Annual ryegrass (spring or fall), or Winter wheat (fall), or Winter rye (fall)	64 10 90 56	96 15 120 112
2[3]	Tall fescue, or Fine fescue, or Kentucky bluegrass, plus Redtop[4], or Perennial ryegrass	60 35 25 3 15	75 40 30 3 20
3	Birdsfoot trefoil, plus Tall fescue	6 30	10 35
4	Birdsfoot trefoil, plus Reed canarygrass	6 10	10 15
5[8]	Crownvetch, plus Tall fescue, or Perennial ryegrass	10 20 20	15 25 25
6[5,8]	Crownvetch, plus Annual ryegrass	10 20	15 25
7[8]	Birdsfoot trefoil, plus Crownvetch, plus Fall fescue	6 10 20	10 25 30
8	Flatpea, plus Tall fescue, or Perennial ryegrass	20 20 20	30 30 25
9[6]	Serecia lespedeza, plus Tall fescue, plus Redtop[4]	10 20 3	20 25 3
10	Tall fescue, plus Fine fescue	40 10	60 15
11	Deertongue, plus Birdsfoot trefoil	15 6	20 10
12[7]	Switchgrass, or Big Bluestem, plus Birsfoot trefoil	15 15 6	20 20 10
13	Orchardgrass, or Smooth bromegrass, plus Birdsfoot trefoil	20 25 6	30 35 10

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. PLS is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planning rate for switchgrass, divide 12 pounds PLS shown on the seed tag. Thus, if the PLS content of a given seed lot is 35%, divide 12 PLS by 0.35 to obtain 34.3 pounds of seed required to plant one acre. All mixtures in this table are shown in terms of PLS.
2. If high-quality seed is used, for most sites seed spring oats at a rate or 2 bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at 1 bushel per acre. If germination is below 90%, increase these suggested seeding rates by 0.5 bushel per acre.
3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.

4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.
5. Use for highway slopes and similar sites where desired species after establishment is crownvetch.
6. Use only in extreme southeastern or extreme southwestern Pennsylvania. *Serecia lespedeza* is not well adapted to most of PA.
7. Do not mow shorter than 9 to 10 inches.
8. Seed mixtures containing crown vetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

Table 11.5 – Recommended Seed Mixtures for Stabilizing Disturbed Areas

Site Condition	Nurse Crop	Seed Mixture (Select one mixture)
Slopes and Banks (not mowed)		
Well-drained	1 plus	3, 5, 8, or 12[1]
Variable drainage	1 plus	3 or 7
Slopes and Banks (mowed)		
Well-drained	1 plus	2 or 10
Slopes and Banks (grazed/hay)		
Well-drained	1 plus	2, 3, or 13
Gullies and Eroded Areas	1 plus	3, 5, 7, or 12[1]
Erosion Control Facilities (BMPs)		
Sod waterways, spillways, frequent water flow areas	1 plus	2, 3, or 4
Drainage ditches		
Shallow, less than 3 feet deep	1 plus	2, 3, or 4
Deep, not mowed	1 plus	5 or 7
Pond banks, dikes, levees, dams, diversion channels, And occasional water slow areas		
Mowed areas	1 plus	2 or 3
Non-moved areas	1 plus	5 or 7
For hay or silage on diversion channels and Occasional water slow areas	1 plus	3 or 13
Highways[2]		
Non-mowed areas		
Pure crownvetch[3]	1 plus	5 or 6
Well-drained	1 plus	5, 7, 8, 9, or 10
Variable drained	1 plus	3 or 7
Poorly drained	1 plus	3 or 4
Areas mowed several times per year	1 plus	2, 3, or 10
Utility Right-of-way		
Well-drained	1 plus	5, 8, or 12[1]
Variable drained	1 plus	3 or 7
Well-drained areas for grazing/hay	1 plus	2, 3, or 13
Effluent Disposal Areas	1 plus	3 or 4
Sanitary Landfills	1 plus	3, 5, 7, 11[1], or 12[1]
Surface mines		
Spoils, mine wastes, fly ash, slag, settling basin Residues and other severely disturbed areas	1 plus	3, 4, 5, 7, 8, 9, 11[1], or 12[1]

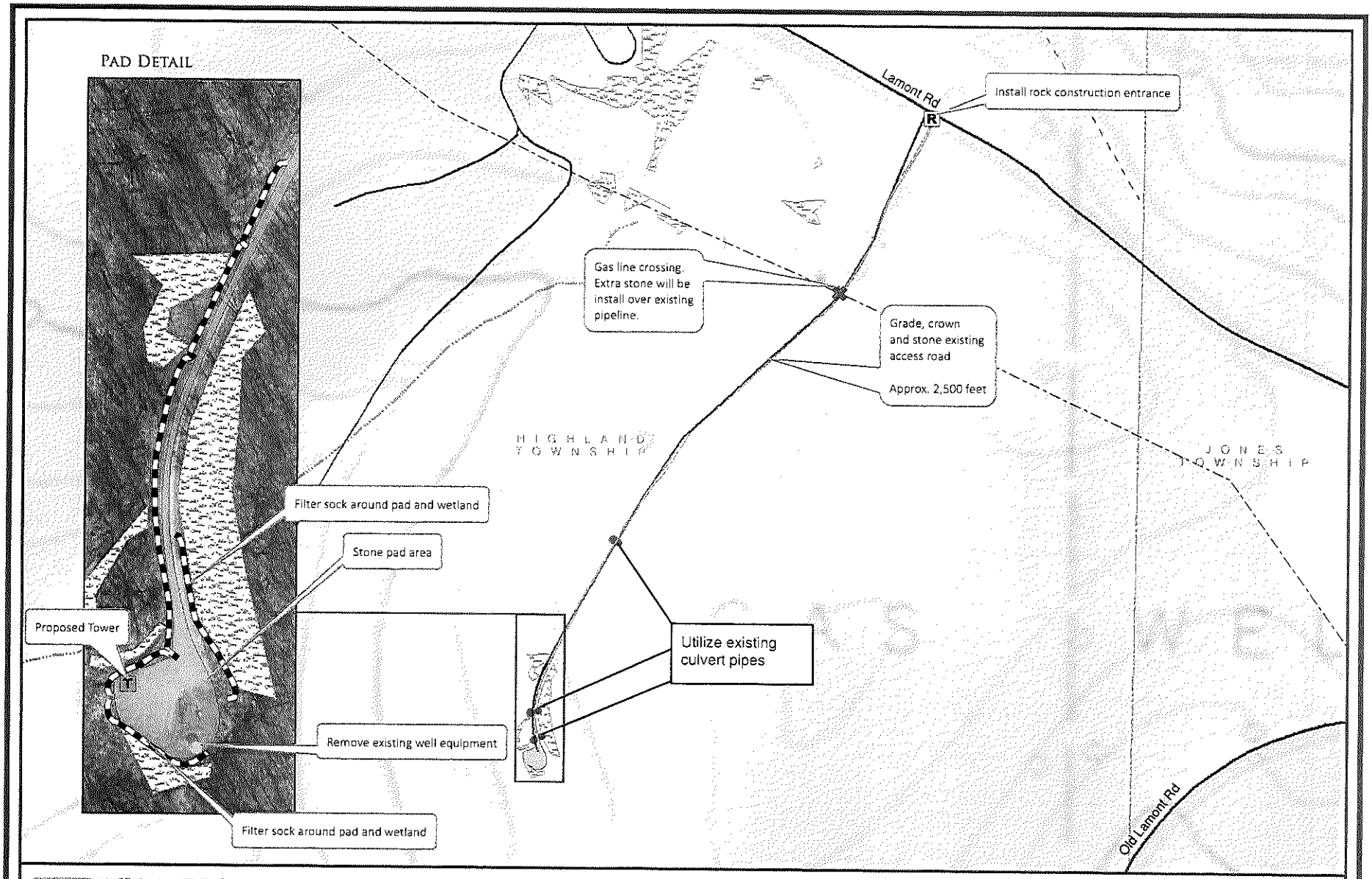
Table 11.5 – Recommended Seed Mixtures for Stabilizing Disturbed Areas		
(lime to soil test) Severely disturbed areas for grazing/hay	1 plus	3 or 13

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.
2. Contact the Pennsylvania Department of Transportation district roadside specialist for specific suggestions on treatment techniques and management practices.
3. Seed mixtures containing crownvetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

APPENDIX

APPENDIX 1:
Project Map



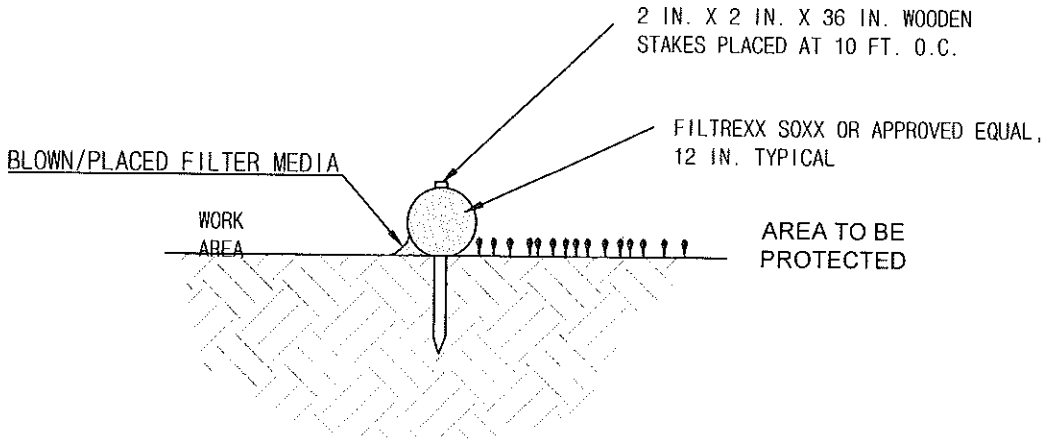
JAMES CITY INJECTION WELL 38282

HIGHLAND TOWNSHIP, ELK COUNTY

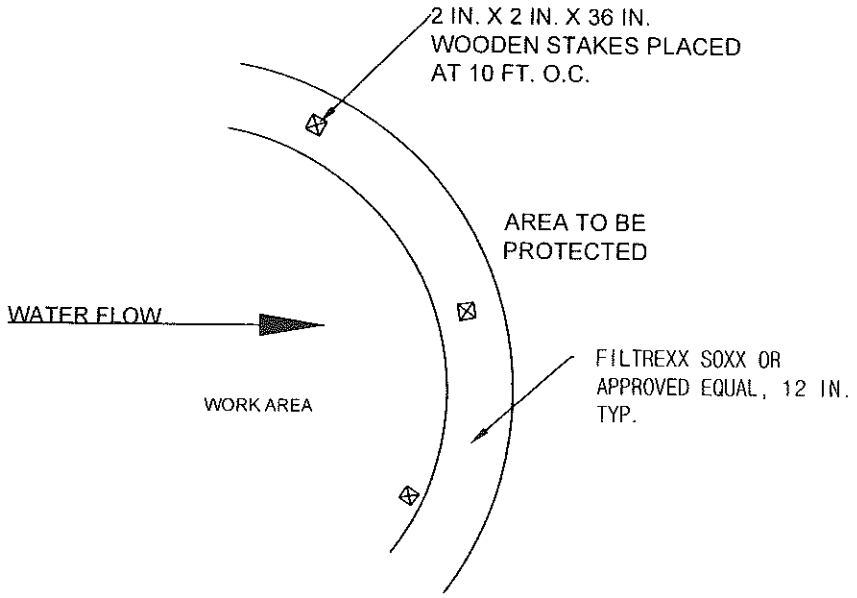
5/29/2019

Mapped By: kimmelq

APPENDIX 2:
Filter Sock
Detail



SECTION



PLAN

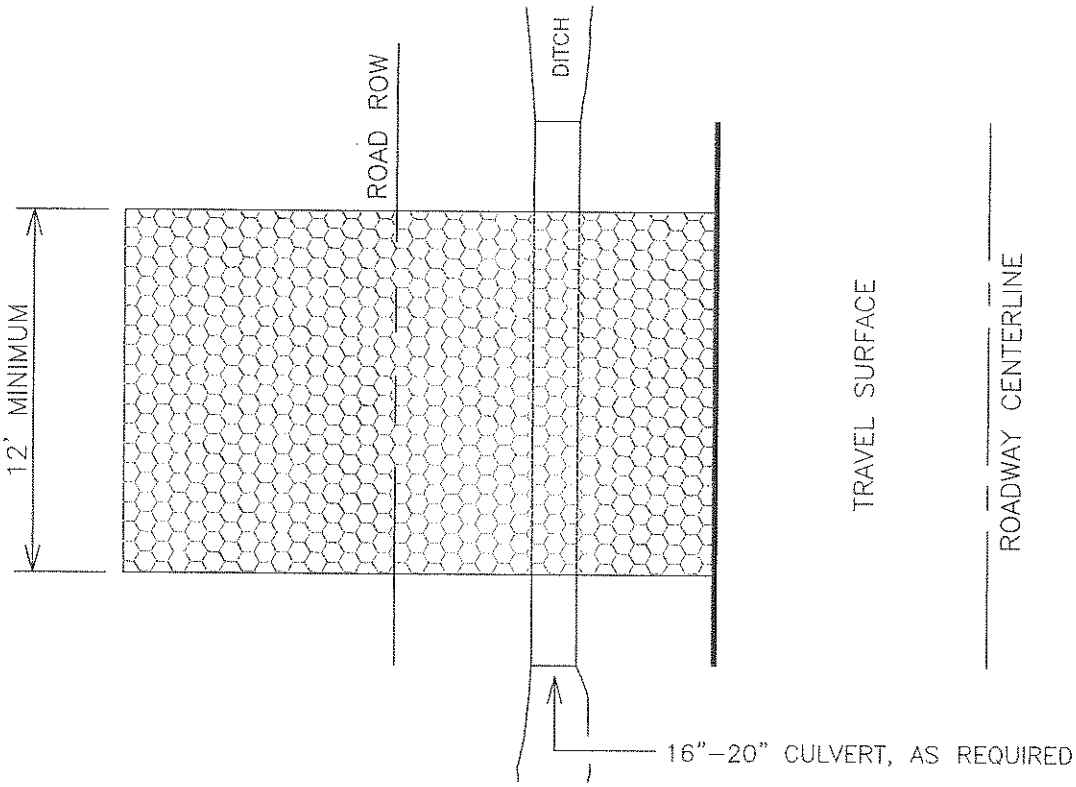
NOTES:
1. FILTER SOCK SHALL BE FILTREXX SOXX OR APPROVED EQUAL.
2. FILTER MEDIA TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE UPON FILTER SOCK REMOVAL, AS DIRECTED BY THE ENGINEER.

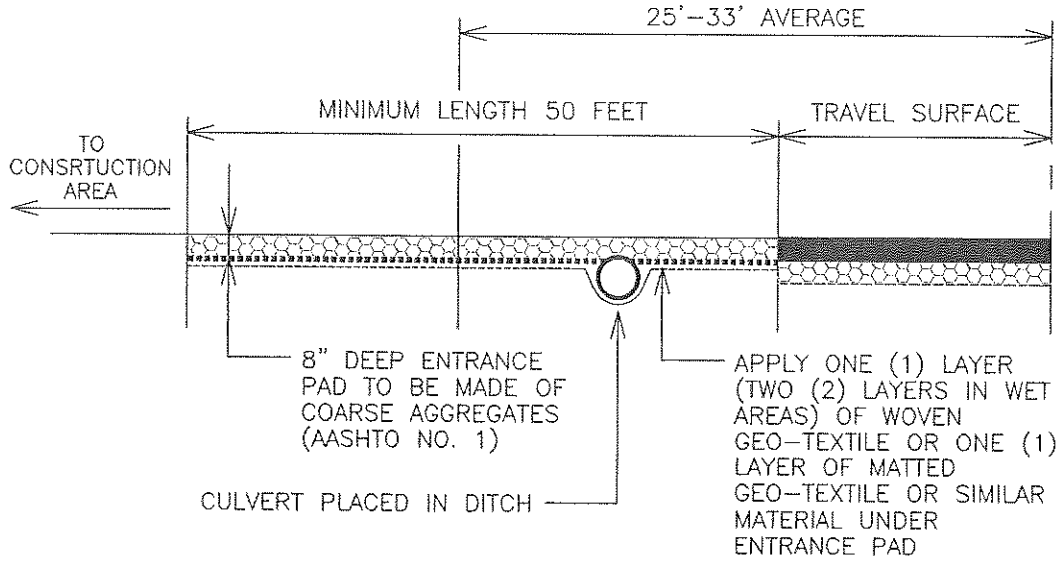
FILTER SOCK DETAIL

(NTS)

SENECA RESOURCES	SENECA RESOURCES 51 ZENTS BLVD. BROOKVILLE, PA 15825 (814) 849-4555	DRAWN BY: M. CLINGER FILENAME: EPC\BMP05.dwg LAST REVISION DATE: 04/24/2012	FILTER SOCK	DRAWING NUMBER: 5A

APPENDIX 3:
Rock Construction Entrance detail





ENTRANCE PAD TO BE USED ON BOTH SIDES OF ROADWAY

SENECA RESOURCES	SENECA RESOURCES 51 ZENTS BLVD. BROOKVILLE, PA 15825 (814) 849–4555	DRAWN BY: M. CLINGER FILENAME: EPC\BMP01.dwg DATE: 5/21/2011	ROCK CONSTRUCTION ENTRANCE	DRAWING NUMBER: 1

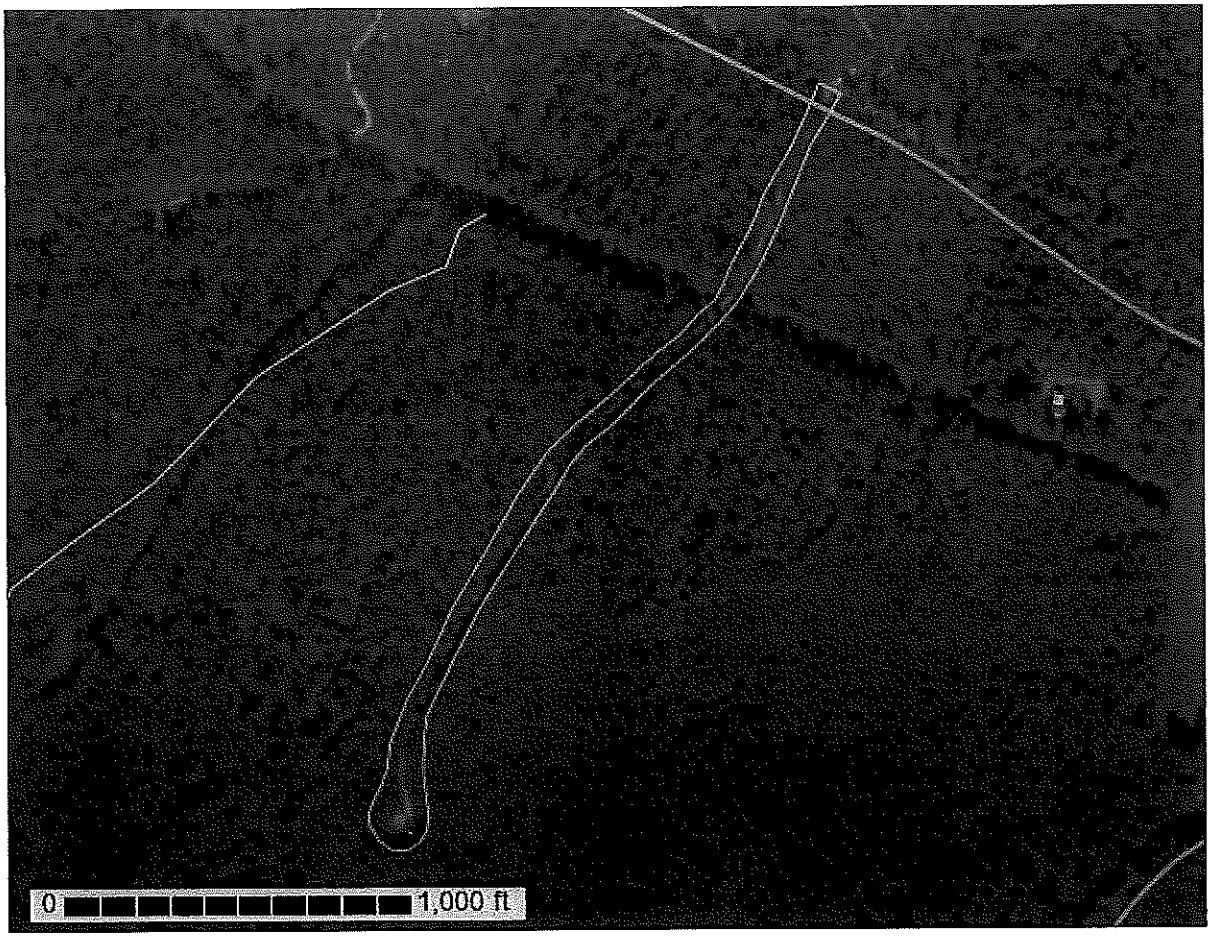
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Cameron and Elk Counties, Pennsylvania



May 29, 2019

APPENDIX 4:
NRCS Soil Report

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

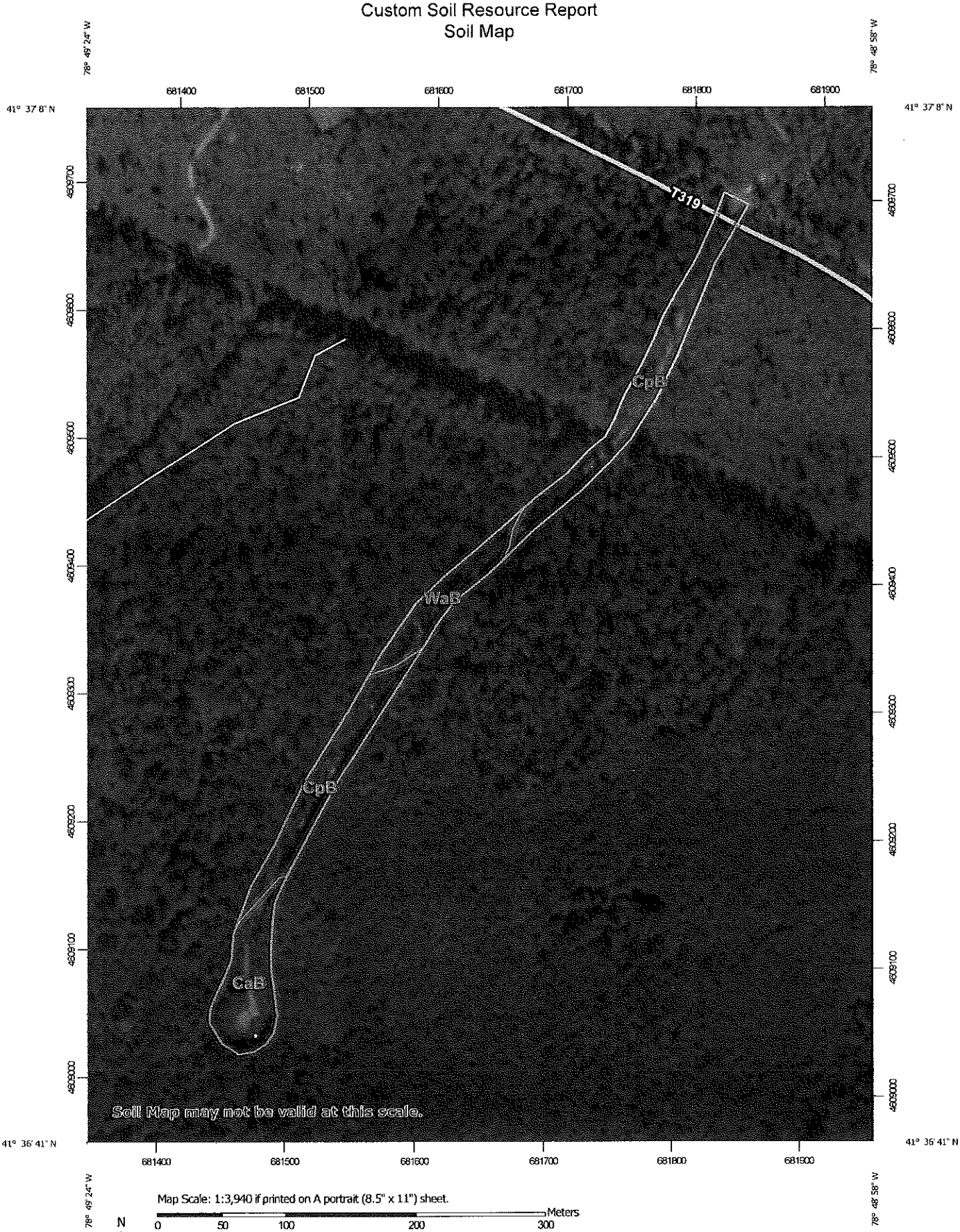
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,940 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cameron and Elk Counties, Pennsylvania
Survey Area Data: Version 16, Sep 19, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 24, 2009—Jun 2, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CaB	Cavode silt loam, 3 to 8 percent slopes	1.1	24.6%
CpB	Cookport channery loam, 0 to 8 percent slopes, very stony	2.6	58.8%
WaB	Wharton silt loam, 3 to 8 percent slopes	0.7	16.6%
Totals for Area of Interest		**4.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Cameron and Elk Counties, Pennsylvania

CaB—Cavode silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l31c
Elevation: 1,000 to 1,700 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 160 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cavode and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cavode

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, concave
Across-slope shape: Concave
Parent material: Acid clayey residuum weathered from clayey shale

Typical profile

Ap - 0 to 10 inches: silt loam
Btg - 10 to 47 inches: silty clay loam
BCg - 47 to 57 inches: channery silt loam
R - 57 to 61 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 90 inches to lithic bedrock
Natural drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit: 10 percent
Landform: Hills

Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Hills, draws
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

CpB—Cookport channery loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2wsj4
Elevation: 870 to 2,720 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Hazleton

Percent of map unit: 10 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Clymer

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Nolo

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

WaB—Wharton silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2vxhr
Elevation: 1,030 to 2,910 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Wharton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Fine-loamy residuum weathered from shale and siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: silt loam
BA - 4 to 8 inches: silt loam
Bt1 - 8 to 21 inches: silt loam
Bt2 - 21 to 42 inches: silty clay loam
Bt3 - 42 to 52 inches: channery silty clay loam
C - 52 to 69 inches: very channery silty clay loam
R - 69 to 79 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 46 to 80 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 14 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit: 8 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Armagh

Percent of map unit: 5 percent
Landform: Depressions on hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Ernest

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave, linear
Hydric soil rating: No

Cavode

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No