TRIP REPORT

Date: November 17, 2015

To: Rob Simcik

From: Scott R. Anderson, Hydrogeologist

Subject: Summary of Soil Infiltration Tests
Locke Mountain Road
Sunoco Pipeline/Valve Stations
Frankstown Township, Blair County, Pennsylvania

This trip report provides results of soil infiltration tests that were completed as part of the Segment 2 Pipeline Project for Sunoco, in Frankstown Township, Blair County, Pennsylvania.

1.0 PURPOSE

This report presents the field data and results of double ring soil infiltration tests conducted to support the design of stormwater management systems at several locations in Frankstown Township, Blair County, Pennsylvania. Two shallow test (IT-1 and IT-2) were performed at the property. Test locations are listed by coordinates (latitude and longitude) in Table 1 and shown on the attached figures.

2.0 FIELD ACTIVIES

The infiltration tests were conducted by Scott Anderson, Terry Rojahn, and Matt Simcik of Tetra Tech, Inc., on September 14, 2015. The test locations were positioned in the field using a handheld, WAAS-enabled GPS unit and reference to google earth map. Table 1 provides the coordinates recorded in the field. IT-1 and IT-2 were located in an open farm.

The infiltration tests were performed in accordance with the procedure specified in the 2006 Pennsylvania Stormwater Best Management Practices (BMP) Manual. Double ring tests were performed at this site. The double ring test locations were prepared for test locations with a shovel. The double-ring infiltrometers that were used for testing consisted of 10-inch and 6-inch diameter sections of 10-inch steel casing. After digging to the target depth, the test surface was leveled, and any loose soil or fallen vegetation was removed. The rings were driven a minimum of 2 inches into the soil. Infiltration test depths are provided on Table 1.

Test locations were pre-soaked for 1 hour. The tests were then conducted with measurements at 10-minute intervals, based on the observed water level drops during the pre-soak period. Pre-soak and test information was recorded on infiltration test sheets; copies of the test sheets are attached to this report.

During the testing, the weather was warm and overcast, approximately 70 degrees Fahrenheit, and light to moderate rain observed during the tests.

In addition, hand augering was performed and was advanced to refusal at 36 inches bgs near the testing locations to characterize the soil, determine the depth to bedrock, if encountered, and inspect for evidence of the seasonal high water table. The hand auger advancement was completed to refusal.

Descriptions of the soil were recorded on field logs, which were based on the form example in the BMP manual. Copies of the field soil logs are attached to this report.

3.0 RESULTS

3.1 SOILS DESCRIPTION

Soils encountered generally consisted of thin (approximately 5 inches) layers of topsoil/surface soil layer consisting of brown to dark tan silt with minor clay. Underlain is a silty clay loam transitioning to a silty clay loam with rock fragments, increasing with depth. Refusal was encountered at approximately 36 inches bgs. Thin roots were encountered in the topsoil/surface soils with trace roots being observed in the underlying soil horizons. Table 1 summarizes the depths of the infiltration tests (hand auger completed to refusal).

The soils were noted to be dry to moist during the excavation activities. No groundwater was recorded. Additionally, no mottling (redoximorphic) was observed at either location.

According to United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey[1] data, the soil types for the test locations are mapped as follows:

- IT-1 and IT-2 – Brinkerton silt loam (BrB soil symbol) with 3 to 8 percent slopes

Based on the interactive website PaGEODE, the geology of the site is shale of the Hamilton Group (Devonian age). The Hamilton Group consists of shale of the Mahantango Formation. A Geologic map is attached to this report.

3.2 INFILTRATION TEST RESULTS

Table 1 summarizes the infiltration rates (inches per hour) calculated from the test data. Infiltration rates presented in Table 1 were calculated from the average water level drop of the last four readings measured in the inner ring.

IT-1 and IT-2 exhibited moderate to high rates of infiltration requiring a 10-minute test cycle.

[1] http://websoilsurvey.nrcs.usda.gov/. Accessed November 4, 2015.

Table 1
Summary of Infiltration Test Results
Juniata River West
Frankstown Township, Blair County, PA
Sunoco Pipeline/Valve Stations

Test Location (IT-)	Location Data		Test Depth (inches)	Infiltration Test Result (inches/hour)
	LATITUDE	LONGITUDE		
IT-1	40° 25’ 53.12”	78° 20’ 8.31”	6	3.8
IT-2	40° 25’ 52.94”	78° 20’ 7.96”	6	3.0

ATTACHMENTS

SITE FIGURE

Google earth

feet 400

meters 100

SOIL LOGS

TETRA TECH

Soil Log

Tested By: SA
Project: Sunoco
Project No.: 112IC07309
Test Pit: Locke Mt. Road #1
Date: 9-14-15
Elevation:
Equipment Used: Hand Auger
Geology: Hamilton Group
Soil Type: Brinkerton Silt Loam (BrB)
Land Use:
Weather: 70°F, Cloudy

Additional Comments: Hand Auger refusal at 3.0 feet

Horizon	Upper Boundary	Lower Boundary	Soil Textural Class	Type, Size, Coarse Fragments, etc.	Soil Color	Color Patterns	Pores, Roots, Rock Structure	Depth to Bedrock	Depth to Water	Comments
O	0"	3"	Top Soil	Silts w/ Minor Sands + Clays	Dark Brown		Organics + Roots	—	—	
A	3"	1.31'	Silty Clay	Silts w/ Clays	Dark Brown		end of Roots	—	—	has Limestone Fragments
B	1.31'	2.3'		Silts w/ clay + Shale Fragments	Brown/ Black		Shale Fragments	—	—	
C	2.3'	3.0'	—	Shale Fragments	Brown / Black		More compacted Shale	~3.0	—	

TETRA TECH

Soil Log

Tested By: ~~S~~ SA
Project: Sunoco
Project No.: 112IC07309
Test Pit: Locke MT. Road #2
Date: 9-14-15
Elevation:
Equipment Used Hand Augur
Geology: Hamilton Group
Soil Type: Brinkerton Silt Loam (BrB)
Land Use: Field
Weather: 70°, Cloudy

Additional Comments: Hand Augur refusal at 3.0 feet

Horizon	Upper Boundary	Lower Boundary	Soil Textural Class	Type, Size, Coarse Fragments, etc.	Soil Color	Color Patterns	Pores, Roots, Rock Structure	Depth to Bedrock	Depth to Water	Comments
O	0"	5"	Top Soil	Silts w/ Minor clay, Sands	Dark Brown		Roots, organics	—	—	
A	5"	1.17'	Silty Clay	Silts w/ clays	Dark Brown		end of Roots Rock Fragments	—	—	
B	1.17'	2.3'		Silts w/ clays + Shale Fragments	Brown/ Black		Shale Fragments	—		
C	2.3'	3.0	—	Shale Fragments	Brown / Black		More competent shale	~3.0	—	

INFILTRATION TEST DATA SHEETS

Locke Mountain Rd. #1		Test Loc. 6" deep	Test Date 9/14/2015
Time	Elapsed Time (minutes)	Water Level Drop (in)	Volume of Water Added (L)
1615	10	0.94	0.6
1625	20	0.75	0.41
1635	30	0.75	0.42
1645	40	0.50	0.32
1655	50	0.50	0.31

Infiltration Rate
Average Stabilized Rate (in/hr)
3.8

Locke Mountain Rd. #2 | Test Loc. 6" deep | Test Date 9/14/2015

Time	Elapsed Time (minutes)	Water Level Drop (in)	Volume of Water Added (L)
1620	10	0.63	0.42
1630	20	0.50	0.30
1640	30	0.50	0.30
1650	40	0.50	0.31
1700	50	0.50	0.30

Infiltration Rate
Average Stabilized Rate (in/hr)
3.0

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: Sunoco Pipeline TEST AREA ID: Locke Mt Rd #IT-01

PROJECT NUMBER: 112IC07309 PERSONNEL: SA, TR, MS

TEST METHOD: (Double Ring Infiltrometer) Percolation

Location Coordinates or Description:
N 40° 25' 53.12"
W 78° 20' 8.31"

INNER RING INSIDE DIAMETER: 6"

OUTER RING INSIDE DIAMETER: 10"

PERCOLATION HOLE DIAMETER: NA (If performing an open hole perc test)

DATE(s): 9-14-15

Distance from the bottom of the inner ring/hole to measuring point (minimum water column of 4-6 inches): 8"

MEARSURING POINT: (Ring Rim) Indicator Mark

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE* (units ____)	REMARKS
PRESOAK DATA				
1505	0	–	8L	FALLOW FIELD - FORBS & GRASSES
1535	30	6 1/8	3L	
1605	60	3 3/8	1,7	
TEST DATA				
1615	0(60)	15/16	0.6L	
1625	10	3/4	0.41L	
1635	20	3/4	0.42L	
1645	30	1/2	0.32L	
1655	40	1/2	0.31L	

*For double ring test, the volume of water added equals the sum for the inner and outer rings.

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: SUNOCO PIPELINE
PROJECT NUMBER: 112IC07309
TEST AREA ID: LOCKE MT. ROAD #IT-02
PERSONNEL: SA, TR, MS

TEST METHOD: Double Ring Infiltrometer / Percolation

Location Coordinates or Description:
N40° 25' 52.94"
W 78° 20' 7.96"

INNER RING INSIDE DIAMETER: 6"
OUTER RING INSIDE DIAMETER: 10"
PERCOLATION HOLE DIAMETER: NA (If performing an open hole perc test)
DATE(s): 9-14-15

Distance from the bottom of the inner ring/hole to measuring point (minimum water column of 4-6 inches): 7 1/2"

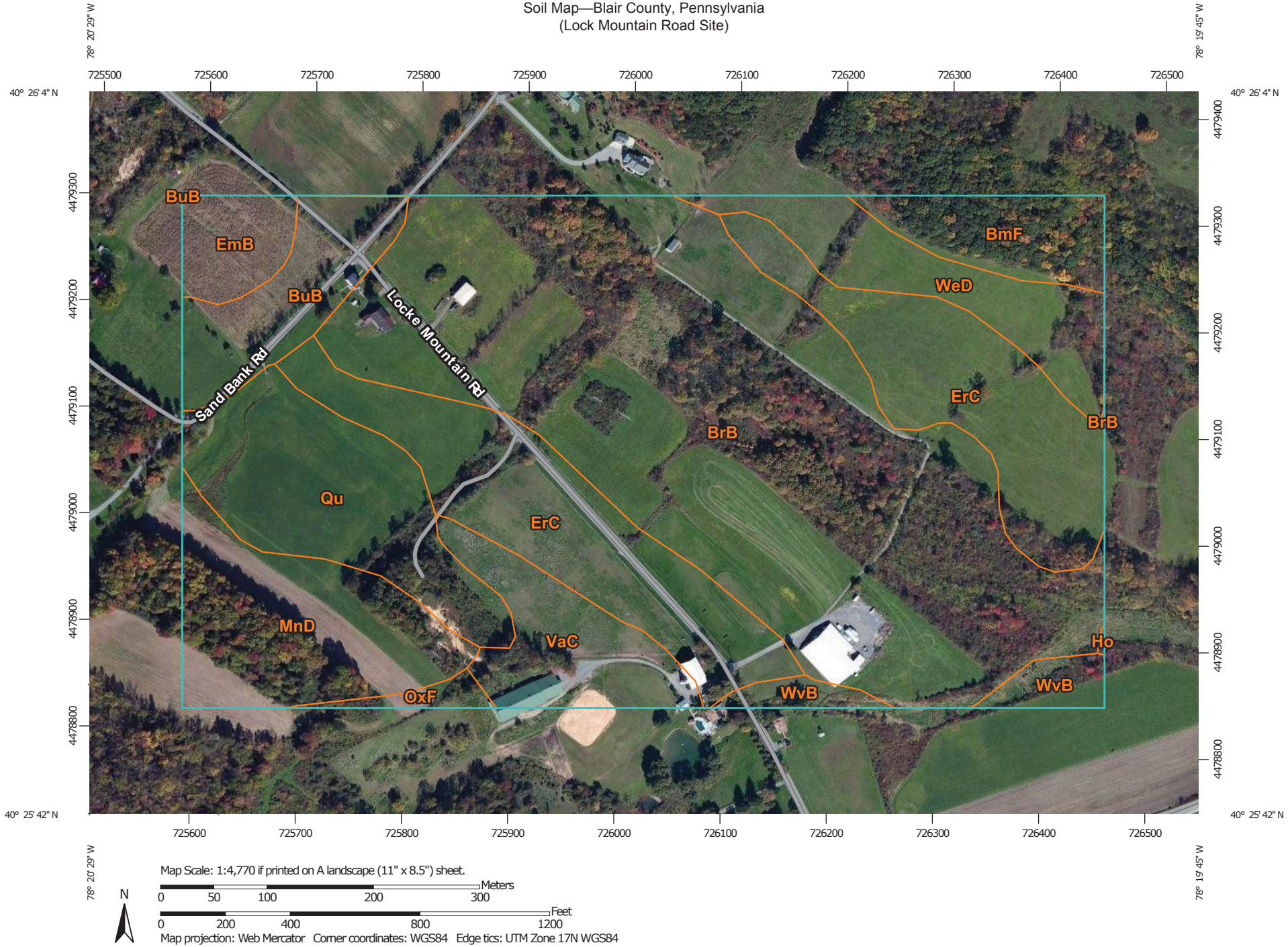
MEARSURING POINT: ~~Ring Rim~~ / Indicator Mark

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE* (units ____)	REMARKS
PRESOAK DATA				
1510	0	–	8 L	FALLOW FIELD - FORBS & GRASSES
1540	30	4 1/2	2.5 L	
1610	60	2 1/2	1420 ML	
TEST DATA				
1620	0 (60)	5/8"	0.42 L	
1630	10	1/2"	0.30 L	
1640	20	1/2"	0.30 L	
1650	30	1/2"	0.31 L	
1700	40	1/2"	0.30 L	

*For double ring test, the volume of water added equals the sum for the inner and outer rings.

SOIL MAP FIGURE AND SUPPORTING MATERIAL

Soil Map—Blair County, Pennsylvania
(Lock Mountain Road Site)



Map Scale: 1:4,770 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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: http://websoilsurvey.nrcs.usda.gov
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: Blair County, Pennsylvania
Survey Area Data: Version 8, Sep 28, 2015

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

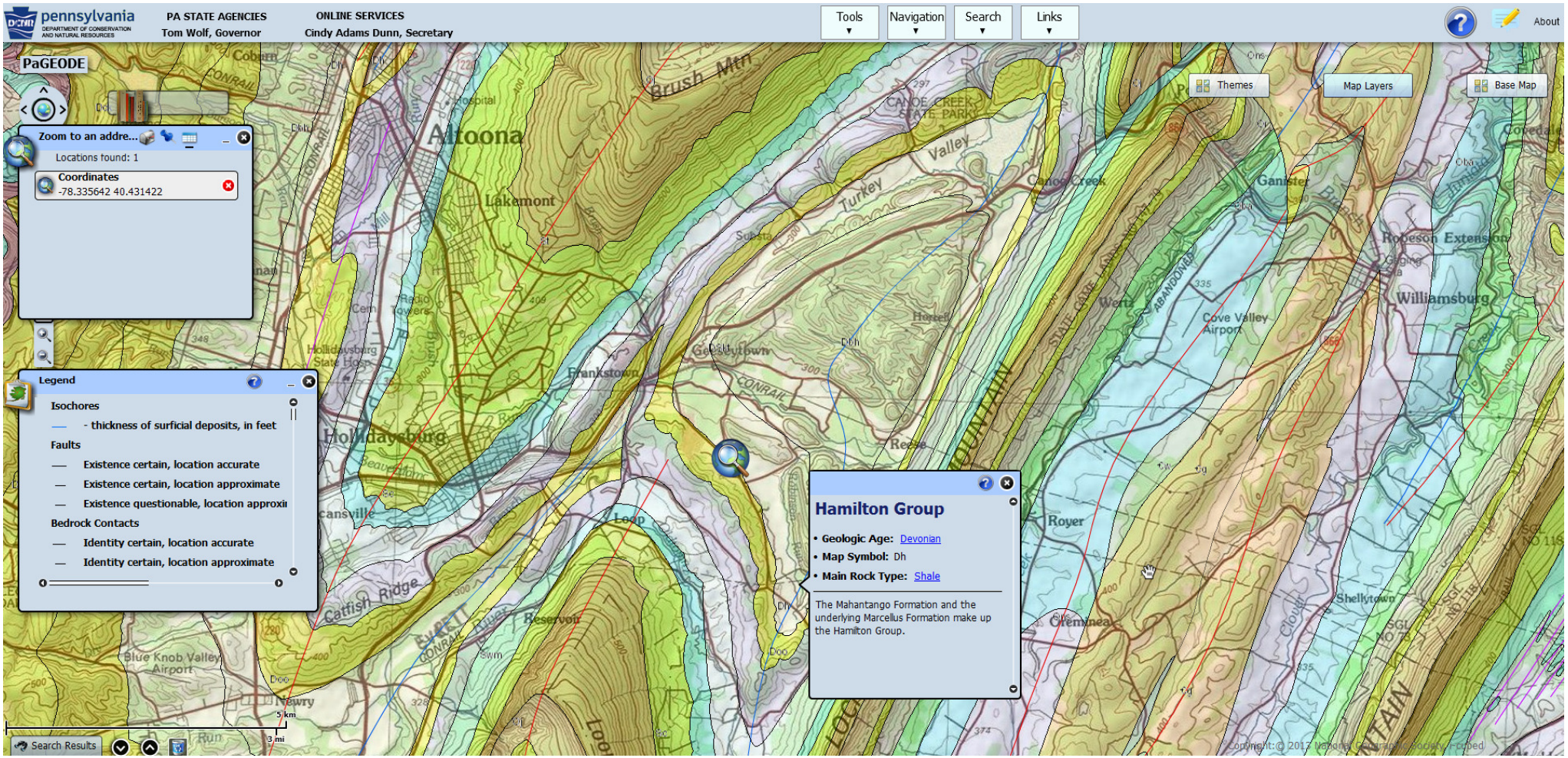
Date(s) aerial images were photographed: Oct 6, 2011—Oct 17, 2011

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

Blair County, Pennsylvania (PA013)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BmF	Berks-Weikert channery silt loams, 25 to 70 percent slopes	3.7	3.5%
BrB	Brinkerton silt loam, 3 to 8 percent slopes	42.4	41.0%
BuB	Buchanan gravelly silt loam, 3 to 8 percent slopes	4.7	4.5%
EmB	Edom-Weikert complex, 3 to 8 percent slopes	2.3	2.3%
ErC	Ernest silt loam, 8 to 15 percent slopes	19.6	18.9%
Ho	Holly silt loam	0.0	0.0%
MnD	Mertz channery silt loam, 15 to 25 percent slopes	8.6	8.3%
OxF	Opequon-Hagerstown-Rock outcrop complex, 25 to 50 percent slopes	0.7	0.6%
Qu	Quarries-Dumps complex	9.0	8.7%
VaC	Vanderlip loamy sand, 3 to 25 percent slopes	5.1	4.9%
WeD	Weikert channery silt loam, 15 to 25 percent slopes	5.5	5.3%
WvB	Wharton variant silt loam, 3 to 8 percent slopes	2.0	1.9%
Totals for Area of Interest		**103.6**	**100.0%**

SITE GEOLOGY MAP



Geologic Map of the Locke Mountain Road Site