

TRIP REPORT

Date: November 17, 2015

To: Rob Simcik

From: Scott R. Anderson, Hydrogeologist

Subject: Summary of Soil Infiltration Tests
Juniata River West
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 ACTIVITIES

The infiltration tests were conducted by Mark Mengel and Matt Simcik of Tetra Tech, Inc., on September 21, 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 field and both locations were located southeast of Juniata Valley Road. Photographs of testing locations are attached to this report.

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 or 30-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 auger location was advanced to refusal at 21 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 12 inches) layers of topsoil/surface soil layer consisting of brown to dark tan loam. Underlain is a clay loam transitioning to a sandy loam with rock fragments increasing with depth. Refusal, assumed bedrock (Shale) encountered at approximately 21 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. Mottled soils may have been encountered around 12-18 inches bgs but soil above and below remained dry. It is likely that water/moisture is retained (or trapped) in this zone due to the less permeable clays present as compared to the soil above and below, which contain sands and silts which more effectively drain (or transport) water/moisture.

According to United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey¹ data, the soil types for the test locations are mapped as follows:

- IT-1 and IT-2 – Holly silt loam (Ho soil symbol)

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.

¹ <http://websoilsurvey.nrcs.usda.gov/>. Accessed November 4, 2015.

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-2 test exhibited slow rates of infiltration requiring a 30-minute test cycle. IT-1 exhibited moderate to high rates of infiltration requiring a 10-minute test cycle.

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° 26' 8.97"	78° 17' 59.56"	6	46.5
IT-2	40° 26' 8.97"	78° 17' 59.76"	6	0.1

ATTACHMENTS

SITE FIGURE

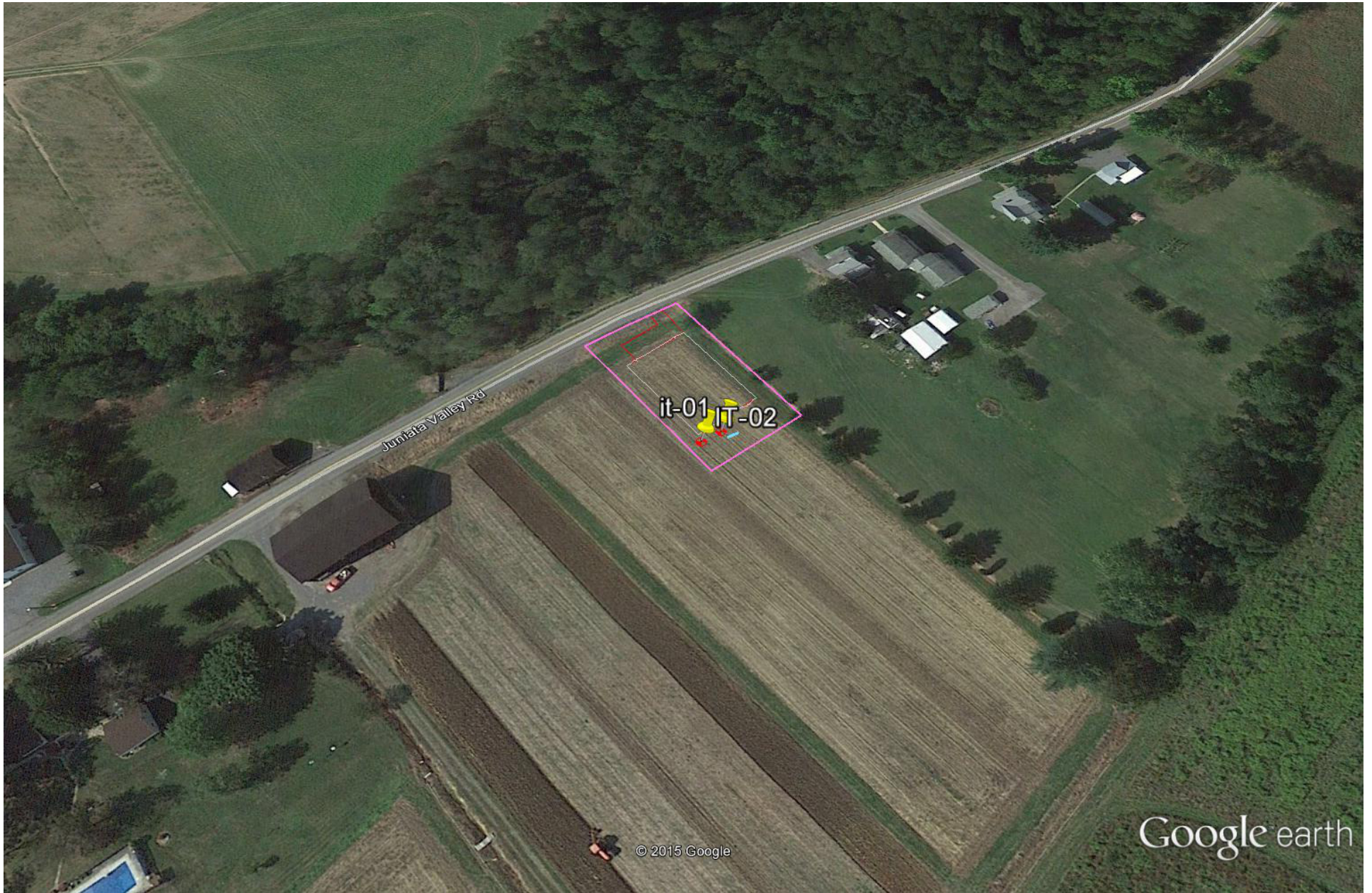
SOIL LOGS

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ATTACHMENTS

SITE FIGURE



Google earth

feet
meters



SOIL LOGS

Soil Log

Tested By: MS

Project: Sunoco Pipeline Project No.: 112IC07309

Test Pit: Juniata River West Date: 9-21-15

Elevation: _____ Equipment Used: Hand Auger

Geology: Hamilton group Soil Type: Holly Silt Loam (Ho)

Land Use: Farm Field Weather: 70°F, cloudy

Additional Comments Hand Auger refusal at 21.0 inches.

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/A	0"	12"	Top Soil / Loam	Fine Sands, w/ minor silts + clays	Brown to Dark Tan		Roots	-	- Dry	Vertical crack in soil from 2.0 inches to 8 inches.
B	12"	18"	Clay loam	Prevalent clays	Light tan w/ gray clays	Mottled?	Minimal Rock fragments		- Dry	Slight orange oxidation in clays.
C	18"	21"	Sandy Loam	Sands + silts Shale fragments			Shale fragments	≥ 21.0"	- Dry	-

INFILTRATION TEST DATA SHEETS

Juniata River West #1		Test Loc. 6" deep	Test Date 9/21/2015	
Time	Elapsed Time (minutes)	Water Level Drop (in)	Volume of Water Added (L)	
1235	10	7.75	5.6	
1245	20	7.75	5.9	
1255	30	7.75	5.6	
1305	40	7.75	NA	
			Infiltration Rate	
			Average Stabilized Rate (in/hr)	
			46.5	

Juniata River West #2		Test Loc. 6" deep	Test Date 9/21/2015	
Time	Elapsed Time (minutes)	Water Level Drop (in)	Volume of Water Added (L)	
1255	30	0.06	0.6	
1325	60	0.06	0.5	
1355	90	0.06	0.5	
1425	120	0.06	NA	
				Infiltration Rate
				Average Stabilized Rate (in/hr)
				0.1



TETRA TECH

INFILTRATION TEST DATA SHEET

PROJECT NAME: SUNOCO Pipeline 2 TEST AREA ID: Juniata River West #1
 PROJECT NUMBER: 1121C07309 PERSONNEL: MM + MS
 TEST METHOD: Double-Ring Infiltrometer Percolation
 INNER RING INSIDE DIAMETER: 6"
 OUTER RING INSIDE DIAMETER: 10"
 PERCOLATION HOLE DIAMETER: N/A (If performing an open hole percolation test)
 DATE(s): 9/21/15
 Distance from the bottom of the inner ring/hole to measuring point 7.75"
 (minimum water column of 4-6 inches):
 MEASURING POINT: Ring Rim Indicator Mark _____ DEPTH OF TEST: 6"

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				
1125	0	-	9.4	
1155	30	7.75	8.4	Dry Inner Ring
1225	60	7.75	8.1	Dry Inner Ring
TEST DATA				
1235	70	7.75	5.6	Dry Inner Ring
1245	80	7.75	5.9	Dry Inner Ring
1255	90	7.75	5.6	Dry Inner Ring
1305	100	7.75	-	Dry Inner Ring

Location Coordinates or Description:
 N. 40° 26' 8.97" E
 W. 78° 17' 59.56"

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

$v = \pi r^2(h)$
 $v = \pi (3)^2(7.75) = 219.13$



TETRA TECH

INFILTRATION TEST DATA SHEET

PROJECT NAME: Subco Pipeline 2 TEST AREA ID: TUNATA RIVER WEST TT-2
 PROJECT NUMBER: 112 IIC 07309 PERSONNEL: MM, MS

TEST METHOD: Double-Ring Infiltrometer Percolation Location Coordinates or Description:

INNER RING INSIDE DIAMETER: 6" N 40° 26' 8.87"
 OUTER RING INSIDE DIAMETER: 10" W 78° 17' 59.76"

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

DATE(S): 9-21-15 7 1/2"

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

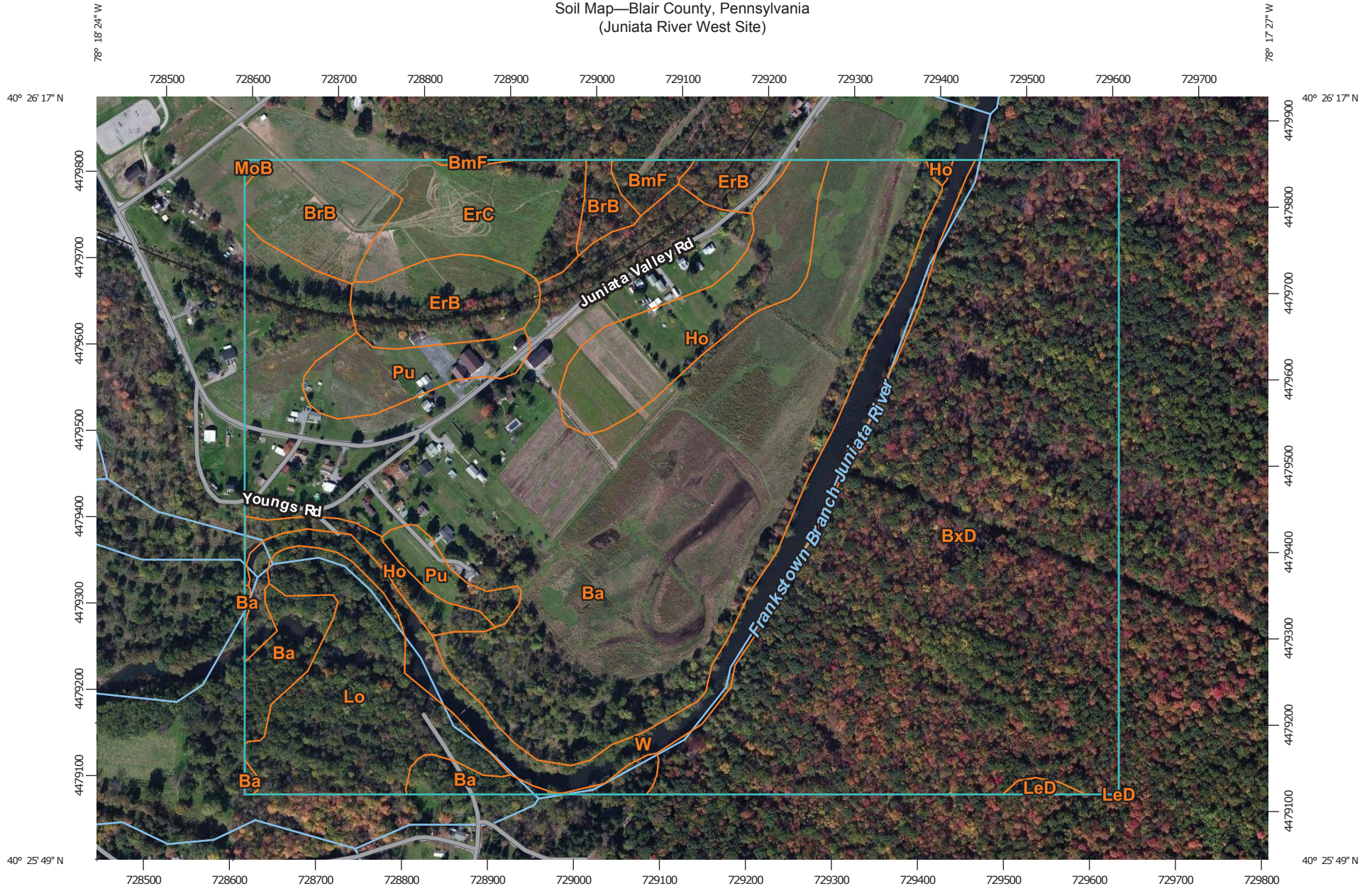
MEASURING POINT: Ring Rim Indicator Mark _____ DEPTH OF TEST: 6"

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				
1125	0	-	9.4	
1155	30	1/16	800 ml	
1225	60	1/16	700 ml	
TEST DATA				
1255	90	1/16	600 ml	
1325	120	1/16	500 ml	
1355	150	1/16	500 ml	
1425	180	1/16	-	END OF TEST

*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
(Juniata River West Site)



Map Scale: 1:6,230 if printed on A landscape (11" x 8.5") sheet.

0 50 100 200 300 Meters


0 300 600 1200 1800 Feet

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.

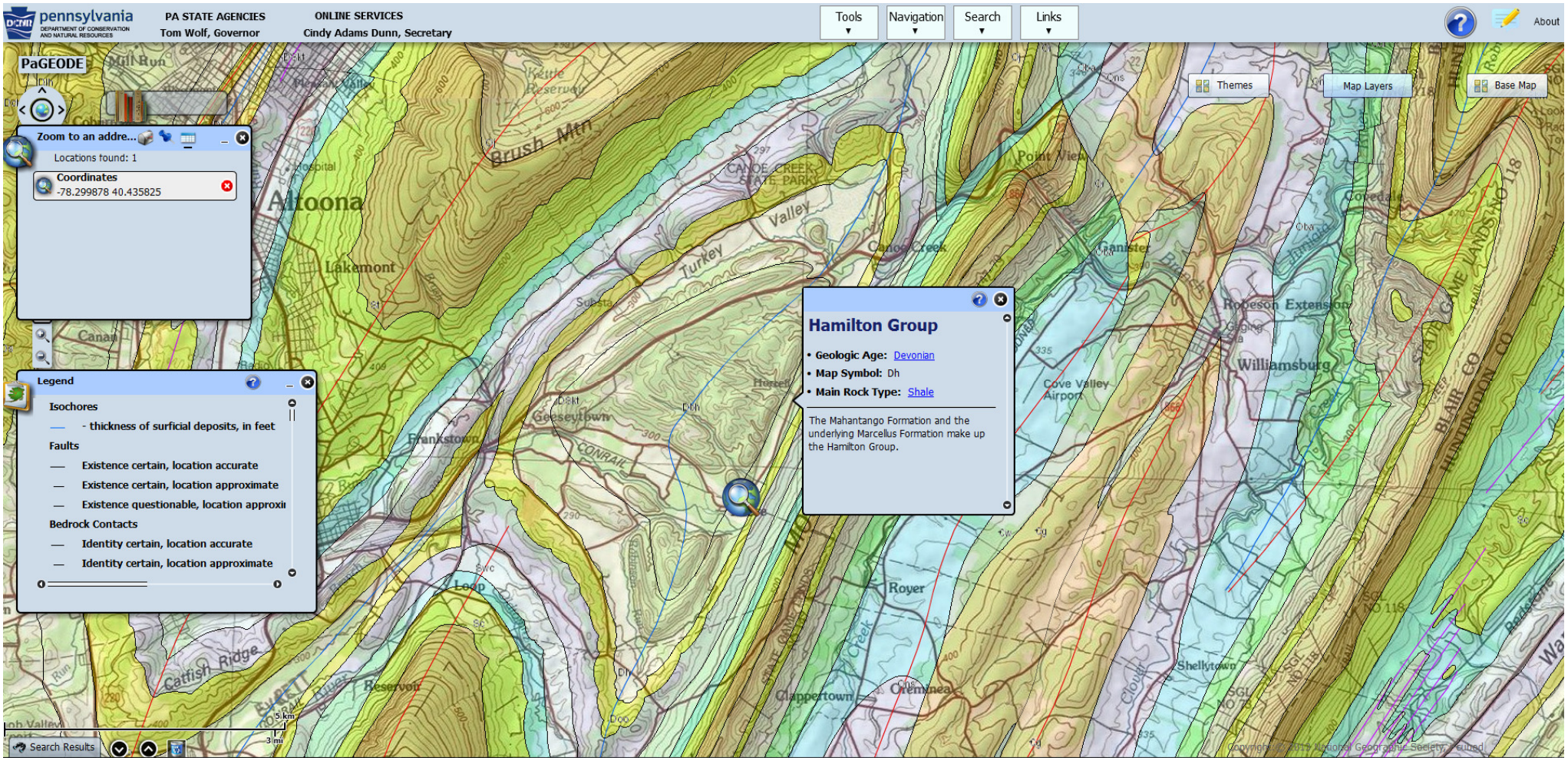
Date(s) aerial images were photographed: Oct 6, 2011—Oct 17, 2011

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
Ba	Basher soils	68.3	36.9%
BmF	Berks-Weikert channery silt loams, 25 to 70 percent slopes	1.0	0.6%
BrB	Brinkerton silt loam, 3 to 8 percent slopes	5.5	2.9%
BxD	Buchanan extremely stony silt loam, 8 to 25 percent slopes	60.8	32.8%
ErB	Ernest silt loam, 3 to 8 percent slopes	6.0	3.2%
ErC	Ernest silt loam, 8 to 15 percent slopes	7.2	3.9%
Ho	Holly silt loam	9.8	5.3%
LeD	Laidig extremely stony loam, 8 to 25 percent slopes	0.3	0.2%
Lo	Linden soils	10.6	5.7%
MoB	Monongahela silt loam, 3 to 8 percent slopes	0.1	0.1%
Pu	Purdy silt loam	5.4	2.9%
W	Water	10.1	5.5%
Totals for Area of Interest		185.3	100.0%

SITE GEOLOGY MAP



Geologic Map of the Juniata River West Site