TRIP REPORT
OLD YORK ROAD EFRD SITE – INFILTRATION TESTING

1.0 PURPOSE

This Trip Report presents the field data and results of double-ring soil infiltration tests conducted to support the design of stormwater management systems at the Old York Road EFRD site located off Old York Road in Fairview Township, York County, Pennsylvania, as part of the Pennsylvania Pipeline Project (PPP) for Sunoco Pipeline, LP. Two shallow and two deep tests (IT-A and IT-B) were conducted at the site. The 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 Kevin Schwab of Tetra Tech, Inc., on October 4, 2016. The test locations were positioned in the field using a handheld, WAAS-enabled GPS unit. Table 1 provides the coordinates of each of the test locations. All of the test locations were situated along a farm access road between a fence line and a cornfield on flat terrain on the east side of Old York Road.

The infiltration tests were performed in accordance with the procedure specified in the 2006 Pennsylvania Stormwater Best Management Practices (BMP) Manual. The test locations were prepared with the assistance of a mini-excavator, and care was taken to minimize disturbance of the soil surface to be tested. Double-ring infiltrometers were used for testing and consisted of 10-inch and 6-inch sections of steel casing, each 10 inches in height. After digging to the target depth, the test surface was leveled, and loose soil and debris were removed. The rings were driven a minimum of 2 inches into the soil. The infiltration test depths are presented in Table 1.

Test locations were pre-soaked for 1 hour. The tests were then conducted with measurements at 10-minute or 30-minute intervals, based on the observed water level drops during the last half of the pre-soak period. Pre-soak and test information was recorded on infiltration test data sheets; copies of the test data sheets are attached to this report.

A hand auger was utilized to characterize the soil, determine the depth to bedrock, if encountered, and inspect for evidence of seasonal high water table near the test area. This was completed from the ground surface down to two feet below the target infiltration test depth. The hand augered final depth (5-feet) for boring IT-A was not reached due to the landowner dispute with Sunoco representatives on site. Descriptions of the soil were documented on field logs, which were based on the form example in the BMP manual. Copies of the soil logs are attached to this report.

During the testing, the weather was sunny, approximately 65-70 degrees Fahrenheit, and no precipitation was observed in the area at the time of testing. Additionally, less than 0.5 inches of precipitation was observed 24 hours prior to testing.

3.0 RESULTS

3.1 SOILS DESCRIPTION

Soils encountered generally consisted of a thin (approximately 6 inches) brown (7.5YR 4/2) fill layer composed of a silt loam matrix with up to 90% small cobble sized angular limestone fragments associated with a close proximity logging road. Below this fill layer a more natural, brown to dark brown (7.5YR 4/3 to 7.5YR 3/2) topsoil layer was encountered with up to 15% of the limestone fragments from the previous layer near the transition. In addition to this topsoil layer IT-A showed two illuvial subsurface layers and one alluvial layer. The illuvial layers consisted of a sandy loam with 10-20% sub-angular to sub-rounded small to large pebble sized rock fragments. These two illuvial layers contained mottling which was lithochromatic in nature and trended from a brown (7.5YR 4/3) to a dark brown (7.5YR 3/4) in the first illuvial layer and from a brown (10YR 5/3) to a dark yellowish brown (10YR 4/6) in the deeper illuvial layer. The alluvial layer which began roughly 30 inches bgs contained medium to coarse grained sands with approximately 35% water worn small pebbles to small cobbles. Below the topsoil layer of IT-B the profile trended from a silt clay to a clay and finally a sandy clay with depth. Soil color ranged from a brown (7.5YR 4/4) to a strong brown (7.5YR 4/6). Rock content ranged from 10-15% of small pebble to small cobble sized degrading sandstones. Table 1 summarizes the depths of the infiltration tests.

Seasonal high water was not observed in any of the test pits, nor was any bedrock observed. Mottling was limited to the two illuvial layers.

According to United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey data, the soil type for the test location is mapped as follows and shown on attached figure:

- Watchung Silt Loam, (WbB soil symbol). 0-8 percent slopes, extremely bouldery with very high runoff and poorly drained.

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 stabilized readings measured in the inner ring.

All four pre-soak tests exhibited a slow infiltration rate with the highest rate being 1.2 inches per hour, which caused a 30-minute test cycle. One hour into the infiltration test a landowner dispute caused an evacuation of the premises with one hour remaining in the test. All data is calculated from this first hour of testing.

Table 1
Summary of Infiltration Test Results
Old York Road
Fairview Township, York County, PA
Sunoco PPP

Test Location (IT-)	Location Data		Test Depth (inches)	Infiltration Test Result (inches/hour)
	Latitude	Longitude		
IT-A (Shallow)	40.1915827°	- 076.8407534°	3	0.60
IT-A (Deep)			36	0.06
IT-B (Shallow)	40.1916653°	- 076.8405763°	3	1.20
IT-B (Deep)			36	0.13

Note: Tests were suspended due to Landowner dispute with Sunoco


Figure 1
Infiltration Testing Locations
Old York Road Valve
Soil Type: Watchung Silt Loam (WdB)
York County, PA
Legend
Infiltration Tests
WbB
IT-B
IT-A
1003
Google Earth
© 2016 Google
N
100 ft

ATTACHMENTS

SOIL LOGS

TETRA TECH

Soil Log

Tested By: KAS Kevin Schwab **Project:** old York Rd. Sunoco PPP **Project No.:** 112IC06958

Test Pit: IT-A **Date:** 10/4/16 **Elevation:** _____ **Equipment Used** _____

Geology: possible T-2 terrace roughly 150-200 ft SE from stream roughly 1.5m above stream **Soil Type:** _____ **Land Use:** next to old logging road beside ag field **Weather:** cloudy

Additional Comments _____

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
fill	0"	6"	silt loam matrix	fine granular matrix	7.5YR 4/2	even	90% small cobble sized limestone frags			
A	6"	11 3/4"	silt loam	fine granular	7.5YR 3/2	even	5% limestone frags throughout unit			
B	11 3/4"	21 1/2"	sandy silt loam	fine-med weak subangular blocky	7.5YR 4/3 7.5YR 3/4	60% matt 40%	10% small subrounded pebbles			
BC	21 1/2"	30 1/2"	sandy loam	fine-med weak subangular subrounded	10YR 5/3 10YR 4/6	90% matt 10%	20% small to large pebbles			
C	30 1/2"		sands (med-coarse)	fine-med subrounded	10YR 5/3	even	35% small pebbles to small cobbles (degrading)			channel log

Horizon:	USDA Definition	Soil Textural Class	Boundary	Notes:
O	Organic debris	Use ternary diagram from US Department of Agriculture Soil Conservation Service	Use depth and classification Classification as Follows: Abrupt	final depth not reached due to land owner complaints. Land agent instructed us to pack up equipment.
A	Dark colored, mixed mineral organic matter			
B	Maximum accumulation of silicate clay minerals		Clear	
C	Weathered parent material		Gradual	C horizon at base of unit contained water worn small pebbles to small cobbles in medium to coarse grained sands
R	Layer of consolidated rock beneath the soil		Diffuse	

Table based on: Sample soil log located on page 12 of the Pennsylvania Stormwater Best Management Practices Manual
USDA Definitions located from: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054308

TETRA TECH

Soil Log

Tested By: KAS Kevin Schwab **Project:** Old York Rd Sunoco PPP **Project No.:** 112IC05958

Test Pit: IT-B **Date:** 10/4/16 **Elevation:** **Equipment Used:**

Geology: **Soil Type:** **Land Use:** next to old logging road beside ag field **Weather:** Cloudy

Additional Comments

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
fill	0"	4"	silt loam matrix	fine granular matrix	7.5YR 5/2	even	85% small cobble sized limestone frags			
A	4"	14"	silt loam	fine granular	7.5YR 4/3		15% small cobble sized limestone from road			
B	14"	29½"	silt clay	fine to med sub angular (strong) to angular (med)	7.5YR 4/4		10% degrading sandstone & claystones			
Ba	29½"	47"	clay	fine to med weak subangular to subrounded	7.5YR 4/6		SAA			
BC	47"	59"	sandy clay	fine to med weak subangular weak subrounded	5YR 4/4		15% mod-highly weathered sandstones/claystones			

Horizon:	USDA Definition	Soil Textural Class	Boundary	Notes:
O	Organic debris	Use ternary diagram from US Department of Agriculture Soil Conservation Service	Use depth and classification	limestone cobbles from logging road not natural to area
A	Dark colored, mixed mineral organic matter		Classification as Follows: Abrupt	
B	Maximum accumulation of silicate clay minerals		Clear	
C	Weathered parent material		Gradual	
R	Layer of consolidated rock beneath the soil		Diffuse	

Table based on: Sample soil log located on page 12 of the Pennsylvania Stormwater Best Management Practices Manual
USDA Definitions located from: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054308

INFILTRATION TEST DATA SHEETS

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: Old York Rd. Sunoco PPP
PROJECT NUMBER: 112IC05958
TEST AREA ID: IT-A shallow closest to road Old York Rd.
PERSONNEL: KAS, MM Kevin Schwab Mark Mengel

TEST METHOD: (Double Ring Infiltrometer) Percolation
Single Ring Infiltrometer

Location Coordinates or Description:
40.1915827
-076.8407534

INNER RING INSIDE DIAMETER/HEIGHT: 6/10
OUTER RING INSIDE DIAMETER/HEIGHT: 10/10

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

DATE(s): 10/4/16 Rainfall within last 24 hrs < 0.5"

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

MEASURING POINT: (Ring Rim) Indicator Mark

DEPTH OF TEST: 3"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE, INNER RING (liters)	REMARKS
PRESOAK DATA				
1405	0	----------	4.2 L	
1435	30	3/16	.2 L	
1505	60	4/16	.25L	
TEST DATA				
1505	0	----------		
1535	30	5/16	.30L	
1605	60	9/16	.25L	
1635	90			Test not finished due to land
1705	120			owner complaining. Land agent
				asked us to pack up equipment

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: Old York Rd. Sunoco
PROJECT NUMBER: 112IC05958
TEST AREA ID: Old York Rd IT-A Deep closest to road
PERSONNEL: KAS, MM Kevin Schwab Mark Menges

TEST METHOD: (Double Ring Infiltrometer) Percolation
Single Ring Infiltrometer

Location Coordinates or Description:
40.191582T
-076.840753W

INNER RING INSIDE DIAMETER/HEIGHT: 6/10
OUTER RING INSIDE DIAMETER/HEIGHT: 10/10

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

DATE(s): 10/4/16 Rainfall within last 24 hrs < 0.5"

Distance from the bottom of the inner ring/hole to measuring point (minimum water column of 6-8 inches): 7"

MEASURING POINT: (Ring Rim) Indicator Mark

DEPTH OF TEST: 36"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE, INNER RING (liters)	REMARKS
PRESOAK DATA				
1412	0	----------	4.2L	
1442	30	2/16	.2 L	
1512	60	0/16	0L	
TEST DATA				
1512	0	----------		
1542	30	1/16	.15L	
1612	60	0/16	0L	
1642	90			Test not completed due to landowner complaining. Land agent asked us to pack up equipment.
1712	120			

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: SUNOCO PPP OLD YORK RD
PROJECT NUMBER: 112IC05958
TEST AREA ID: O/d York Rd IT-B (SHALLOW)
PERSONNEL: Kevin Schwab

TEST METHOD: (Double Ring Infiltrometer) Percolation
Single Ring Infiltrometer

Location Coordinates or Description:
40.1916653
-076.8405763

INNER RING INSIDE DIAMETER/HEIGHT: 6" / 10"
OUTER RING INSIDE DIAMETER/HEIGHT: 10" / 10"

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

DATE(s): 10-4-16 Rain fall within last 24 hrs < 0.5"

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

MEASURING POINT: (Ring Rim) Indicator Mark

DEPTH OF TEST: 3"

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE, INNER RING (liters)	REMARKS
PRESOAK DATA				
1358	0	----------	4.2	
1428	30	1 11/16	.5L	
1458	60	12/16	.3L	
TEST DATA				
1458	0	----------		
1528	30	10/16	.3L	
1558	60	9/16	.2L	LANDOWNER complaining to Landman and we are suspending tests
1628	90			
1658	120			

INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: SUNOCO PPP OLD YORK RD
PROJECT NUMBER: 112IC05958
TEST AREA ID: Old York RD IT-B (DEEP)
PERSONNEL: Mark Schwab

TEST METHOD: (Double Ring Infiltrometer) Percolation
~~Single Ring Infiltrometer~~

Location Coordinates or Description:
40.1916653
-076.8405763

INNER RING INSIDE DIAMETER/HEIGHT: 6"/10"
OUTER RING INSIDE DIAMETER/HEIGHT: 10"/10"

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

DATE(s): 10-4-16

Rainfall within last 24 hrs < 0.5"

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

MEASURING POINT: (Ring Rim) Indicator Mark

DEPTH OF TEST: 3'

TIME	ELAPSED TIME SINCE START OF TEST (minutes)	WATER LEVEL DROP, INNER RING OR PERCOLATION HOLE (inches)	VOLUME OF WATER ADDED AT EACH CYCLE, INNER RING (liters)	REMARKS
PRESOAK DATA				
1400	0	----------		
1430	30	5/16	.3 L	
1500	60	1/16	.1 L	
TEST DATA				
1500	0	----------		
1530	30	1/16	.1 L	
1600	60	1/16	.1 L	LANDOWNER complaining to LANDMAN AND WE ARE suspending testing
1630	90			
1700	120			