

TRIP REPORT RAYSTOWN 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 a stormwater management system at the Raystown Road EFRD site located in Penn Township, Huntingdon County, Pennsylvania as part of the Pennsylvania Pipeline Project (PPP) for Sunoco Pipeline, LP. Four deep and four shallow tests (IT-A, IT-B, IT-C, and IT-D) were performed at the site. The test locations are listed by coordinates (latitude and longitude) in Table 1 and shown on the attached figure.

2.0 FIELD ACTIVITIES

The infiltration tests were conducted by Jim Goerdts and Jim Coffman of Tetra Tech, Inc., on October 3, 2016. The test locations were positioned in the field using a handheld, WAAS-enabled GPS unit. Table 1 provides the coordinates of the test locations. All four tests were located in a low-lying flat field west of State Road 26.

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 hand tools and 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 diameter and 6-inch diameter 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.

The 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.

During the testing, the weather was sunny, approximately 60 degrees Fahrenheit, and no precipitation was observed during the time of testing. Additionally, less than 0.5 inches of precipitation was observed 24 hours prior to testing.

Test pits were excavated near each testing location to characterize the soil, determine the depth to bedrock, if encountered, and inspect for evidence of the seasonal high water table. The test pits were identified with the corresponding infiltration test name. The test pits were machine-excavated to 2 feet below the target infiltration test depth or refusal, whichever was encountered first. 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 Soil Description

Soils encountered generally consisted of a thin (up to approximately 3 inches) dark brown (7.5YR 3/2) loamy sand to silty clay topsoil/surface layer with many small roots. In test units IT-B through IT-D, this topsoil/surface layer was underlain by a dark brown (7.5YR 3/3) silty clay with few siltstone and sandstone fragments. An illuvial layer was found from 38-62 inches below ground surface and consisted of a dark yellowish brown (10YR 4/4) silty clay with rock fragments ranging up to small cobble size. In test unit IT-A this topsoil/surface layer was underlain by a dark brown (7.5YR 3/2) loamy sand consisting of abundant rock fragments up to small cobble size. This loamy sand layer was underlain by a second sandy loam layer which was yellowish brown (10YR 5/8) in color and contained a few rock fragments up to small cobble size.

Seasonal high water was observed at approximately 60 inches below ground surface in all testing locations. Redoximorphic mottling was observed in all testing locations.

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

- Newark Silt Loam - (Ne soil symbol) with 3-8 percent slopes; with very high runoff and is somewhat poorly drained.

3.2 Infiltration Tests 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.

The pre-soak test results for IT-A (surface and deep) indicated high infiltration rates, requiring 10 minute test cycles; whereas, the pre-soak test results for IT-B (surface and deep), IT-C (surface and deep), and IT-D (surface and deep) indicated low infiltration rates, requiring 30 minute test cycles.


Table 1
Summary of Infiltration Test Results
Raystown Road EFRD
Penn Township, Huntingdon County, PA
Sunoco PPP

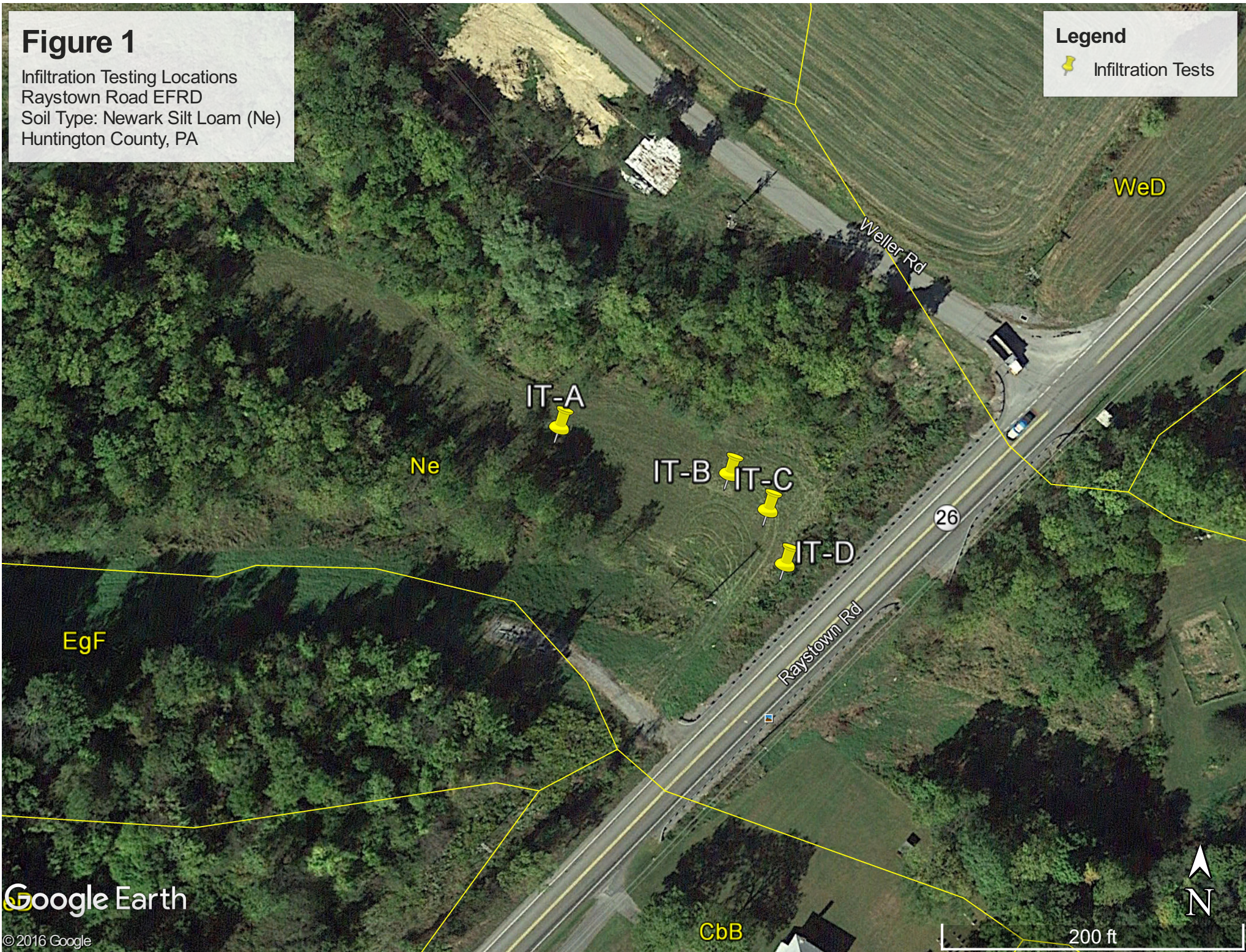
| Test Location (IT-) | Location Data | | Test Depth (inches) | Infiltration Test Result (inches/hour) |
|------------------------|---------------|----------------|---------------------|--|
| | LATITUDE | LONGITUDE | | |
| IT-A (shallow) | 40.3968448° | - 078.1502072° | 4 | 20.06 |
| IT-A (deep) | | | 24 | 4.97 |
| IT-B (shallow) | 40.3967685° | - 078.1498101° | 4 | 0.41 |
| IT-B (deep) | | | 36 | 0.31 |
| IT-C (shallow) | 40.3967057° | - 078.1497186° | 4 | 0.00 |
| IT-C (deep) | | | 36 | 0.00 |
| IT-D (shallow) | 40.3966107° | - 078.1496772° | 4 | 3.94 |
| IT-D (deep) | | | 36 | 0.13 |

Figure 1

Infiltration Testing Locations
Raystown Road EFRD
Soil Type: Newark Silt Loam (Ne)
Huntington County, PA

Legend

-  Infiltration Tests



ATTACHMENTS

SOIL LOGS



Soil Log

Tested By: J. Coffman

Project: Sunoco Marine 2E

Project No.: 112IC05958

Test Pit: A (Raystown SR26)

Date: 10/3/16

Elevation: _____

Equipment Used: Track hoe

Geology: Soil

Soil Type: loam/sand

Land Use: grass field

Weather: Sunny 70°

Additional Comments Bottom of pit 63"

| 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" | loamy sand | | DrBwn 7.5YR 3/2 | solid | small roots | — | — | moist |
| A | 3" | 37" | sandy loam loamy sand | v.f. to coarse sands to (whit & red) frag abundant | DrBwn 7.5YR 3/2 | mixed, no mottling | | — | — | moist cobble-sized frag |
| B | 37" | 63" | loamy sand sandy loam | " | DrBwn 10YR 5/8 | solid mottling | | — | 60" | moist cobble-sized frag wet (p 60") |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| 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 | Photo #3 |
| 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



Soil Log

Tested By: J. Coffman Project: Sunoco Mariner 2E Project No.: 112IC05958
 Test Pit: B/C/D Raystown - SR 26 Date: 10/3/16 Elevation: _____ Equipment Used: Tracker
 Geology: soil Soil Type: silty clay Land Use: grass field Weather: Sunny 70°

Additional Comments: Bottom of pit @ 62"

| 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" | silty clay | | Pk Brn 7.5YR 3/2 | Solid (no mottling) | small rocks | — | — | moist |
| A | 3" | 38" | " | Siltstone to med-course sandstone frag (colloidal sized) | dk Brn 7.5YR 3/3 | Solid (no mottling) | | — | — | moist |
| B | 38" | 62" | " | " | Org Brn 10YR 4/4 | mottling | | — | 60" | moist wet |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| 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 | Photos # 1 & 2 |
| 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
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INFILTRATION TEST DATA SHEETS



INFILTRATION TEST DATA SHEET

Tetra Tech, Inc.

PROJECT NAME: Sunoco Marineo 2 E TEST AREA ID: Raystown (SR 26) D
 PROJECT NUMBER: 112TC05958 PERSONNEL: J. Coffman

TEST METHOD: Double Ring Infiltrometer Percolation
 Single Ring Infiltrometer

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

Location Coordinates or Description:
grass field, slight slope,
loc. closest to SR 26.
40.396607, -81.1496772

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

DATE(S): 10/3/16 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): 6"

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

| | | | | |
|-----------------|----|--------------------------------|-----------|------------------|
| 1342 | 0 | ----- | 2 gallons | Start of presoak |
| 1412 | 30 | 0 ⁶ / ₁₆ | 0.2L | |
| 1442 | 60 | 0 ¹ / ₁₆ | 0.05 | End Presoak |
| 1512 | | | | |

TEST DATA

| | | | | |
|------|-----|--|------|---------------|
| 1442 | 0 | ----- | — | start of test |
| 1512 | 30 | 0 ^{12} / ₁₆ | 0.05 | |
| 1542 | 60 | 0 ¹ / ₁₆ | 0.05 | |
| 1612 | 90 | 0 ¹ / ₁₆ | 0.05 | |
| 1642 | 120 | 0 ¹ / ₁₆ | 0.05 | end of test |

* Location is at base of road (SR 26) bank, and a little seepage from the base of bank likely to be cause of a little standing water in test pit (~20% of pit with standing water.)