INFILTRATION ANALYSIS & NOLIN SOILS INVESTIGATION

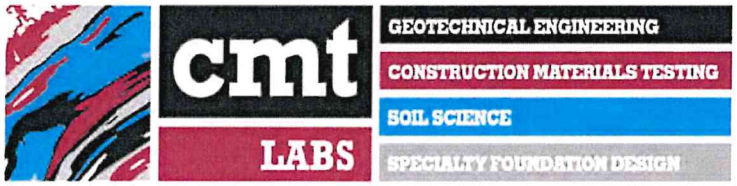
Rahal Honda
Ferguson Township, Centre County, Pennsylvania

CMT Laboratories File No. 2114800

Prepared for:

PennTerra Engineering, Inc.
3075 Enterprise Drive, Suite 100
State College, PA 16801

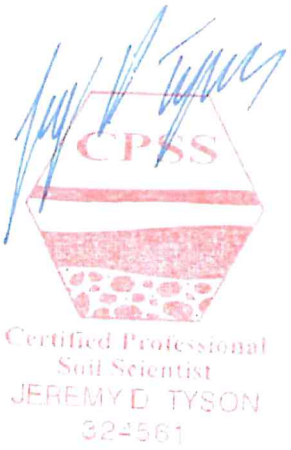
Prepared by:



The groundwork for success.

CMT Laboratories, Inc.
2701 Carolean Industrial Drive
State College, PA 16801

July 8, 2021



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INFILTRATION ANALYSIS
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July 8, 2021

1.0 INTRODUCTION

This report presents the results of an Infiltration Analysis & Nolin Soils Investigation for the Rahal Honda project located in Ferguson Township, Centre County, Pennsylvania. Our services for this project were performed in accordance with CMT Proposal No. 2114800, dated June 10, 2021. Authorization to perform this work was given by Mr. C. Anthony Fruchtl, Project Engineer for PennTerra Engineering, Inc., on June 14, 2021.

Our scope of services included observing a total of eighteen (18) test pits. Twelve (12) of the test pits were excavated within three (3) proposed stormwater management areas (Areas A through C). Infiltration tests were conducted at each of these test pit locations. The six (6) remaining test pits were excavated within other areas of interest that were mapped as having alluvial (Nolin) soils by the Natural Resource Conservation Service (NRCS). The purpose of these test pits was to determine if the NRCS soil mapping was accurate, and assuming Nolin soils were present, offer an opinion on whether or not development within Nolin soils would require extraordinary engineering methods.

The approximate test pit locations are shown on a site plan provided by PennTerra in Appendix A. It should be noted that we have not considered any potential impact that an infiltration Best Management Practice (BMP) may have on adjacent structures (existing and/or proposed). These types of issues, if applicable, should be addressed by the appropriate professionals.

2.0 SITE INFORMATION

The proposed project is located on the east side of West College Avenue in Ferguson Township, Centre County, Pennsylvania. The proposed development includes portions of Tax Parcels 24-004-079A through 24-004-082. The existing land uses include gravel parking areas, a residential/office building, a paved driveway, lawns, wooded/brushy areas, and

agricultural fields. A Google Earth "Location Map" and a "Tax ID Map" generated from Centre County's Web Information Access (WEBIA) website are provided in Appendix A.

3.0 DESKTOP RESEARCH

CMT used the following information as a preliminary step in identifying potential soil, bedrock, and karst features at the site.

3.1 Soil Mapping

The Natural Resource Conservation Service (NRCS) soil mapping indicates that Opequon-Hagerstown Complex (OhB, OhC) and Nolin (No) series soils exist at the site.

Hagerstown and Opequon series soils are similar in that both consist of well-drained residual soils derived from limestone or dolomite bedrock. Opequon soils are shallow (20 inches or less to bedrock), while Hagerstown soils are deep to very deep (depth to bedrock of 40 inches or more). Typically, areas mapped as Opequon-Hagerstown Complex have an intermediate depth to rock, or a depth to rock too variable to differentiate between the two series.

The Nolin series consists of very deep, well-drained alluvial soils. Nolin soils are often referred to as "local alluvium" since they are often associated with runoff from upslope areas rather than a defined stream (with bed and banks). It should be noted that the NRCS mapping does not indicate that the Nolin soils at this site are associated with a stream, extended drainageway, or floodplain.

The NRCS soil map is provided in Appendix B.

3.2 Geology Mapping

The Pennsylvania Department of Conservation and Natural Resources (PADCNR) geologic mapping indicates that the bedrock formations at the site include the Nittany (On) and Axemann (Oa) Formations.

The Nittany Formation is comprised of light to dark-gray finely to coarsely crystalline dolomite with alternating beds of sandy, cherty dolomite. The rock is moderately resistant to weathering to a shallow depth and small to medium-sized flat, rectangular fragments result from weathering. The interface between the bedrock and the soil mantle is characterized by pinnacles and the development of joint channels is common. Excavation of the bedrock is typically difficult and cut-slope stability is good in most areas. Foundation stability is good, provided the bedrock has been thoroughly investigated for solution openings (Berg and others, 1980; Geyer and Wilshusen, 1982).

The Axemann Formation is comprised of light-gray, fossiliferous and coarsely crystalline limestone with silty, fine-grained dolomitic limestone. Some oolitic and conglomeratic limestone is present within this formation. Flint concretions and chert occur throughout the unit. The joints have a blocky pattern which are well developed, moderately abundant and regularly spaced. The rock is moderately resistant to weathering to a shallow depth. Excavation of the bedrock pinnacles is typically difficult and cut-slope stability is good in most areas. Foundation stability is good, provided the bedrock has been thoroughly investigated for solution openings (Geyer and Wilshusen, 1982).

The PADCNR Geology Map is provided in Appendix B.

3.3 Sinkhole Potential

No sinkholes or sinkhole-like conditions were observed during our investigation; however, PADCNR karst feature mapping does indicate several known sinkholes in the general vicinity of the site (within approximately ½-mile). This may indicate that the site is at a higher risk for sinkhole formation than similar "karst" sites located farther from known sinkholes. The PADCNR karst feature map is provided in Appendix B.

The presence of a carbonate bedrock formation in itself renders the site susceptible to sinkhole development during or after construction, and altering a site's grading and drainage characteristics can result in sinkholes developing even when surface/subsurface observations reflect little or no potential. In other words, the risk of sinkholes developing at this site (or any site within a carbonate bedrock/karst area) as a result of stormwater infiltration BMPs

is inherent, and the best management strategy, short of eliminating groundwater recharge, may be to preplan for the repair of sinkholes, should they develop.

4.0 SITE CONDITIONS

The field work (test pits and infiltration tests) for CMT's investigation occurred on June 24 and June 25, 2021. The ambient temperatures these days ranged from approximately 60 degrees Fahrenheit to 81 degrees Fahrenheit. No rainfall occurred during, or within approximately 24 hours prior to, our investigation.

No visual evidence of surface water flow or flooding (i.e., folded vegetation, erosion, water marks, etc.) were observed at the site.

5.0 TEST PITS

A total of eighteen (18) test pits were excavated in the presence of CMT's soil scientist with a backhoe provided and operated by a subcontractor. The test pit observations support the accuracy of the NRCS soil mapping with only one minor mapping inaccuracy, a residual soil within (but near the boundary of) an area mapped as having Nolin soils.

Specific soil profile information for each test pit location is provided on the individual test pit logs available in Appendix C. The following sections are a general summary of the test pit observations.

5.1 Area A

A total of six (6) test pits (A1 through A6) were excavated within Area A. Alluvial (Nolin) soils were observed in five of the six test pits (A1 through A5). The alluvial soils extended to depths ranging from approximately 2.0 to 8.0 feet below the surface. The alluvial soils include topsoil layers (Ap-horizons), weakly developed "topsoil-like" subsoil layers (AB-horizons), and weakly developed subsoil layers (Bw-horizons). Residual (Opequon-

Hagerstown) soils were observed in test pit A6, and below the alluvial soil layers in test pits A1 through A5. The residual soils include topsoil layers (Ap-horizons), well developed subsoil layers (Bt-horizons), and weakly developed subsoil layers (BC-horizons). A "2" prefix (e.g. 2Bt or 2BC) is added to the residual subsoil layers encountered below alluvial soils to indicate a change in parent material from alluvium to residuum.

Dolomite bedrock was encountered in test pits A5 and A6 at depths of approximately 3.0 and 5.0 feet below the surface, respectively. Excavation refusal occurred at depths of 5.0 and 5.5 feet below the surface, respectively.

No groundwater was observed through the excavation termination depths. Redoximorphic (redox) features (commonly referred to as "gray mottling") were observed sporadically in several of the test pits; however, these features appeared related to the presence of deep organic matter, increased moisture related to slope position, and differences in soil matric potentials. We do not consider the redox features evidence of a seasonal high groundwater table within the excavation termination depths in Area A.

5.2 Area B

A total of three (3) test pits (B1 through B3) were excavated within Area B. Alluvial (Nolin) soils were observed in each of the test pits. The alluvial soils extended to depths ranging from approximately 3.8 to 6.0 feet below the surface. The alluvial soils include topsoil layers (Ap-horizons) and weakly developed subsoil layers (Bw-horizons). The alluvial soils are underlain by weakly developed residual subsoil layers (BC-horizons).

Dolomite bedrock was encountered in test pits B1 and B2 at depths of approximately 5.5 and 7.5 feet below the surface, respectively. Excavation refusal occurred at depths of approximately 6.5 and 7.5 feet below the surface, respectively.

No groundwater or redox features were observed in Area B through the excavation termination depths.

5.3 Area C

A total of three (3) test pits (C1 through C3) were excavated within Area C. The majority of Area C is covered with parking lot gravel. The gravel is underlain by residual (Opequon-Hagerstown) soils. The residual soils include topsoil layers (Ap-horizons), well developed subsoil layers (Bt-horizons), and weakly developed subsoil layers (BC-horizons).

Dolomite bedrock was encountered in each of the test pits at depths ranging from approximately 1.0 to 6.7 feet below the surface. Excavation refusal occurred at depths ranging from approximately 3.0 to 8.0 feet below the surface.

No groundwater or redox features were observed in Area C through the excavation termination depths.

5.4 Additional Tests Pits (Nolin Soils)

A total of six (6) additional test pits (N1 through N6) were excavated within other portions of the Nolin soil mapping unit at the site. Alluvial soil layers were observed in each of the test pits. The alluvial soils extended to depths ranging from approximately 2.0 to 8.5 feet below the surface. The alluvial soils include topsoil layers (Ap-horizons) and weakly developed subsoil layers (Bw-horizons). Two samples of the alluvial subsoils (Bw-horizons) were obtained for soil classifications using the Unified Soil Classification System. The samples were classified as ML-CL (sandy silty clay) and CL (lean clay with sand). The alluvial soils are underlain by weakly developed residual subsoil layers (BC-horizons) in test pits N1 through N5. No residual soils were noted in test pit N6; however, it should be noted that the transition from the weakly developed alluvial Bw-horizons to the weakly developed residual BC-horizons at the site was not always clear, and we suspect that some of the deeper Bw-horizons may actually be "eluvial" residual subsoil layers (BE-horizons).

Dolomite bedrock was encountered in test pits N1 through N4 at depths ranging from approximately 4.5 and 5.8 feet below the surface. These test pits were terminated prior to excavation refusal.

No groundwater or redox features were observed through the excavation termination depths in the additional test pits.

6.0 INFILTRATION TESTS

Infiltration tests were conducted at each of the test pit locations in Areas A through C. In general, the infiltration testing occurred at test depths discussed with PennTerra Engineering. Relevance of the infiltration test results will be determined by PennTerra Engineering based on the actual design elevations.

After the infiltration tests were completed, all of the excavations were backfilled with excavated materials.

6.1 Conventional Infiltration Tests Methods

A total of twenty-seven (27) conventional infiltration tests, including twenty-six (26) double-ring infiltrometer tests and one (1) uncased-hole test were conducted. The uncased-hole test was conducted in general (24-hour presoak omitted) accordance with the Percolation Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual. The double-ring infiltrometer tests were conducted in accordance with the BMP Manual.

The infiltration rate obtained using the uncased-hole method is calculated using the Reduction Factor specified in the BMP Manual for use with percolation tests. The reduction factor accounts for the exfiltration occurring through the sides of the percolation hole and assumes that the infiltration rate is affected by the depth of the water in the hole.

The apparent infiltration rate for both the double-ring infiltrometer and uncased-hole test methods is taken to be either the average rate of all measurements or the final measurement reported in in/hr, whichever is lower. The maximum design infiltration rates shown in this report were calculated using what we believe are reasonable minimum safety factors. The design engineer should determine if higher safety factors are appropriate.

6.2 Non-Conventional Infiltration Test Method

A total of six (6) non-conventional infiltration tests were conducted using the following general procedure:

1. An area (i.e., test area) was prepared in the bottom of each test pit to contain a maximum of 6 inches of water. The dimensions of the test area were recorded and are shown on the infiltration logs.
2. Using containers of known volume, water was added to the test area and the time required for the water to drain completely was recorded.
3. The apparent infiltration rates (no safety factor applied) were calculated, and are shown on the infiltration logs.

7.0 INFILTRATION TEST RESULTS

The following table summarizes the infiltration test results.

Location	Test Type	Test Depth (ft)	Materials Tested	Apparent Infiltration Rate (in/hr)	Min. Safety Factor	Maximum Design Infiltration Rate (in/hr)
			Area A			
A1A	Infiltrometer	4.5	Yellowish Brown Sandy Silty Clay (Bw_3)	1.92	2	0.96
A1B	Infiltrometer	6.5	Strong Brown Clayey Sand with Gravel (2BC)	0.48	2	0.24
A2A	Infiltrometer	5.0	Yellowish Brown Sandy Silty Clay (Bw_3)	1.20	2	0.60
A2B	Infiltrometer	5.0	Yellowish Brown Sandy Silty Clay (Bw_3)	0.72	2	0.36
A3A	Infiltrometer	4.0	Brown Clayey Silt with Sand, Trace Gravel (AB)	0.96	2	0.48
A3B	Infiltrometer	4.0	Brown Clayey Silt with Sand, Trace Gravel (AB)	0.24	2	0.12
A4A	Infiltrometer	2.5	Brown Clayey Silt with Sand, Trace Gravel (AB)	2.88	2	1.44
A4B	Infiltrometer	2.5	Brown Clayey Silt with Sand, Trace Gravel (AB)	2.40	2	1.20
A5A	Infiltrometer	1.5	Brown Clayey Silt with Sand, Trace Gravel (AB)	1.92	2	0.96
A5B	Infiltrometer	1.5	Brown Clayey Silt with Sand, Trace Gravel (AB)	1.44	2	0.72
A5C	Non-Conv.	5.0	Gray Dolomite (R)	15.17	*	*
A6A	Infiltrometer	2.5	Strong Brown Lean Clay with Sand (Bt_1)	1.68	2	0.84
A6B	Infiltrometer	2.5	Strong Brown Lean Clay with Sand (Bt_1)	1.68	2	0.84
A6C	Non-Conv.	5.5	Gray Dolomite (R)	24.06	*	*
			Area B			
B1A	Infiltrometer	1.5	Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_1)	1.44	2	0.72
B1B	Infiltrometer	1.5	Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_1)	1.68	2	0.84
B1C	Infiltrometer	3.0	Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_2)	0.24	2	0.12
B1D	Infiltrometer	3.0	Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_2)	0.66	2	0.33
B1E	Non-Conv.	6.5	Gray Dolomite with Soil-Filled Fractures (R)	7.18	*	*
B2A	Uncased-hole	1.5	Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_1)	0.50	3	0.17
B2B	Infiltrometer	5.5	Strong Brown Sandy Clay, Trace Gravel (2BC)	1.14	2	0.57
B2C	Infiltrometer	5.5	Strong Brown Sandy Clay, Trace Gravel (2BC)	0.48	2	0.24
B3A	Infiltrometer	2.5	Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_2)	2.52	2	1.26
B3B	Infiltrometer	2.5	Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_2)	3.60	2	1.80
B3C	Infiltrometer	6.0	Strong Brown Sandy Clay, Trace Gravel (2BC)	0.24	2	0.12
B3D	Infiltrometer	6.0	Strong Brown Sandy Clay, Trace Gravel (2BC)	0.60	2	0.30
			Area C			
C1A	Infiltrometer	4.5	Strong Brown Lean Clay with Sand (Bt_2)	1.44	2	0.72
C1B	Infiltrometer	4.5	Strong Brown Lean Clay with Sand (Bt_2)	0.90	2	0.45
C1C	Non-Conv.	8.0	Gray Dolomite with Soil-Filled Fractures (R)	12.15	*	*
C2A	Non-Conv.	3.5	Gray Dolomite with Soil-Filled Fractures (R)	11.46	*	*
C3A	Infiltrometer	0.5	Strong Brown Lean Clay with Sand (Bt)	2.16	2	1.08
C3B	Infiltrometer	0.5	Strong Brown Lean Clay with Sand (Bt)	0.72	2	0.36
C3B	Non-Conv.	3.0	Gray Dolomite with Soil-Filled Fractures (R)	18.51	*	*

*See Recommendations

8.0 RECOMMENDATIONS

8.1 Conclusions (Infiltration Areas)

We consider the conventional (infiltrometer and uncased-hole) infiltration test results accurate for design purposes, provided the existing soil structure and macropore abundance is maintained and/or improved during and after construction. Particular attention is called to the discussions in Sections 8.4 and 8.5 regarding compaction during construction, sediment accumulation, and soil restoration. We believe it is reasonable for the designer to establish design infiltration rates for BMPs from all relevant test results within the BMP's area, without eliminating the highest test result at each test pit location. In the event an untested horizon needs to be assigned an infiltration rate, we believe it is reasonable to assume that the untested horizon has similar infiltration capabilities as a similar tested horizon from a nearby test pit location. Based on the conventional infiltration test results, the tested soils in each of Areas A through C appear capable of providing favorable infiltration rates for design purposes.

The non-conventional infiltration test results suggests that the bedrock in each of the test areas is highly permeable; however, if disposal of stormwater directly into the bedrock is considered, we recommend the designer first discuss their proposed design with the governing municipality, since they may require pre-treatment of stormwater through a specified thickness of filtration medium (i.e., typically a topsoil layer or other suitable medium) prior to entering the bedrock. Depending on the method of pre-treatment, a separation material (permeable geotextile or fine stone bedding material) may be needed to minimize loss of the filtration medium into rock fractures. Some geotextile materials may be more prone to clogging over time than others.

8.2 Conclusions (Nolin Soils)

Based on our investigation, the following opinions are offered:

1. Nolin soils exist in the areas of interest.

2. No visual evidence of surface water flow or flooding (i.e., folded vegetation, erosion, water marks, etc.) was observed at the site.

3. The composition of the Nolin subsoils is not inconsistent with the composition of other fine-grained subsoils common within the Centre Region. Please see attached laboratory testing report.

4. No evidence of a shallow seasonal-high groundwater table was observed within the test pit termination depths.

5. We believe that development within the Nolin soils can proceed using typical design and construction practices (i.e., we do not believe extraordinary methods will be required).

8.3 Minimum Safety Factors

It is recommended that the civil engineer apply an appropriate factor of safety when establishing the design infiltration rates to account for inconsistencies in the test results, non-homogeneity of the soils, and long-term variations in the soils' infiltration characteristics due to seasonal changes and other factors. We believe that minimum safety factors of 2 and 3 should be applied to the infiltrometer and uncased-hole test results, respectively, for this purpose, and have applied these safety factors to the results shown in this report.

We believe the non-conventional infiltration test method is useful in demonstrating the general permeability and infiltration characteristics of the materials tested; however, we do not believe that the test results should be used without first applying a reasonable safety factor. Since the minimum safety factor for conventional test methods ranges from 2 to 3, we recommend the designer consider applying a safety factor of 3 or more to the non-conventional test results if they are considered for design purposes. Actual rates should be assumed to vary a factor of safety higher or lower than the apparent rates, depending on design concerns.

8.4 Protection of Infiltration Areas

Soils within planned infiltration areas must not be compacted during construction since it is believed that even minimal compaction will result in a loss of infiltration capability. All heavy equipment should be prohibited from operating and traveling over the infiltration

areas, and all other traffic should be minimized. It is also recommended that planned infiltration areas be clearly marked on the site prior to the commencement of earthwork activities and construction traffic be prohibited from entering the infiltration areas.

The infiltration capacity of an area may decrease over time due to sediment accumulation. We believe infiltration areas that are protected from sediment accumulation will maintain their infiltration capacity longer than those which are not protected. We recommend that infiltration areas not be used as temporary sediment traps during site construction; however, if the use of an infiltration area as a temporary sediment trap is unavoidable, measures to prevent sediment from reaching the planned infiltration surface may be effective in preserving the infiltration capacity. In our experience, these measures typically involve leaving some thickness of soil above the infiltration surface for the sediment trap, and then removing it when the sediment trap is converted to an infiltration area. Since the soils at the infiltration elevation may be moist or wet after the area is used as a sediment trap, it may be necessary to wait for dryer conditions to prevent compaction or smearing during the conversion process.

8.5 Restoration of Living Soil

BMP construction typically involves removing and replacing soil layers. Removing the existing vegetation and underlying soils drastically changes the existing biological community (i.e., organic matter, bacteria, fungi, nematodes, earthworms, plant roots, etc.) which is essential for maintaining a "living soil" as described and tested during CMT's investigation. The biological community present in a living soil is the "glue" that helps maintain and build soil structure and create macropores, which are extremely important for maintaining, enhancing, and/or restoring the original (pre-disturbance) infiltration rates. Some provisions the designer may consider to help restore an infiltration area to a living soil again are outlined below:

1. If construction of the infiltration area requires the existing topsoil to be removed and replaced, the techniques for removing, stockpiling, and replacing the topsoil can greatly affect its ability to infiltrate water and be restored to a healthy living soil in the future. Stripping the topsoil inherently negatively affects the infiltration capacity of the soil profile; however, stripping the topsoil during wet conditions greatly amplifies the negative effects. In

general, stripping topsoil during a relatively dry period and stockpiling it in a way that maintains most of the existing soil structure, reduces compaction, and maintains aerobic conditions is essential.

2. Adding soil amendments may help improve/maintain soil structure and infiltration rates during construction and help re-establish a living soil. Sources of these materials vary in suitability and availability and should be evaluated prior to placement.

3. Any compacted subsoils or sediment layers must be removed prior to placing the topsoil. Creating a natural topsoil to subsoil interface is typically beneficial. This can be accomplished by carefully blending several inches of the new topsoil with the in-situ subgrade soil, being careful not to compact the soils. Alternatively, a similar effect could be accomplished by scarifying the in-situ subgrade soil just prior to placing the topsoil.

4. We recommend that the new soil be seeded immediately after placement. If this occurs later in the growing season (i.e., approximately after August), we recommend initially seeding the new soil with a vegetation that quickly establishes itself and roots deeply. The primary purpose of this seeding is to stabilize the new soil and stimulate biological activity. An annual vegetation such as rye grass can typically establish several feet of root growth in several months' time; however, re-seeding the following year with a more desirable permanent mixture would be necessary. Selecting a vegetation that is moisture tolerant and does not require frequent mowing is beneficial. Frequent mowing typically results in shallow root penetration and compaction of the topsoil, both of which reduce infiltration and affect BMP performance. The designer can select vegetation that is best adapted to their design and the anticipated moisture conditions by contacting seed companies.

5. We recommend allowing the new vegetation to fully establish itself throughout the BMP prior to the introduction of stormwater. Vegetation will stabilize the surface soils making them more resistant to particle separation when the BMP is inundated with water. If inundation prior to vegetation occurs, particle separation may result in the development of a restrictive layer. Once vegetation is established, it will help create soil structure and habitat for soil organisms, both of which typically increase infiltration rates. If inundation of the BMP is unavoidable prior to a stable vegetative surface being established, the BMP should be monitored

and maintenance performed as needed (i.e., reseeding and/or removal of any restrictive layers created).

It is recommended that construction oversight (quality assurance) during construction be provided by the designer or owner. Oversight should include observation during earthwork activities and evaluation of proposed fill materials (including topsoil and topsoil mixtures).

9.0 COMMENTS

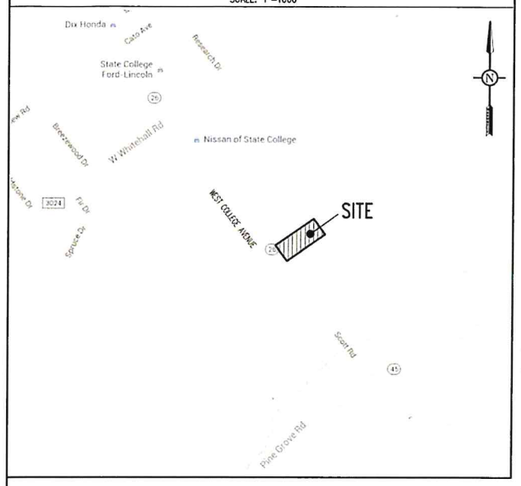
We request that this office be consulted if, during design or construction, conditions are encountered which differ from those contained herein, thereby warranting a review of our recommendations. This report has been prepared for the exclusive use of PennTerra Engineering, Inc.

APPENDIX A

SITE PLAN & LOCATION MAPS

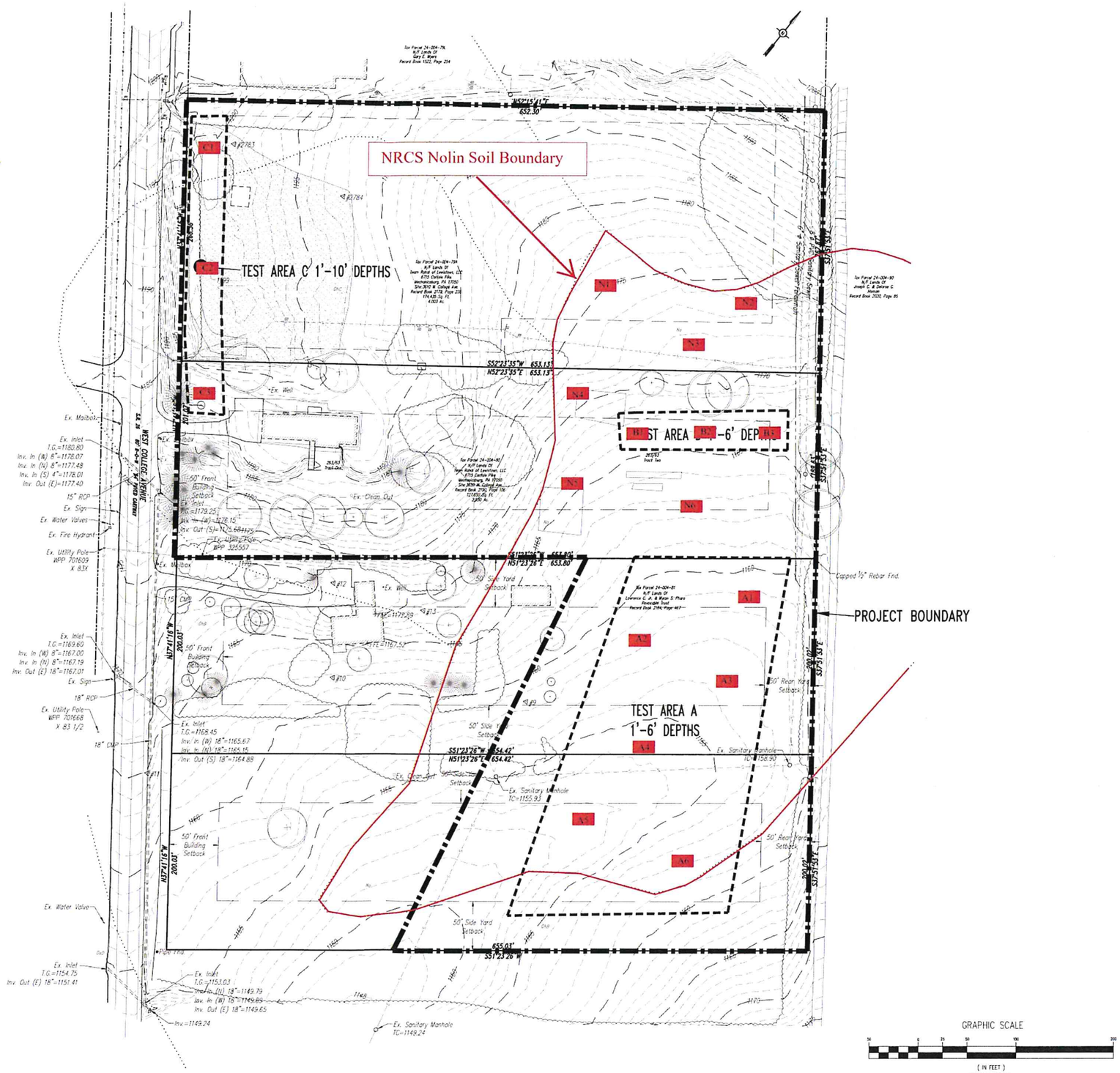
LOCATION MAP

SCALE: 1"=1000'



EXISTING FEATURES LEGEND

- Property Line, Lot Line or Right of Way Line
- Adjoining Property Line
- Building Setback Line
- Easement Line
- Roadway Center Line
- I.P. Found
- I.P. To Be Set
- Existing Building
- Existing Curbing
- Existing Contours (1's & 2's)
- Existing Contours (5's & 10's)
- Existing Soil Limit Line / Boundary
- HaB — Existing Soil Type
- Existing Tree Line
- Existing Sanitary Sewer w/ Manhole
- Existing Water Line w/ Valve
- Existing Overhead Utility Line w/ Pole
- CO — Existing Clean-Out



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Designer	JDH
Draftsman	JDH
Proj.Manager	CAF
Surveyor	MAK
Perimeter Ck.	
Book	497 Pg 16-19
Drive	P: Layout 24x36
Acad	15350.04-MD.dwg

Date	Description
	REVISIONS

TAX PARCEL
24-4-79A

FERGUSON TOWNSHIP
CENTRE COUNTY
PENNSYLVANIA

INFILTRATION TESTING PLAN

PROJECT NO.
15350.04

DATE
JUNE 2, 2021

SCALE
1" = 50'

SHEET NO.
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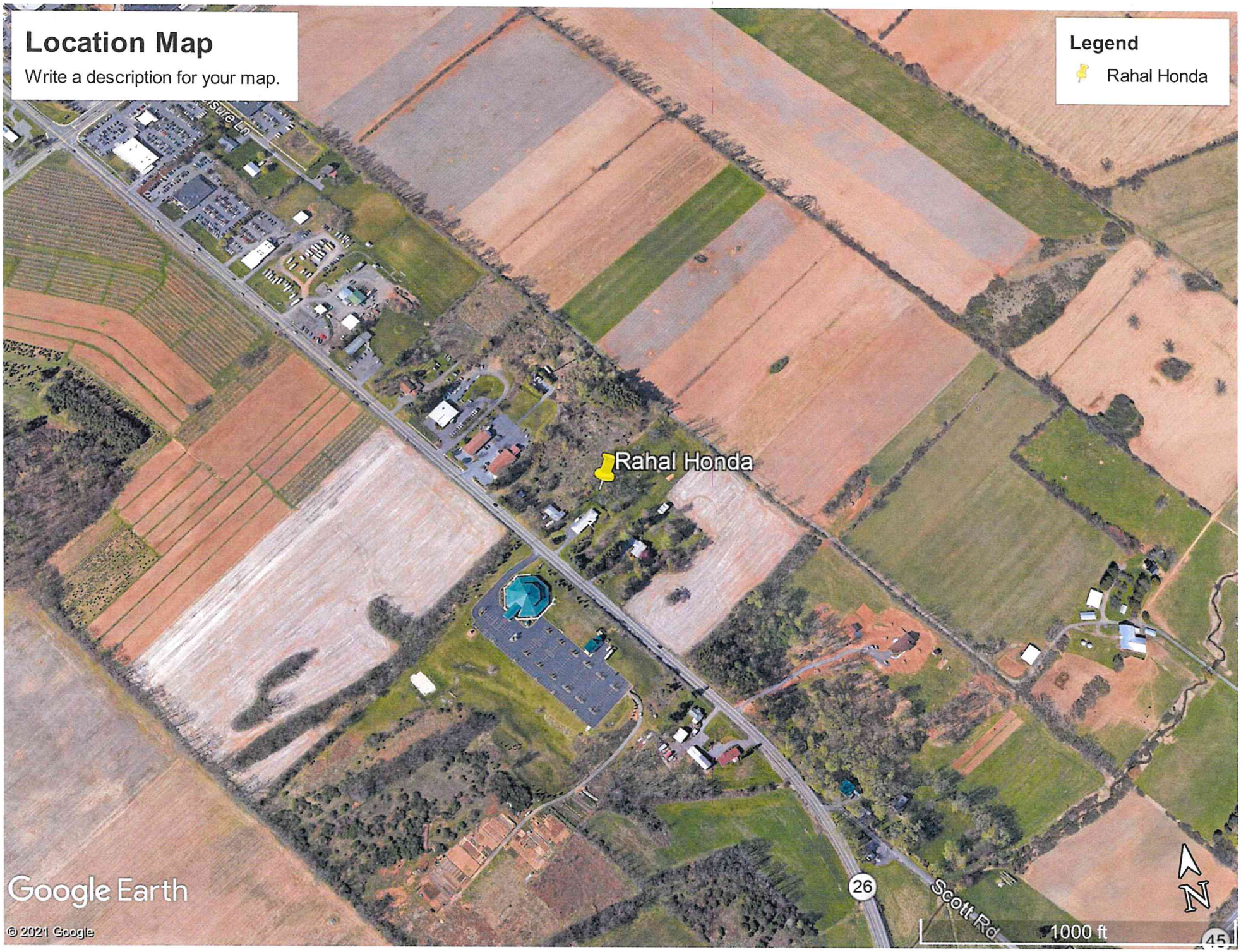
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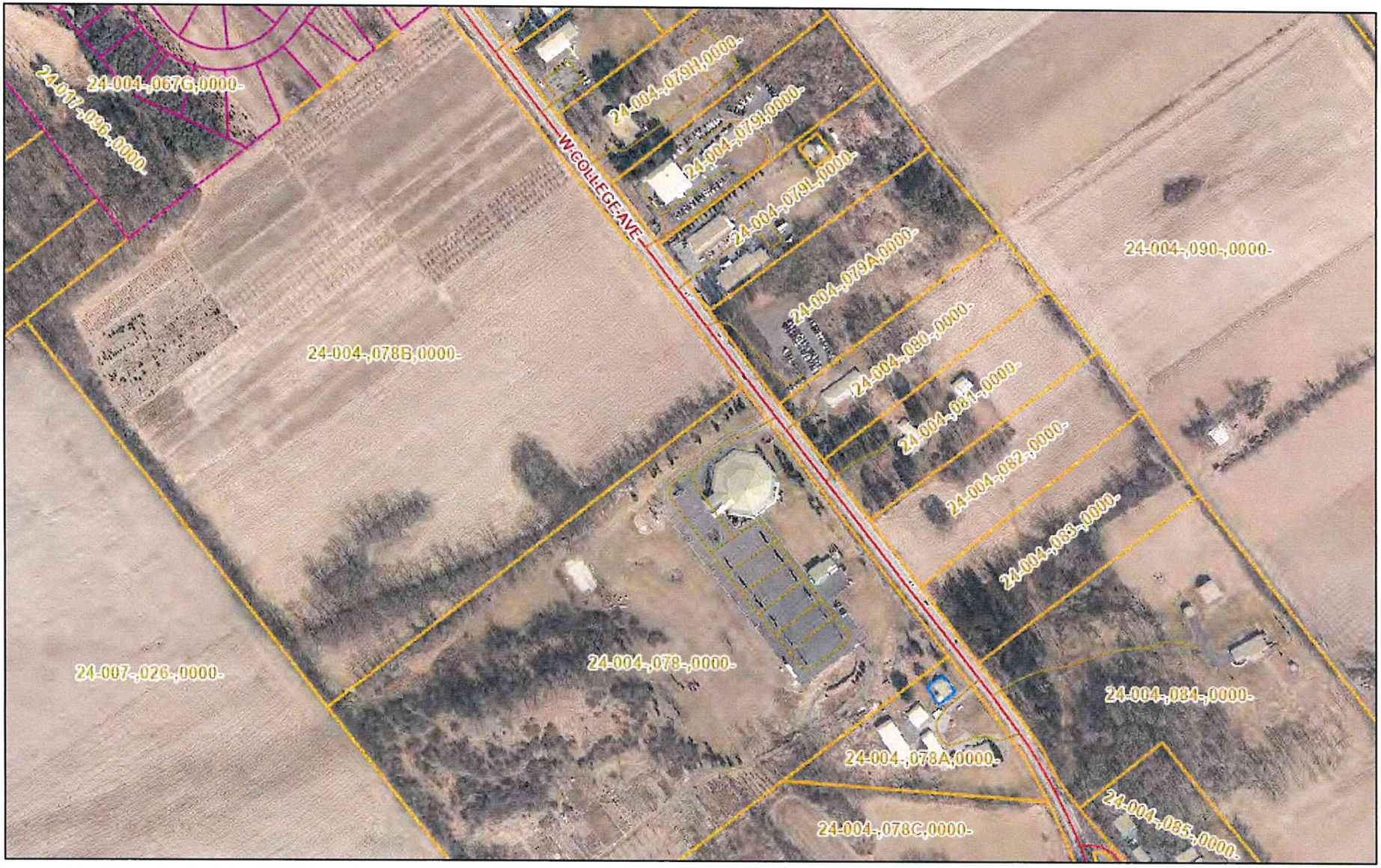
ArcGIS Web Map



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Municipalities
Parcels
Unsold Lot
Point Card
Standard
Buildings
Streets
Streams
Driveways
DEP_OilGas
Parcel Numbers
Building Addresses
Street Names

1:4,000

0 0.03 0.07 0.13 mi

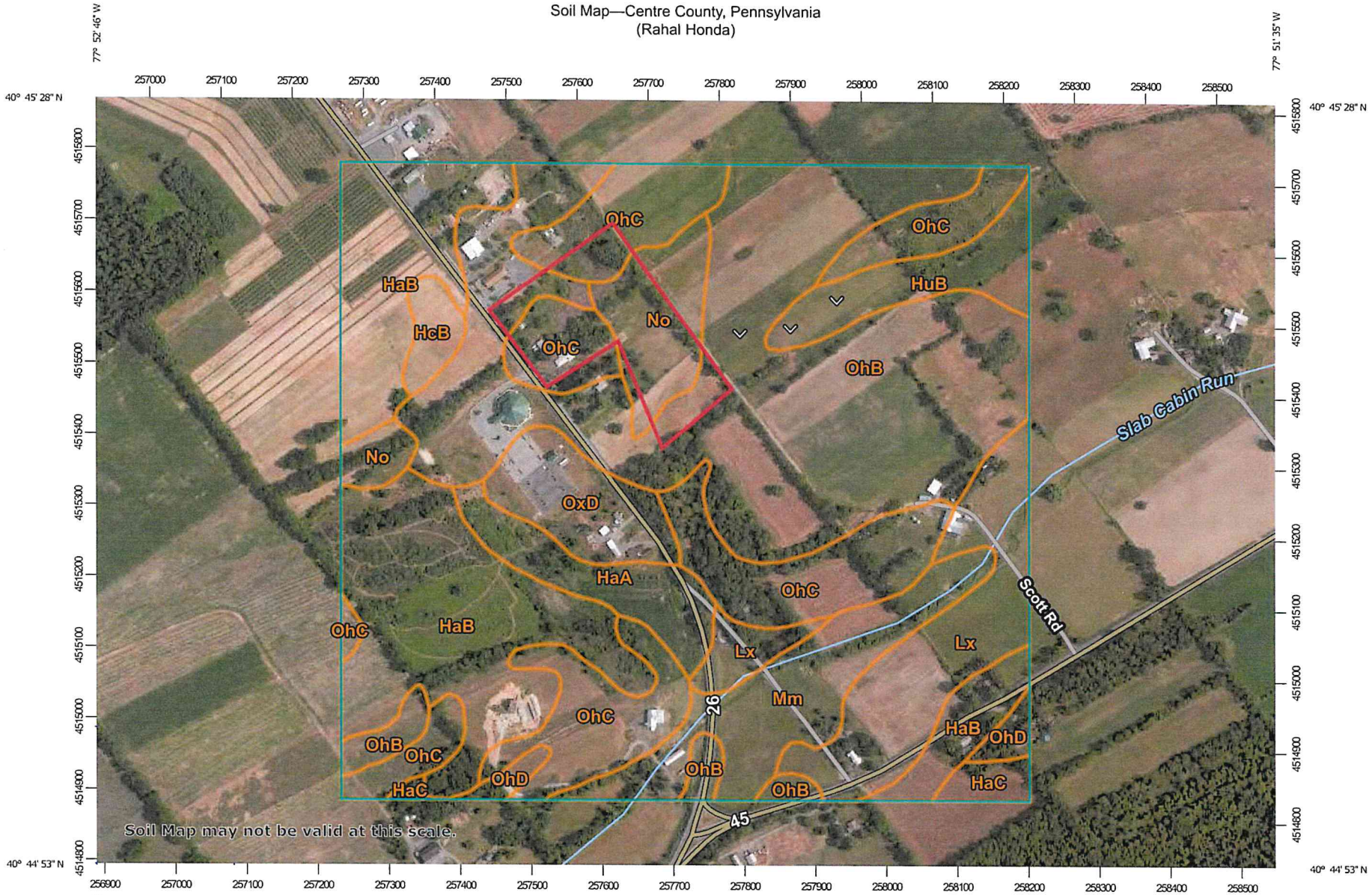
0 0.05 0.1 0.2 km

Web AppBuilder for ArcGIS
Centre County GIS

APPENDIX B

DESKTOP RESEARCH MAPS

Soil Map—Centre County, Pennsylvania
(Rahal Honda)



Map Scale: 1:7,580 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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: Centre County, Pennsylvania
Survey Area Data: Version 20, Jun 4, 2020

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

Date(s) aerial images were photographed: Jun 18, 2010—Sep 25, 2010

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
HaA	Hagerstown silt loam, 0 to 3 percent slopes	7.2	3.4%
HaB	Hagerstown silt loam, 3 to 8 percent slopes	41.8	19.5%
HaC	Hagerstown silt loam, 8 to 15 percent slopes	2.0	0.9%
HcB	Hagerstown silty clay loam, 3 to 8 percent slopes	2.3	1.1%
HuB	Hublersburg silt loam, 3 to 8 percent slopes	7.1	3.3%
Lx	Lindside soils	17.8	8.3%
Mm	Melvin silt loam	13.8	6.4%
No	Nolin silt loam, local alluvium, 0 to 5 percent slopes	9.2	4.3%
OhB	Opequon-Hagerstown complex, 3 to 8 percent slopes	66.7	31.0%
OhC	Opequon-Hagerstown complex, 8 to 15 percent slopes	37.2	17.3%
OhD	Opequon-Hagerstown complex, 15 to 25 percent slopes	2.1	1.0%
OxD	Opequon-Rock outcrop complex, 8 to 25 percent slopes	7.8	3.6%
Totals for Area of Interest		**215.0**	**100.0%**

Centre County, Pennsylvania

OhB—Opequon-Hagerstown complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l25p
Elevation: 400 to 3,000 feet
Mean annual precipitation: 30 to 46 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 140 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Opequon and similar soils: 50 percent
Hagerstown and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Opequon

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from limestone

Typical profile

H1 - 0 to 6 inches: silty clay loam
H2 - 6 to 16 inches: silty clay
H3 - 16 to 20 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 12 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.6 inches)

Interpretive groups

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

Description of Hagerstown

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex

Typical profile

A - 0 to 8 inches: silt loam
Bt - 8 to 45 inches: clay
C - 45 to 75 inches: clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 72 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Edom

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

Hagerstown

Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Centre County, Pennsylvania
Survey Area Data: Version 20, Jun 4, 2020

LOCATION NOLIN KY+IL IN MD OH PA TN VA WV

Established Series
Rev. SJ:DH:WHC:JCJ
02/2009

NOLIN SERIES

The Nolin series consists of very deep, well drained soils formed in alluvium derived from limestones, sandstones, siltstones, shales, and loess. These nearly level to moderately steep soils are on flood plains, in depressions which receive runoff from surrounding slopes, or on natural levees of major streams and rivers. Slope ranges from 0 to 25 percent, but is dominantly 0 to 3 percent. Mean annual temperature is 56 degrees F. and the mean annual precipitation is 43 inches.

TAXONOMIC CLASS: Fine-silty, mixed, active, mesic Dystric Fluventic Eutrudepts

TYPICAL PEDON: Nolin silt loam--pasture/hay land. (Colors are for moist soil.)

Ap--0 to 12 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; slightly acid (pH 6.5); clear wavy boundary. (6 to 12 inches thick)

Bw1--12 to 25 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; common fine roots, one coarse root; few, medium faint yellowish brown (10YR 5/4), soft irregular masses of weathered siltstone; few fine fragments of charcoal; neutral (pH 7.0); gradual smooth boundary. (10 to 30 inches thick)

Bw2--25 to 35 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; few fine roots; few to common medium and coarse faint yellowish brown (10YR 5/4), soft irregular masses of weathered siltstone; slightly acid (pH 6.5); gradual smooth boundary. (0 to 30 inches thick)

Bw3--35 to 44 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; few fine and coarse roots; few medium faint yellowish brown (10YR 5/4), soft irregular masses of weathered siltstone; neutral (pH 7.0); gradual wavy boundary (0 to 15 inches)

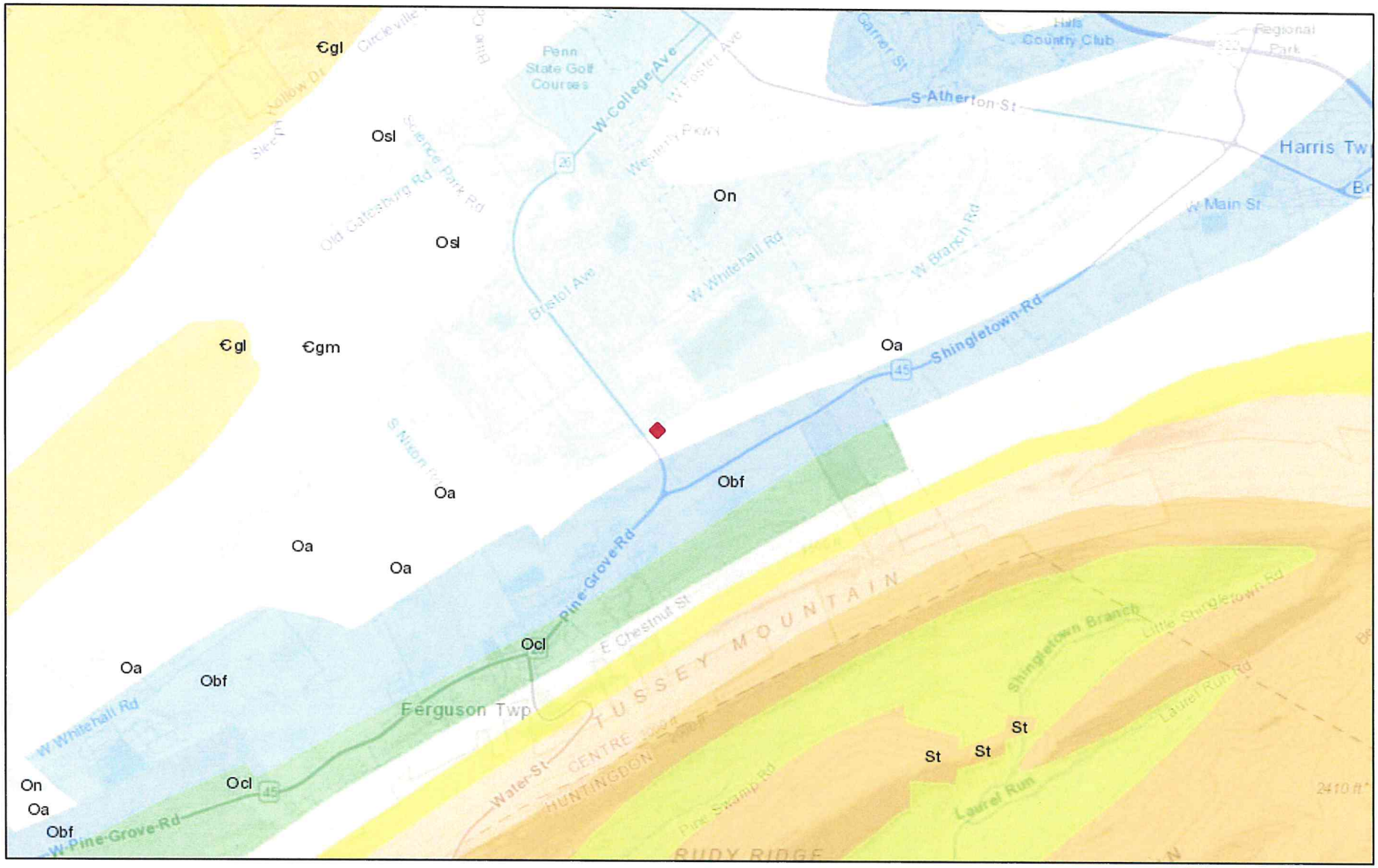
Bw4-- 44 to 74 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine and coarse roots; few fine faint yellowish brown (10YR 5/4), soft irregular masses of weathered siltstone; neutral (pH 7.0); clear wavy boundary. (0 to 30 inches thick)

C-- 74 to 80 inches; brown (10YR 4/3) silt loam; friable and firm; few fine roots; few faint silt coatings in worn holes; neutral (pH 7.0).

TYPE LOCATION: Bath County, Kentucky; in a hay field 0.4 mile southeast of Kentucky Highway 11 bridge at Sherburne, Kentucky, 650 feet ENE of Kentucky Highway 1325, 375 feet southeast of the intersection of Licking River and Flat Creek, 100 feet west of Flat Creek. USGS Sherburne Quadrangle (LAT 38/16/42N, LONG 83/48/01W).

RANGE IN CHARACTERISTICS: Solum thickness is 40 or more inches. Thickness of alluvial deposits ranges from 60 inches to many feet. Coarse fragments, mostly rounded pebbles, ranges from none to about 5 percent in the A and Bw horizon and from 0 to 35 percent in the C horizon. Redoximorphic features, if present, are below 72 inches. Reaction is moderately acid to moderately alkaline, but some pedons are strongly acid in the lower part of the Bw and C horizon. Some pedons have buried A or B horizons below a depth of 20 inches.

Geology Map



6/25/2021

1:72,224

0 0.47 0.95 1.9 mi

0 0.75 1.5 3 km

PSU Office of Physical Plant, Centre County Government, Esri, HERE,

Publication Search

Surficial Geology Search

Bedrock Geology Search

Elevation Profile

Identify Results

Latitude:	40° 45' 16" N
Longitude:	77° 52' 12" W
County:	Centre
Municipality:	Ferguson Twp
Zip Code:	16801
Quadrangle:	State College

Geologic Units < 2 of 2

Axemann Formation

Geologic Age:	Ordovician (PDF)
Map Symbol:	Oa
Main Rock Type:	Limestone

The Axemann Formation is composed of light-gray, fossiliferous, coarsely crystalline limestone interbedded with silty, fine-grained dolomitic limestone. It contains some oolitic and conglomeratic limestone. Flint concretions and chert occur throughout the unit. In certain areas, limonite has replaced the oolitic limestone. Beds are thick to thin and well developed. Its maximum thickness is about 500 feet (Geyer and Wilshusen, 1982).

Layers

Legend

Print

Download Data

2 km
1 mi

Earthstar Geographics | PA DCNR | Esri, HERE, Garmin

Powered by Esri

Publication Search

Surficial Geology Search

Bedrock Geology Search

Elevation Profile

Identify Results

Latitude:	40° 45' 16" N
Longitude:	77° 52' 12" W
County:	Centre
Municipality:	Ferguson Twp
Zip Code:	16801
Quadrangle:	State College

Geologic Units 1 of 2

Nittany Formation

Geologic Age:	Ordovician (PDF)
Map Symbol:	On
Main Rock Type:	Dolomite

The Nittany Formation consists of medium- to dark-gray, finely to coarsely crystalline dolomite. It is sandy and cherty and can have siliceous oolites, and, in part, contains alternating beds of light- and dark-gray dolomite. Beds are thick and moderately well bedded to well bedded. It is approximately 1,250 feet thick (Berg and others, 1980; Geyer and Wilshusen, 1982).

Layers

Legend

Print

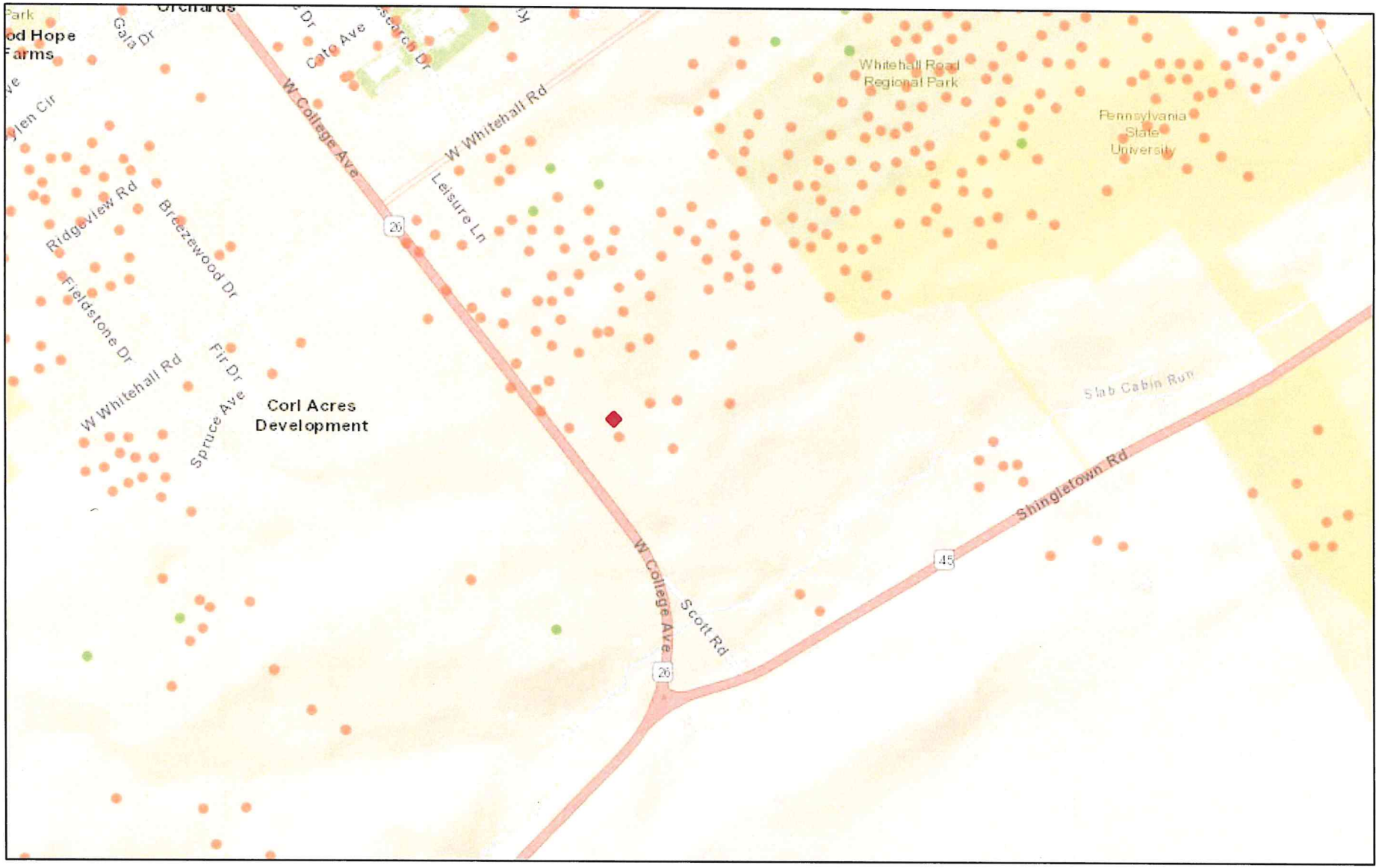
Download Data

2 km
1 mi

Earthstar Geographics | PA DCNR | Esri, HERE, Garmin

Powered by Esri

Karst Features Map



7/1/2021

1:18,056

0 0.1 0.2 0.4 mi

0 0.17 0.35 0.7 km

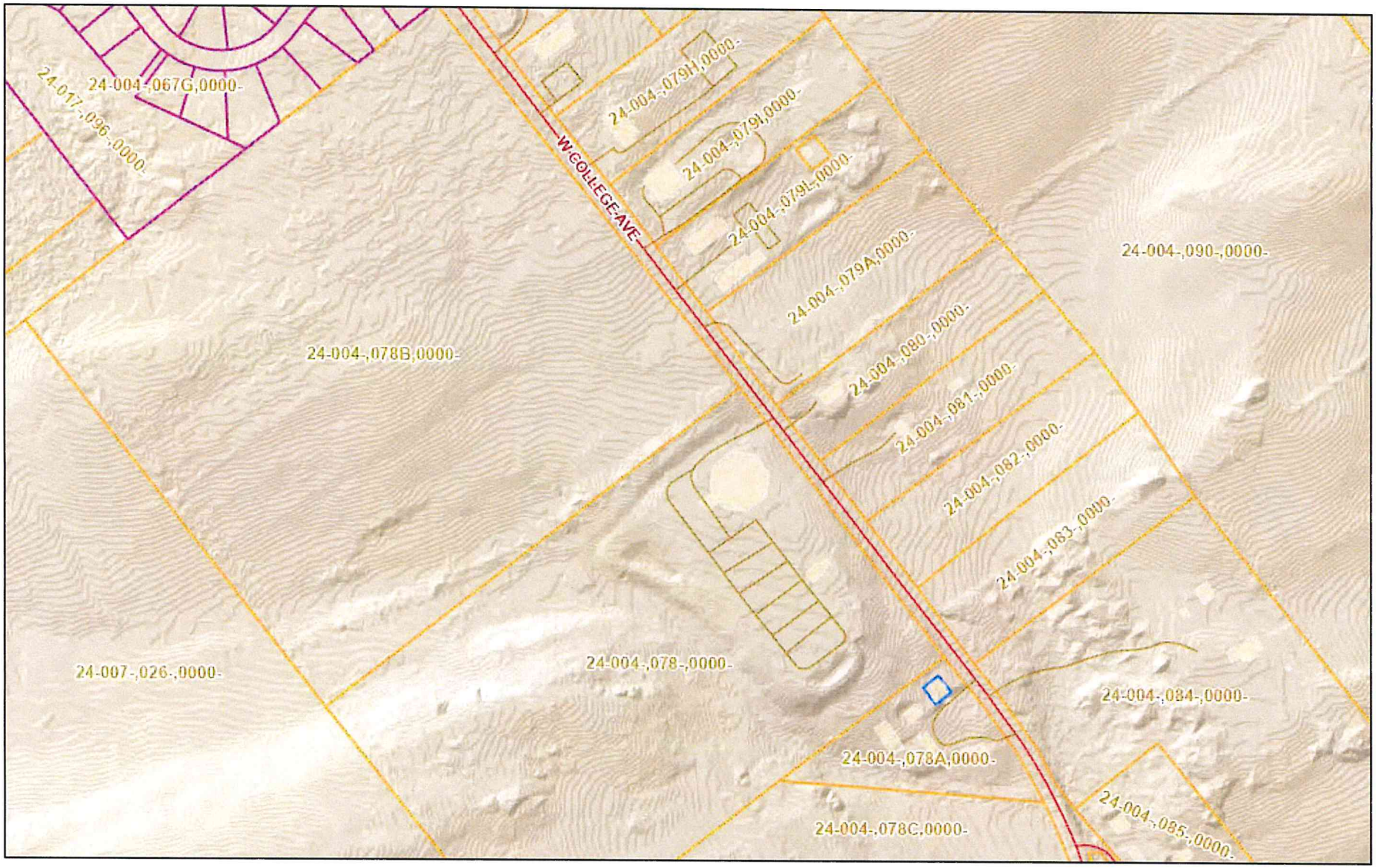
Karst Features

Surface Depression

Sinkhole

PSU Office of Physical Plant, Centre County Government, Esri, HERE,

ArcGIS Web Map



6/14/2021, 12:59:52 PM

Municipalities
Parcels
Unsold Lot
Point Card
Standard
Buildings
Streets
Streams
Driveways
DEP_OilGas
Parcel Numbers
Building Addresses
Street Names

1:4,000

0 0.03 0.07 0.13 mi

0 0.05 0.1 0.2 km

Web AppBuilder for ArcGIS
Centre County GIS

APPENDIX C

TEST PIT LOGS

GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
SOIL SCIENCE
SPECIALTY FOUNDATION DESIGN

The groundwork for success.

Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: A1
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 11") TOPSOIL: Dark Brown CLAYEY SILT with Sand; Loose, Medium Sub-Angular Blocky Structure, Common Macropores, Damp		
Bw_1 - (11" to 2.2') Yellowish Brown SANDY SILTY CLAY; Firm, Weak Fine to Medium Sub-Angular Blocky Structure, Common Macropores, Damp	1 2	
Bw_2 - (2.2' to 4.5') Yellowish Brown SANDY SILTY CLAY; Soft, Weak Medium to Coarse Sub-Angular Blocky Structure, Few Macropores, Moist	3 4	
Bw_3 - (4.5' to 6.5') Yellowish Brown SANDY SILTY CLAY; Soft, Weak Coarse Sub-Angular Blocky Structure, Few Distinct Redoximorphic Features, Few Manganese Coatings, Few Macropores, Moist	5 6	4.5': Infiltration Test A1A (0.96 in/hr)
2BC - (6.5' to 9.0') Strong Brown/Yellowish Brown CLAYEY SAND with Gravel; Slightly Compact, Single-Grain/Massive Structure, Few Manganese Coatings, Moist	7 8	**6.5': Residual Soils** 6.5': Infiltration Test A1B (0.24 in/hr)
Bottom of Pit - 9.0'	9 10	Groundwater Not Encountered

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www.cmtlabsinc.com

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SOIL SCIENCE

The groundwork for success.

Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: A2
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 10") TOPSOIL: Dark Brown CLAYEY SILT with Sand; Loose, Fine Sub-Angular Blocky Structure, Common Macropores, Damp		
Bw_1 - (10" to 2.0') Yellowish Brown SILTY CLAY with Sand; Soft to Firm, Weak Fine to Medium Sub-Angular Blocky Structure, Common Macropores, Damp	1	
Bw_2 - (2.0' to 4.0') Yellowish Brown SANDY SILTY CLAY; Soft to Firm, Weak Medium to Coarse Sub-Angular Blocky Structure, Few Macropores, Moist	2	
	3	
Bw_3 - (4.0' to 8.0') Yellowish Brown SANDY SILTY CLAY; Soft, Weak Coarse Sub-Angular Blocky Structure, Few Distinct Redoximorphic Features, Few Manganese Coatings, Moist	4	
	5	5.0': Infiltration Tests A2A & A2B (0.60 & 0.36 in/hr)
	6	
	7	
2BC - (8.0' to 9.5') Strong Brown LEAN CLAY with Sand; Soft to Firm, Massive Structure, Few Manganese Coatings, Few Distinct Redoximorphic Features, Moist	8	**8.0': Residual Soils**
	9	
Bottom of Pit - 9.5'	10	Groundwater Not Encountered

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Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: A3
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 13") TOPSOIL: Dark Brown CLAYEY SILT with Sand; Loose, Granular to Fine Sub-Angular Blocky Structure, Common Macropores, Damp	1	
AB - (13" to 4.5') Brown CLAYEY SILT with Sand, Trace Gravel; Loose, Weak Medium Sub-Angular Blocky Structure, Common Macropores, Moist	2	
	3	
	4	4.0': Infiltration Tests A3A & A3B (0.48 & 0.12 in/hr)
2BC - (4.5' to 7.5') Brownish Yellow LEAN CLAY with Sand, Little Gravel; Soft to Firm, Single-Grain/Massive Structure, Few Manganese Coatings, Moist	5	**4.5': Residual Soils**
	6	
	7	
Bottom of Pit - 7.5'	8	Groundwater Not Encountered
	9	
	10	

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Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: A4
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 12") TOPSOIL: Dark Brown CLAYEY SILT with Sand; Loose, Granular to Fine Sub-Angular Blocky Structure, Common Macropores, Damp		
AB - (12" to 6.0') Brown CLAYEY SILT with Sand, Trace Gravel; Loose, Weak Medium Sub-Angular Blocky Structure, Common Macropores, Moist	1	
	2	
	3	2.5': Infiltration Tests A4A & A4B (1.44 & 1.20 in/hr)
	4	
	5	
2BC - (6.0' to 9.0') Strong Brown CLAYEY SAND with Weathered Dolomite Cobbles; Slightly Compact, Single-Grain Structure, Moist	6	**6.0': Residual Soils**
	7	
	8	
Bottom of Pit - 9.0'	9	Groundwater Not Encountered
	10	

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Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: A5
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 12") TOPSOIL: Dark Brown CLAYEY SILT with Sand; Loose, Granular to Fine Sub-Angular Blocky Structure, Common Macropores, Damp	1	
AB - (12" to 2.0') Brown CLAYEY SILT with Sand, Trace Gravel; Loose, Weak Medium Sub-Angular Blocky Structure, Common Macropores, Moist	2	1.5': Infiltration Tests A5A & A5B (0.96 & 0.72 in/hr)
$2Bt_1$ - (2.0' to 3.5') Yellowish Brown LEAN CLAY with Sand; Firm, Medium Sub-Angular Blocky Structure, Few Macropores, Damp	3	**2.0': Residual Soils**
$2Bt_2$ - (3.5' to 5.0') Yellowish Brown LEAN CLAY with Sand, Some Gravel; Firm, Medium to Coarse Sub-Angular Blocky Structure, Moist	4	
R - (5.0') Gray DOLOMITE; Hard, Slightly Weathered, Massive, Moist	5	5.0': Excavation Refusal (Hard Rock) 5.0': Infiltration Test A5C (*15.17 in/hr)
Bottom of Pit - 5.0'	6	Groundwater Not Encountered *Apparent infiltration rate (no safety factor applied) using a non-conv. infiltration test meathod. See report for additional information.
	7	
	8	
	9	
	10	

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SOIL SCIENCE

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Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: A6
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 8") TOPSOIL: Dark Brown CLAYEY SILT with Sand; Loose, Granular to Fine Sub-Angular Blocky Structure, Common Macropores, Damp		**0.0': Residual Soils**
Bt_1 - (8" to 3.0') Strong Brown LEAN CLAY with Sand, Few Cobbles (Weathered Dolomite); Firm, Fine to Medium Sub-Angular Blocky Structure, Damp	1	
	2	2.5': Infiltration Tests A6A & A6B (0.84 & 0.84 in/hr)
Bt_2/R - (3.0' to 5.0') Strong Brown LEAN CLAY with Pinnacles of Gray WEATHERED DOLOMITE; Firm (soil)/Medium Hard (rock), Medium Sub-Angular Blocky Structure (soil), Damp to Moist	3	
	4	
R - (5.0' to 5.5') Gray DOLOMITE; Hard, Slightly Weathered, Slightly Broken, Damp	5	5.5': Excavation Refusal (Hard Rock) 5.5': Infiltration Test A6C (*24.06 in/hr)
Bottom of Pit - 5.5'		Groundwater Not Encountered
	6	*Apparent infiltration rate (no safety factor applied) using a non-conv. infiltration test meathod. See report for additional information.
	7	
	8	
	9	
	10	

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The groundwork for success.

Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: B1
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 13") TOPSOIL: Dark Brown SILT with Sand; Loose, Granular to Fine Sub-Angular Blocky Structure, Common Macropores, Damp	1	
Bw_1 - (13" to 2.2') Yellowish Brown SANDY SILTY CLAY, Trace Gravel, Few Cobbles; Soft to Firm, Weak Fine to Medium Sub-Angular Blocky Structure, Common Macropores, Damp	2	1.5': Infiltration Test B1A & B1B (0.72 & 0.84 in/hr)
Bw_2 - (2.2' to 3.8') Yellowish Brown SANDY SILTY CLAY, Trace Gravel, Few Cobbles; Soft to Firm, Weak Medium to Coarse Sub-Angular Blocky Structure, Few Macropores, Damp	3	3.0': Infiltration Tests B1C & B1D (0.12 & 0.33 in/hr)
2BC - (3.8' to 5.5') Yellowish Brown SANDY CLAY, Little Gravel; Firm, Single-Grain/Massive Structure, Damp to Moist	4 5	**3.8': Residual Soils**
R - (5.5' to 6.5') Gray DOLOMITE with Soil-Filled Fractures; Hard, Moderately Weathered, Broken, Damp to Moist	6	6.5': Excavation Refusal (Hard Rock) 6.5': Infiltration Test B1E (*7.18 in/hr)
Bottom of Pit - 6.5'	7 8 9 10	Groundwater Not Encountered *Apparent infiltration rate (no safety factor applied) using a non-conv. infiltration test meathod. See report for additional information.

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SOIL SCIENCE

The groundwork for success.

Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: B2
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 10") TOPSOIL: Dark Brown SILT with Sand; Slightly Compact, Coarse Sub-Angular Blocky Structure, Common Macropores, Damp		
Bw_1 - (10" to 2.4') Yellowish Brown SANDY SILTY CLAY, Trace Gravel; Stiff, Weak Coarse Sub-Angular Blocky Structure, Few Macropores, Damp	1	1.5': Infiltration Test B2A (0.17 in/hr)
	2	
Bw_2 - (2.4' to 4.5') Yellowish Brown SANDY SILTY CLAY, Trace Gravel, Few Cobbles; Soft to Firm, Weak Medium to Coarse Sub-Angular Blocky Structure, Few Macropores, Damp	3	
	4	
2BC - (4.5' to 7.5') Strong Brown SANDY CLAY, Trace Gravel; Soft to Firm, Single-Grain/Massive Structure, Moist	5	**4.5': Residual Soils**
	6	5.5': Infiltration Tests B2B & B2C (0.57 & 0.24 in/hr)
	7	
R - (7.5') Gray DOLOMITE; Hard, Slightly Weathered, Massive, Damp		7.5': Excavation Refusal (Hard Rock)
Bottom of Pit - 7.5'	8	Groundwater Not Encountered
	9	
	10	

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The groundwork for success.

Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: B3
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 18") TOPSOIL: Dark Brown SILT with Sand; Slightly Compact, Coarse Sub-Angular Blocky Structure, Common Macropores, Damp	1	
Bw_1 - (18" to 2.5') Yellowish Brown SANDY SILTY CLAY, Trace Gravel, Few Cobbles; Soft to Firm, Weak Fine to Medium Sub-Angular Blocky Structure, Common Macropores, Damp	2	
Bw_2 - (2.5' to 4.0') Yellowish Brown SANDY SILTY CLAY, Trace Gravel, Few Cobbles; Soft to Firm, Weak Medium to Coarse Sub-Angular Blocky Structure, Few Manganese Coatings, Few Macropores, Damp	3	2.5': Infiltration Tests B3A & B3B (1.26 & 1.80 in/hr)
Bw_3 - (4.0' to 6.0') Yellowish Brown SANDY SILTY CLAY; Soft to Firm, Weak Coarse Sub-Angular Blocky Structure, Few Distinct Manganese Coatings, Few Macropores, Moist	4 5	
2BC - (6.0' to 8.0') Strong Brown SANDY CLAY, Trace Gravel; Soft to Firm, Single-Grain/Massive Structure, Moist	6 7	**6.0': Residual Soils** 6.0': Infiltration Tests B3C & B3D (0.12 & 0.30 in/hr)
Bottom of Pit - 8.0'	8 9 10	Groundwater Not Encountered

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Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: C1
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 8") TOPSOIL: Brown SILT with Sand; Loose, Granular Structure, Many Macropores, Damp		**0.0': Residual Soils**
Bt_1 - (8" to 2.0') Yellowish Brown LEAN CLAY with Sand; Firm, Medium Sub-Angular Blocky Structure, Common Macropores, Damp	1	
Bt_2 - (2.0' to 5.0') Strong Brown LEAN CLAY with Sand; Firm, Coarse Sub-Angular Blocky Structure, Few Macropores, Damp	2	
	3	
	4	4.5': Infiltration Tests C1A & C1B (0.72 & 0.45 in/hr)
BC - (5.0' to 6.5') Strong Brown/Yellowish Brown LEAN CLAY with Sand, Few Weathered Dolomite Cobbles; Firm, Damp	5	
	6	
R - (6.5' to 8.0') Gray DOLOMITE with Soil-Filled Fractures; Medium Hard to Hard, Moderately Weathered, Broken to Slightly Broken, Damp	7	
	8	8.0': Excavation Refusal (Hard Rock) 8.0': Infiltration Test C1C (*12.15 in/hr)
Bottom of Pit - 8.0'		Groundwater Not Encountered
	9	*Apparent infiltration rate (no safety factor applied) using a non-conv. infiltration test meathod. See report for additional information.
	10	

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Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: C2
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
FILL - (0 to 3") Parking Lot GRAVEL (PennDOT 2A)		**3": Residual Soils**
Bt - (3" to 1.0') Strong Brown LEAN CLAY with Sand, Few Weathered Dolomite Cobbles; Firm to Stiff, Medium Sub-Angular Blocky Structure, Common Macropores, Damp	1	
R - (1.0' to 3.5') Gray DOLOMITE with Soil-Filled Fractures; Medium Hard to Hard, Moderately Weathered, Broken to Slightly Broken, Damp	2	
	3	3.5': Excavation Refusal (Hard Rock) 3.5': Infiltration Test C2A (*11.46 in/hr)
Bottom of Pit - 3.5'	4	Groundwater Not Encountered *Apparent infiltration rate (no safety factor applied) using a non-conv. infiltration test meathod. See report for additional information.
	5	
	6	
	7	
	8	
	9	
	10	

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Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: C3
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 6") TOPSOIL: Dark Brown SILT with Sand; Loose, Granular to Fine Sub-Angular Blocky Structure, Many Macropores, Damp		**0.0': Residual Soils**
Bt - (6" to 1.7') Strong Brown LEAN CLAY with Sand; Firm, Fine to Medium Sub-Angular Blocky Structure, Few Macropores, Damp	1	0.5': Infiltration Tests C3A & C3B (1.08 & 0.36 in/hr)
R - (1.7' to 3.0') Gray DOLOMITE with Soil-Filled Fractures; Medium Hard to Hard, Moderately Weathered, Broken to Slightly Broken, Damp	2	
		3.0': Excavation Refusal (Hard Rock)
	3	3.0': Infiltration Test C3C (*18.51 in/hr)
Bottom of Pit - 3.0'		Groundwater Not Encountered
	4	*Apparent infiltration rate (no safety factor applied) using a non-conv. infiltration test meathod. See report for additional information.
	5	
	6	
	7	
	8	
	9	
	10	

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Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: N1
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 6") TOPSOIL: Dark Brown SILT with Sand; Loose, Granular Structure, Many Macropores, Damp		
Bw (6" to 2.0') Yellowish Brown LEAN CLAY with Sand, Trace Gravel; Firm to Stiff, Weak Fine Sub-Angular Blocky Structure; Common Macropores, Damp	1	
	2	**2.0': Residual Soils**
2BC - (2.0' to 4.5') Strong Brown/Yellowish Brown SANDY CLAY with Gravel; Firm to Stiff, Medium Sub-Angular Blocky Structure, Damp		
	3	
	4	
R - (4.5') Gray DOLOMITE; Medium Hard, Moderately Weathered, Damp		4.5': Difficult Excavation (Rock)
Bottom of Pit - 4.5'		Groundwater Not Encountered
	5	
	6	
	7	
	8	
	9	
	10	

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Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: N2
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 6") TOPSOIL: Dark Brown SILT with Sand; Loose, Granular Structure, Many Macropores, Damp		
Bw (6" to 3.8') Yellowish Brown LEAN CLAY with Sand, Trace Gravel; Firm to Stiff, Weak Fine Sub-Angular Blocky Structure; Common Macropores, Damp	1	
	2	
	3	
2BC - (3.8' to 5.0) Strong Brown/Yellowish Brown CLAYEY SAND with Gravel, Few Weathered Dolomite Cobbles; Slightly Compact, Single-Grain/Massive Structure, Damp to Moist	4	**3.8': Residual Soils**
R - (5.0') Gray DOLOMITE; Medium Hard, Moderately Weathered, Damp	5	
Bottom of Pit - 5.0'		Groundwater Not Encountered
	6	
	7	
	8	
	9	
	10	

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Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: N3
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 6") TOPSOIL: Dark Brown SILT with Sand; Loose, Granular Structure, Many Macropores, Damp		
Bw (6" to 3.8') Yellowish Brown LEAN CLAY with Sand, Trace Gravel; Firm to Stiff, Weak Fine Sub-Angular Blocky Structure; Common Macropores, Damp	1	
	2	
	3	
2BC - (3.8' to 5.8) Strong Brown SANDY CLAY, Little Gravel, Few Weathered Dolomite Cobbles; Firm to Stiff, Single-Grain/Massive Structure, Damp to Moist	4	**3.8': Residual Soils**
	5	
R - (5.8') Gray DOLOMITE; Medium Hard, Moderately Weathered, Damp		
Bottom of Pit - 5.8'	6	Groundwater Not Encountered
	7	
	8	
	9	
	10	

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Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: N4
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 13") TOPSOIL: Dark Brown SILT with Sand; Loose, Granular to Fine Sub-Angular Blocky Structure, Common Macropores, Damp	1	
Bw - (13" to 2.0') Yellowish Brown LEAN CLAY with Sand, Trace Gravel, Few Cobbles; Loose, Weak Fine to Medium Sub-Angular Blocky Structure, Common Macropores, Damp	2	
2BC - (2.0' to 4.5') Strong Brown/Yellowish Brown SANDY CLAY with Gravel, Few Weathered Dolomite Cobbles; Firm to Very Stiff, Medium to Coarse Sub-Angular Blocky Structure, Few Macropores, Damp	3	**2.0': Residual Soils**
R - (4.5') Gray DOLOMITE; Medium Hard, Moderately Weathered, Damp	4	4.5': Difficult Excavation (Rock)
Bottom of Pit - 4.5'	5	Groundwater Not Encountered
	6	
	7	
	8	
	9	
	10	

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Test Pit Log

Project: Rahal Honda
Date Performed: 6/24/2021
Location: Ferguson Township, Centre County, PA
CMT File Number: 2114800
Client: PennTerra Engineering, Inc.

Location: N5
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 11") TOPSOIL: Dark Brown SILT with Sand; Loose, Granular to Fine Sub-Angular Blocky Structure, Common Macropores, Damp		
Bw_1 - (11" to 2.0') Yellowish Brown SANDY SILTY CLAY, Trace Gravel; Firm, Weak Fine to Medium Sub-Angular Blocky Structure, Common Macropores, Damp	1	
Bw_2 - (2.0' to 5.0') Yellowish Brown SANDY SILTY CLAY, Trace Gravel, Few Cobbles; Firm, Weak Medium to Coarse Sub-Angular Blocky Structure, Few Macropores, Damp	2	
	3	
	4	
2BC - (5.0' to 6.0') Strong Brown LEAN CLAY with Sand; Firm to Stiff, Damp	5	**5.0': Residual Soils**
Bottom of Pit - 6.0'	6	Groundwater Not Encountered
	7	
	8	
	9	
	10	

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Test Pit Log

Project: Rahal Honda
Location: Ferguson Township, Centre County, PA
Client: PennTerra Engineering, Inc.

Date Performed: 6/24/2021
CMT File Number: 2114800

Location: N6
Excavation Equipment: Backhoe

Description	Depth (Feet)	Remarks
Ap - (0 to 10") TOPSOIL: Dark Brown CLAYEY SILT with Sand; Loose, Medium Sub-Angular Blocky Structure, Common Macropores, Damp		
Bw_1 - (10" to 2.5') Yellowish Brown SANDY SILTY CLAY; Firm, Weak Fine to Medium Sub-Angular Blocky Structure, Common Macropores, Damp	1	
	2	
Bw_2 - (2.5' to 4.0') Yellowish Brown SANDY SILTY CLAY; Soft to Firm, Weak Medium to Coarse Sub-Angular Blocky Structure, Few Macropores, Moist	3	
Bw_3 - (4.0' to 8.5') Yellowish Brown SANDY SILTY CLAY; Soft to Firm, Weak Coarse Sub-Angular Blocky Structure, Moist	4	
	5	
	6	
	7	
	8	**Note: Residual soils were not confirmed in test pit N6**
Bottom of Pit - 8.5'	9	Groundwater Not Encountered
	10	

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APPENDIX D

INFILTRATION TEST RESULTS

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A1A (Test Pit A1)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 4.5 ft
Soil Tested: Yellowish Brown Sandy Silty Clay (Bw_3-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:25 AM	Start				
	9:55 AM	30	0.35	0.10	0.25	2.40
	10:25 AM	30	0.35	0.08	0.27	1.92
	10:55 AM	30	0.35	0.08	0.27	1.92
	11:25 AM	30	0.35	0.08	0.27	1.92
				Average:		2.04
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.96**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A1B (Test Pit A1)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 6.5 ft
Soil Tested: Strong Brown Clayey Sand with Gravel (2BC-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:25 AM	Start				
	9:55 AM	30	0.35	0.03	0.32	0.72
	10:25 AM	30	0.35	0.02	0.33	0.48
	10:55 AM	30	0.35	0.02	0.33	0.48
	11:25 AM	30	0.35	0.02	0.33	0.48
				Average:		0.54
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.24**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A2A (Test Pit A2)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 5.0 ft
Soil Tested: Yellowish Brown Sandy Silty Clay (Bw_3.horizon$_1$)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:40 AM	Start				
	10:10 AM	30	0.35	0.07	0.28	1.68
	10:40 AM	30	0.35	0.07	0.28	1.68
	11:10 AM	30	0.35	0.06	0.29	1.44
	11:40 AM	30	0.35	0.05	0.30	1.20
				Average:		1.50
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.60**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A2B (Test Pit A2)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 5.0 ft
Soil Tested: Yellowish Brown Sandy Silty Clay ($Bw_3.horizon_1$)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:40 AM	Start				
	10:10 AM	30	0.35	0.04	0.31	0.96
	10:40 AM	30	0.35	0.04	0.31	0.96
	11:10 AM	30	0.35	0.04	0.31	0.96
	11:40 AM	30	0.35	0.03	0.32	0.72
				Average:		0.90
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.36**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A3A (Test Pit A3)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 4.0 ft
Soil Tested: Brown Clayey Silt with Sand, Trace Gravel (AB-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:35 AM	Start				
	10:05 AM	30	0.35	0.04	0.31	0.96
	10:35 AM	30	0.35	0.04	0.31	0.96
	11:05 AM	30	0.35	0.04	0.31	0.96
	11:35 AM	30	0.35	0.04	0.31	0.96
				Average:		0.96
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.48**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A3B (Test Pit A3)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 4.0 ft
Soil Tested: Brown Clayey Silt with Sand, Trace Gravel (AB-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:35 AM	Start				
	10:05 AM	30	0.35	0.02	0.33	0.48
	10:35 AM	30	0.35	0.02	0.33	0.48
	11:05 AM	30	0.35	0.01	0.34	0.24
	11:35 AM	30	0.35	0.01	0.34	0.24
				Average:		0.36
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.12**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A4A (Test Pit A4)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 2.5 ft
Soil Tested: Brown Clayey Silt with Sand, Trace Gravel (AB-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:30 AM	Start				
	10:00 AM	30	0.35	0.13	0.22	3.12
	10:30 AM	30	0.35	0.13	0.22	3.12
	11:00 AM	30	0.35	0.12	0.23	2.88
	11:30 AM	30	0.35	0.12	0.23	2.88
				Average:		3.00
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**1.44**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A4B (Test Pit A4)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 2.5 ft
Soil Tested: Brown Clayey Silt with Sand, Trace Gravel (AB-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:30 AM	Start				
	10:00 AM	30	0.35	0.11	0.24	2.64
	10:30 AM	30	0.35	0.11	0.24	2.64
	11:00 AM	30	0.35	0.09	0.26	2.16
	11:30 AM	30	0.35	0.10	0.25	2.40
				Average:		2.46
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**1.20**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A5A (Test Pit A5)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 1.5 ft
Soil Tested: Brown Clayey Silt with Sand, Trace Gravel (AB-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:25 AM	Start				
	9:55 AM	30	0.35	0.14	0.21	3.36
	10:25 AM	30	0.35	0.08	0.27	1.92
	10:55 AM	30	0.35	0.06	0.29	1.44
	11:25 AM	30	0.35	0.06	0.29	1.44
	11:55 AM	30	0.35	0.08	0.27	1.92
				Average:		2.02
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.96**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project: Rahal Honda
Location: Ferguson Township, Centre Countyt, PA
Client: PennTerra Engineering, Inc.

Date: 6/25/2021
2114800 2114800

Test Location: A5B (Test Pit A5)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 1.5 ft
Soil Tested: Brown Clayey Silt with Sand, Trace Gravel (AB-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:25 AM	Start				
	9:55 AM	30	0.35	0.10	0.25	2.40
	10:25 AM	30	0.35	0.09	0.26	2.16
	10:55 AM	30	0.35	0.07	0.28	1.68
	11:25 AM	30	0.35	0.07	0.28	1.68
	11:55 AM	30	0.35	0.06	0.29	1.44
				Average:		1.87
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.72**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Non-Conventional Method)

Project:	Rahal Honda	**Date:**	6/24/2021
Location:	Ferguson Township, Centre Countyt, PA	**CMT File No.:**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A5C (Test Pit A5)

Test Data
Test Hole Length (ft): 7.0
Test Hole Width (ft): 2.0
Test Hole Height (in): <6
Test Depth: 5.0 ft
Material Tested: Gray Dolomite (R-horizon)

Date	Time Water Added	Volume of Water Added (gal)	Time Water Drained	Time Interval (min)	Apparent Infiltration Rate for Time Interval (in/hr)
6/24/2021	1:39 PM	112.5	2:30 PM	51	15.17
				Safety Factor	**See Note**

Note: We believe the above infiltration test method is useful in demonstrating the general permeability of the material tested. However, we do not believe the results should be used without applying reasonable safety factors. Safety factors should be determined by the designer based on concerns (i.e., lower rate than shown, higher rate than shown, extent of relevance over BMP bottom, etc.).

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A6A (Test Pit A6)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 2.5 ft
Soil Tested: Strong Brown Lean Clay with Sand (Bt_1-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:20 AM	Start				
	9:50 AM	30	0.35	0.19	0.16	4.56
	10:20 AM	30	0.35	0.13	0.22	3.12
	10:50 AM	30	0.35	0.13	0.22	3.12
	11:20 AM	30	0.35	0.09	0.26	2.16
	11:50 AM	30	0.35	0.09	0.26	2.16
	12:20 PM	30	0.35	0.08	0.27	1.92
	12:50 PM	30	0.35	0.07	0.28	1.68
				Average:		2.67
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.84**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A6B (Test Pit A6)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 2.5 ft
Soil Tested: Strong Brown Lean Clay with Sand (Bt_1-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:20 AM	Start				
	9:50 AM	30	0.35	0.13	0.22	3.12
	10:20 AM	30	0.35	0.13	0.22	3.12
	10:50 AM	30	0.35	0.09	0.26	2.16
	11:20 AM	30	0.35	0.08	0.27	1.92
	11:50 AM	30	0.35	0.08	0.27	1.92
	12:20 PM	30	0.35	0.07	0.28	1.68
				Average:		2.32
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.84**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Non-Conventional Method)

Project:	Rahal Honda	**Date:**	6/24/2021
Location:	Ferguson Township, Centre Countyt, PA	**CMT File No.:**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: A6C (Test Pit A6)

Test Data
Test Hole Length (ft): 5.0
Test Hole Width (ft): 2.0
Test Hole Height (in): <6
Test Depth: 5.5 ft
Material Tested: Gray Dolomite (R-horizon)

Date	Time Water Added	Volume of Water Added (gal)	Time Water Drained	Time Interval (min)	Apparent Infiltration Rate for Time Interval (in/hr)
6/24/2021	1:26 PM	112.5	2:11 PM	45	24.06
				Safety Factor	**See Note**

Note: We believe the above infiltration test method is useful in demonstrating the general permeability of the material tested. However, we do not believe the results should be used without applying reasonable safety factors. Safety factors should be determined by the designer based on concerns (i.e., lower rate than shown, higher rate than shown, extent of relevance over BMP bottom, etc.).

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B1A (Test Pit B1)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 1.5 ft
Soil Tested: Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_1-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:34 AM	Start				
	10:04 AM	30	0.35	0.10	0.25	2.40
	10:34 AM	30	0.35	0.07	0.28	1.68
	11:04 AM	30	0.35	0.06	0.29	1.44
	11:34 AM	30	0.35	0.05	0.30	1.20
	12:04 PM	30	0.35	0.06	0.29	1.44
				Average:		1.63
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.72**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B1B (Test Pit B1)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 1.5 ft
Soil Tested: Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_1-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:34 AM	Start				
	10:04 AM	30	0.35	0.10	0.25	2.40
	10:34 AM	30	0.35	0.09	0.26	2.16
	11:04 AM	30	0.35	0.08	0.27	1.92
	11:34 AM	30	0.35	0.07	0.28	1.68
	12:04 PM	30	0.35	0.07	0.28	1.68
				Average:		1.97
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.84**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B1C (Test Pit B1)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 3.0 ft
Soil Tested: Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_2-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:35 AM	Start				
	10:05 AM	30	0.35	0.01	0.34	0.24
	10:35 AM	30	0.35	0.01	0.34	0.24
	11:05 AM	30	0.35	0.01	0.34	0.24
	11:35 AM	30	0.35	0.01	0.34	0.24
				Average:		0.24
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.12**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B1D (Test Pit B1)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 3.0 ft
Soil Tested: Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_2-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:35 AM	Start				
	10:05 AM	30	0.35	0.02	0.33	0.48
	10:35 AM	30	0.35	0.03	0.32	0.72
	11:05 AM	30	0.35	0.03	0.32	0.72
	11:35 AM	30	0.35	0.03	0.32	0.72
				Average:		0.66
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.33**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Non-Conventional Method)

Project:	Rahal Honda	**Date:**	6/24/2021
Location:	Ferguson Township, Centre Countyt, PA	**CMT File No.:**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B1E (Test Pit B1)

Test Data
Test Hole Length (ft): 5.0
Test Hole Width (ft): 2.0
Test Hole Height (in): <6
Test Depth: 6.5 ft
Material Tested: Gray Dolomite with Soil-Filled Fractures (R-horizon)

Date	Time Water Added	Volume of Water Added (gal)	Time Water Drained	Time Interval (min)	Apparent Infiltration Rate for Time Interval (in/hr)
6/24/2021	1:40 PM	50	2:47 PM	67	7.18
				Safety Factor	**See Note**

Note: We believe the above infiltration test method is useful in demonstrating the general permeability of the material tested. However, we do not believe the results should be used without applying reasonable safety factors. Safety factors should be determined by the designer based on concerns (i.e., lower rate than shown, higher rate than shown, extent of relevance over BMP bottom, etc.).

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Infiltration Test (Uncased Hole)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B2A (Test Pit B2)

Test Apparatus Data
Avg. Hole Diameter (in): 6.0
Test Depth: 1.5 ft
Soil Tested: Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_1-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Percolation Rate (in/hr)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:30 AM	Start				
	10:00 AM	30	0.50	0.05	1.20	0.41
	10:30 AM	30	0.50	0.06	1.44	0.50
	11:00 AM	30	0.50	0.07	1.68	0.59
	11:30 AM	30	0.50	0.06	1.44	0.50
				Average:		0.50
				Minimum Safety Factor:		3
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.17**

Note: Test was conducted, and reduction factor/infiltration rate were calculated in general accordance with the Percolation Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B2B (Test Pit B2)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 5.5 ft
Soil Tested: Strong Brown Sandy Clay, Trace Gravel (2BC-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:31 AM	Start				
	10:01 AM	30	0.35	0.05	0.30	1.20
	10:31 AM	30	0.35	0.05	0.30	1.20
	11:01 AM	30	0.35	0.04	0.31	0.96
	11:31 AM	30	0.35	0.05	0.30	1.20
				Average:		1.14
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.57**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B2C (Test Pit B2)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 5.5 ft
Soil Tested: Strong Brown Sandy Clay, Trace Gravel (2BC-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:31 AM	Start				
	10:01 AM	30	0.35	0.02	0.33	0.48
	10:31 AM	30	0.35	0.02	0.33	0.48
	11:01 AM	30	0.35	0.02	0.33	0.48
	11:31 AM	30	0.35	0.02	0.33	0.48
				Average:		0.48
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.24**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B3A (Test Pit B3)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 2.5 ft
Soil Tested: Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_2-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:27 AM	Start				
	9:57 AM	30	0.35	0.11	0.24	2.64
	10:27 AM	30	0.35	0.10	0.25	2.40
	10:57 AM	30	0.35	0.10	0.25	2.40
	11:27 AM	30	0.35	0.11	0.24	2.64
				Average:		2.52
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**1.26**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B3B (Test Pit B3)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 2.5 ft
Soil Tested: Yellowish Brown Sandy Silty Clay, Trace Gravel (Bw_2-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:27 AM	Start				
	9:57 AM	30	0.35	0.16	0.19	3.84
	10:27 AM	30	0.35	0.14	0.21	3.36
	10:57 AM	30	0.35	0.15	0.20	3.60
	11:27 AM	30	0.35	0.15	0.20	3.60
				Average:		3.60
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**1.80**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B3C (Test Pit B3)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 6.0 ft
Soil Tested: Strong Brown Sandy Clay, Trace Gravel (2BC-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:28 AM	Start				
	9:58 AM	30	0.35	0.01	0.34	0.24
	10:28 AM	30	0.35	0.01	0.34	0.24
	10:58 AM	30	0.35	0.01	0.34	0.24
	11:28 AM	30	0.35	0.01	0.34	0.24
				Average:		0.24
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.12**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: B3D (Test Pit B3)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 6.0 ft
Soil Tested: Strong Brown Sandy Clay, Trace Gravel (2BC-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	9:28 AM	Start				
	9:58 AM	30	0.35	0.02	0.33	0.48
	10:28 AM	30	0.35	0.02	0.33	0.48
	10:58 AM	30	0.35	0.03	0.32	0.72
	11:28 AM	30	0.35	0.03	0.32	0.72
				Average:		0.60
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.30**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: C1A (Test Pit C1)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 4.5 ft
Soil Tested: Strong Brown Lean Clay with Sand (Bt_2-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	12:00 PM	Start				
	12:10 PM	10	0.35	0.03	0.32	2.16
	12:20 PM	10	0.35	0.03	0.32	2.16
	12:30 PM	10	0.35	0.02	0.33	1.44
	12:40 PM	10	0.35	0.02	0.33	1.44
				Average:		1.80
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.72**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: C1B (Test Pit C1)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 4.5 ft
Soil Tested: Strong Brown Lean Clay with Sand (Bt_2-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	12:00 PM	Start				
	12:30 PM	30	0.35	0.04	0.31	0.96
	1:00 PM	30	0.35	0.04	0.31	0.96
	1:30 PM	30	0.35	0.03	0.32	0.72
	2:00 PM	30	0.35	0.04	0.31	0.96
				Average:		0.90
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.45**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Non-Conventional Method)

Project:	Rahal Honda	**Date:**	6/24/2021
Location:	Ferguson Township, Centre Countyt, PA	**CMT File No.:**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: C1C (Test Pit C1)

Test Data
Test Hole Length (ft): 3.0
Test Hole Width (ft): 2.0
Test Hole Height (in): <6
Test Depth: 8.0 ft
Material Tested: Gray Dolomite with Soil-Filled Fractures (R-horizon)

Date	Time Water Added	Volume of Water Added (gal)	Time Water Drained	Time Interval (min)	Apparent Infiltration Rate for Time Interval (in/hr)
6/24/2021	9:20 AM	50	10:26 AM	66	12.15
				Safety Factor	**See Note**

Note: We believe the above infiltration test method is useful in demonstrating the general permeability of the material tested. However, we do not believe the results should be used without applying reasonable safety factors. Safety factors should be determined by the designer based on concerns (i.e., lower rate than shown, higher rate than shown, extent of relevance over BMP bottom, etc.).

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Infiltration Test (Non-Conventional Method)

Project: Rahal Honda
Location: Ferguson Township, Centre Countyt, PA
Client: PennTerra Engineering, Inc.

Date: 6/24/2021
CMT File No.: 2114800

Test Location: C2A (Test Pit TPC2)

Test Data
Test Hole Length (ft): 4.0
Test Hole Width (ft): 3.0
Test Hole Height (in): <6
Test Depth: 3.5 ft
Material Tested: Gray Dolomite with Soil-Filled Fractures (R-horizon)

Date	Time Water Added	Volume of Water Added (gal)	Time Water Drained	Time Interval (min)	Apparent Infiltration Rate for Time Interval (in/hr)
6/24/2021	9:07 AM	50	9:42 AM	35	11.46
				Safety Factor	**See Note**

Note: We believe the above infiltration test method is useful in demonstrating the general permeability of the material tested. However, we do not believe the results should be used without applying reasonable safety factors. Safety factors should be determined by the designer based on concerns (i.e., lower rate than shown, higher rate than shown, extent of relevance over BMP bottom, etc.).

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: C3A (Test Pit C3)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 0.5 ft
Soil Tested: Strong Brown Lean Clay with Sand (Bt-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	12:05 PM	Start				
	12:15 PM	10	0.35	0.04	0.31	2.88
	12:25 PM	10	0.35	0.04	0.31	2.88
	12:35 PM	10	0.35	0.03	0.32	2.16
	12:45 PM	10	0.35	0.03	0.32	2.16
				Average:		2.52
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**1.08**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Double-Ring Infiltrometer)

Project:	Rahal Honda	**Date:**	6/25/2021
Location:	Ferguson Township, Centre Countyt, PA	**2114800**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: C3B (Test Pit C3)

Test Apparatus Data
Inner Ring Diameter: 6 in
Outer Ring Diameter: 12 in
Test Depth: 0.5 ft
Soil Tested: Strong Brown Lean Clay with Sand (Bt-horizon)

Date	Time	Time Interval (min)	Initial Water Height (ft)	Measured Water Drop (ft)	Final Water Height (ft)	Infiltration Rate for Time Interval (in/hr)
6/25/2021	12:05 PM	Start				
	12:35 PM	30	0.35	0.04	0.31	0.96
	1:05 PM	30	0.35	0.04	0.31	0.96
	1:35 PM	30	0.35	0.03	0.32	0.72
	2:05 PM	30	0.35	0.03	0.32	0.72
				Average:		0.84
				Minimum Safety Factor:		2
				Recommended Maximum Design Infiltration Rate (in/hr):		**0.36**

Note: Test was conducted in accordance with the Double-Ring Infiltrometer Test procedures outlined in the December 2006 PADEP Stormwater BMP Manual.

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Infiltration Test (Non-Conventional Method)

Project:	Rahal Honda	**Date:**	6/24/2021
Location:	Ferguson Township, Centre Countyt, PA	**CMT File No.:**	2114800
Client:	PennTerra Engineering, Inc.		

Test Location: C3C (Test Pit C3)

Test Data
Test Hole Length (ft): 5.0
Test Hole Width (ft): 4.0
Test Hole Height (in): <6
Test Depth: 3.0 ft
Material Tested: Gray Dolomite with Soil-Filled Fractures (R-horizon)

Date	Time Water Added	Volume of Water Added (gal)	Time Water Drained	Time Interval (min)	Apparent Infiltration Rate for Time Interval (in/hr)
6/24/2021	9:38 AM	50	9:51 AM	13	18.51
				Safety Factor	**See Note**

Note: We believe the above infiltration test method is useful in demonstrating the general permeability of the material tested. However, we do not believe the results should be used without applying reasonable safety factors. Safety factors should be determined by the designer based on concerns (i.e., lower rate than shown, higher rate than shown, extent of relevance over BMP bottom, etc.).

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APPENDIX E

LABORATORY TESTING

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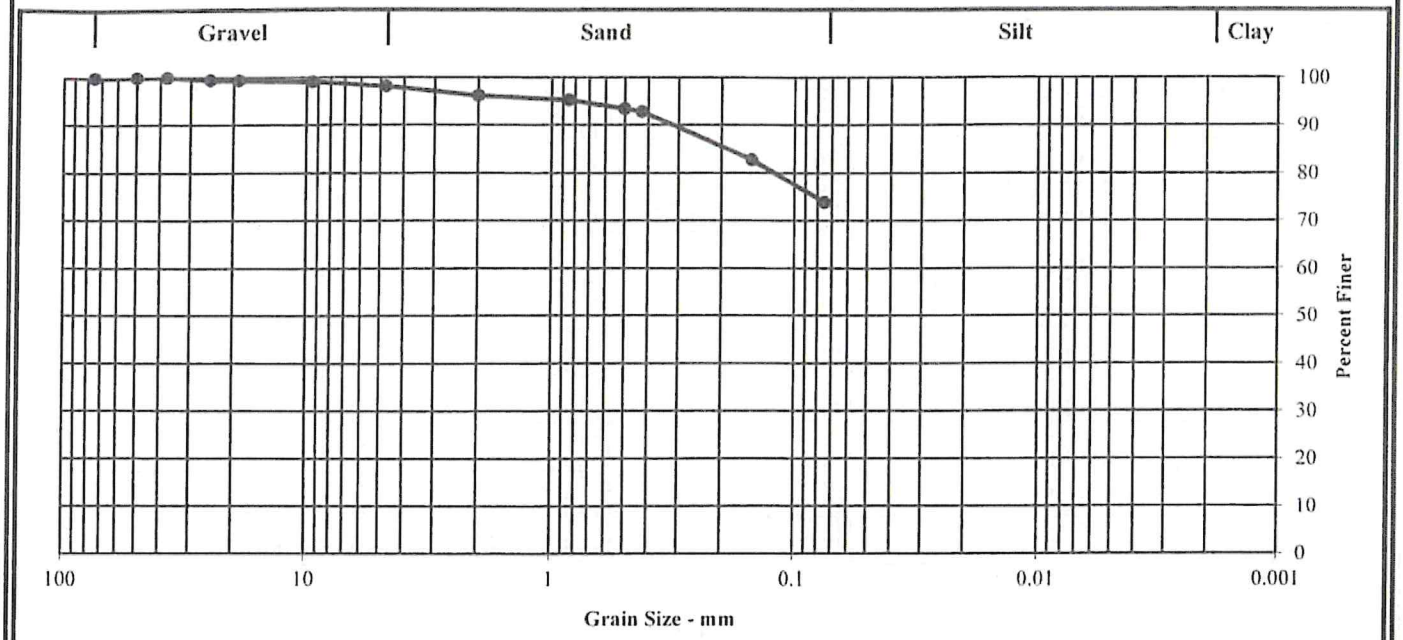
Grain-Size Analysis Test Report for Classification of Soils - ASTM D2487



% Gravel	% Sand	% Silt and Clay	USCS	LL	PI
1.8	24.4	73.8	CL	40	16

Sieve Size (inches)	Sieve Size (mm)	Percent Finer
2	50.0	100.0
1 1/2	37.5	100.0
1	25.0	99.5
3/4	19.0	99.4
3/8	9.50	99.1
#4	4.75	98.2

Sieve Number	Sieve Size (mm)	Percent Finer
#10	2.00	96.2
#20	0.850	95.3
#35	0.500	93.4
#40	0.425	92.8
#100	0.150	82.7
#200	0.075	73.8

Grain Size		Coefficients	
D_{60}		C_c	
D_{30}		C_u	
D_{10}			

Natural Moisture (%): 23.3

Percent +3 Inch : 0.0

Project: Rahal Honda
Location: State College, PA

File Number: 2114800

Date: 28-Jun-21

Sample Location: TPN2 2.5'-3.0'

CMT I.D. No.: 17150

Material Description: Light Brown Lean Clay with Sand

Client: PennTerra Engineering

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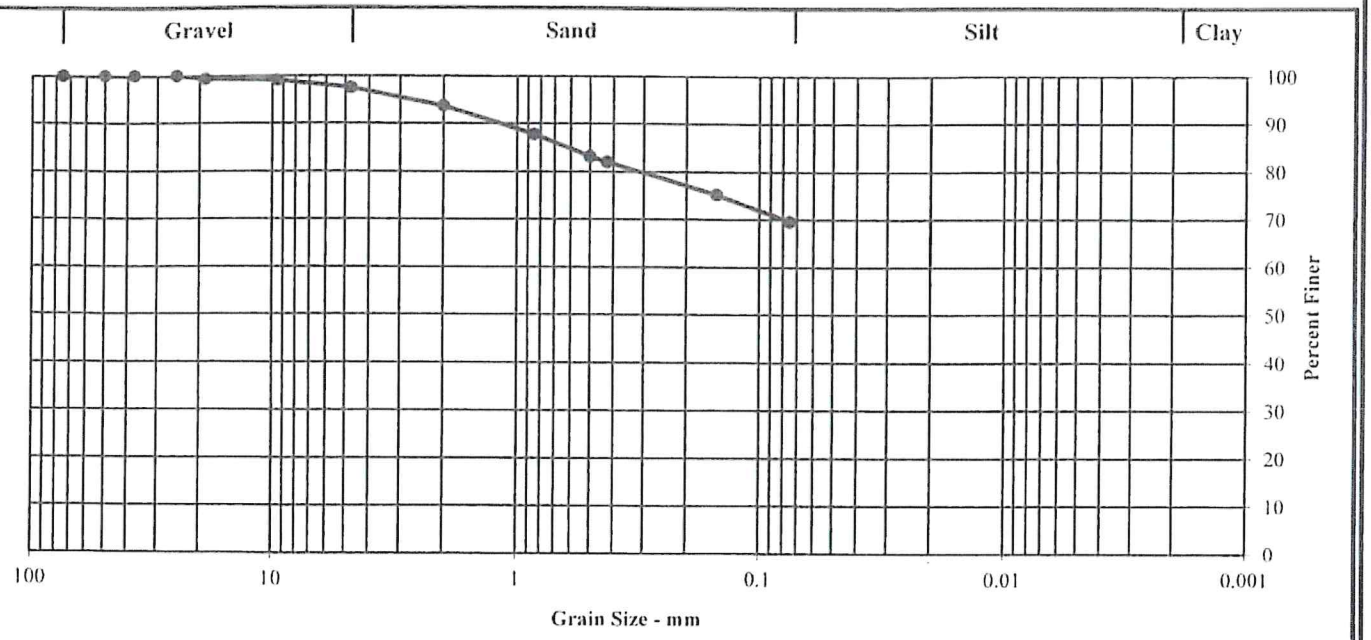

% Gravel	% Sand	% Silt and Clay	USCS	LL	PI
2.5	28.0	69.5	CL-ML	26	7

Sieve Size (inches)	Sieve Size (mm)	Percent Finer
2	50.0	100.0
1 1/2	37.5	100.0
1	25.0	100.0
3/4	19.0	99.3
3/8	9.50	99.1
#4	4.75	97.5

Sieve Number	Sieve Size (mm)	Percent Finer
#10	2.00	93.7
#20	0.850	87.8
#35	0.500	83.1
#40	0.425	82.0
#100	0.150	75.2
#200	0.075	69.5

Grain Size		Coefficients	
D_{60}		C_c	
D_{30}		C_u	
D_{10}			

Natural Moisture: 21.6

Percent +3 Inch : 0.0

Project: Rahal Honda
Location: State College, PA

File Number: 2114800

Date: 28-Jun-21

Sample Location: TPN6 4.0'-5.0'

CMT I.D. No.: 17151

Material Description: Brown Sandy Silty Clay

Client: PennTerra Engineering

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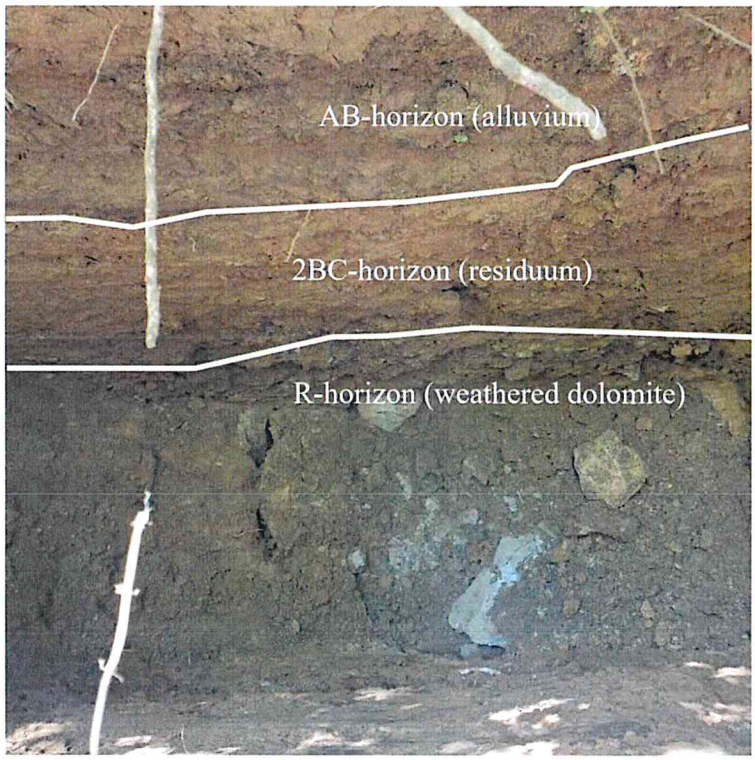
APPENDIX F

PHOTOGRAPHS

Photograph 1: Looking SW across Areas B and A

Photograph 2: Looking north across Areas A and B

Photograph 3: Distinct boundaries between alluvium, residuum, and weathered rock (A4)

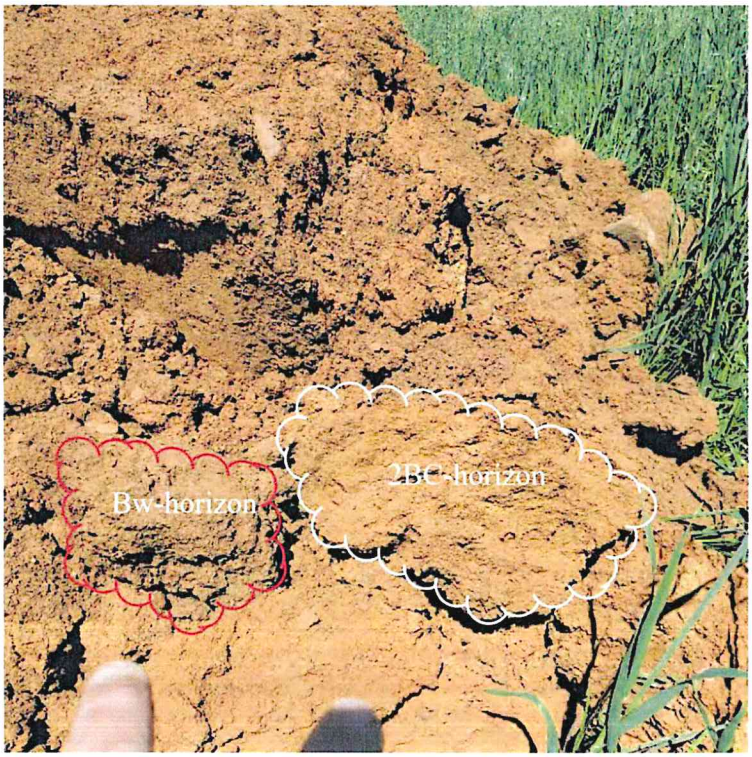


Photograph 4: Non-distinct boundaries between alluvium, residuum, and weathered rock (B1)

Photograph 5: Infiltrometer testing of alluvial AB-horizon at test pit A3

Photograph 6: Infiltrometer testing of "presumed" alluvial Bw_3-horizon at test pit A2

Photograph 7: Subtle difference between alluvial Bw-horizon and residual BC-horizon (A2)



Photograph 8: Area C, looking south from test pit C1

Photograph 9: Infiltrometer testing at test pit C1

Photograph 10: Non-Conventional infiltration testing in test pit C1

Photograph 11: Thin alluvium in test pit N4 (only 2' of "presumed" alluvium)

Photograph 12: Thin alluvium in test pit N1 (only 2' of "presumed" alluvium)

APPENDIX G

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BIBLIOGRAPHY

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