MSET

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MIDLAND STANDARD ENGINEERING & TESTING, INC.

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September 14, 2017

Mr. Reid T. Magner, P.E.
Civiltech Engineering, Inc.
Two Pierce Place, Suite 1400
Itasca, Illinois 60143

Re: Geotechnical Exploration and Analysis
Ethel Woods– Millennium Trail Extension
Lake County, Illinois
MSET Project No. 17386

Dear Mr. Magner:

We have completed the field exploration work and analysis of the subgrade conditions for the referenced project. This report was prepared for use in the preparation of the project design plans.

Purpose

The purpose of this exploration was to determine the subgrade conditions a proposed bike path extension. Using this information along with the project data provided, design criteria and recommendations have been prepared for use by the Design Engineers in preparing the plans and specifications.

Scope

The scope of this exploration and analysis included review of the available information from previous work conducted in the area; field and laboratory testing; analysis of the data obtained; formulation of our recommendations and preparation of this report. The field exploration included making twenty-seven (27) soil borings to depths of five (5) to ten (10) feet.

PROJECT LOCATION AND DESCRIPTION

Project Location and Description

The trail alignment proposed for design is located in a forest preserve area on the east side of US Route 45, North of Grass Lake Road in Lake County, Illinois. Within this area, roughly 4100 lineal feet of trail is planned, with an east-west leg off of Route 45, continuing with a north-south leg, and a loop section to the southeast. The majority of the trail runs along the west side of a creek/reservoir alignment (Elmwood Farms Lake). A parking lot is also planned at the south end with access off of West Miller Road.

FIELD EXPLORATION

General

The procedures for this exploration were conducted in accordance with the appropriate Illinois Department of Transportation Standards. The borings were supervised by a field engineer from Midland Standard Engineering & Testing, Inc. The soil specimens were transported to our laboratory for testing and analysis. Our project engineer has directed all phases of this investigation.

Drilling Equipment

The soil boring was drilled using a track mounted geoprobe 7822-drill rig equipped with a rotary head. Hollow stem augers were used to advance the boreholes.

Sampling and Standard Penetration Test Procedures

Representative samples were obtained by the use of split-spoon sampling procedures in accordance with ASTM Procedure D-1586.

During the split-spoon sampling procedures, a standard penetration test was performed in accordance with current ASTM D-1586 Procedures. At sampling intervals, advancement of the boring was stopped and all loose material removed from the borehole. The sampler was than lowered into the borehole and seated in undisturbed soil by pushing or tapping, taking suitable precautions that the rods were reasonably tight. The sampling spoon was then driven using an automatic drop hammer. During the sampling procedure, the standard penetration value (N) of the soil was determined. The standard penetration value (N) is defined as the number of blows of a one hundred-forty pound (140 lb) hammer required to advance the spoon sampler one foot (12") into the soil.

The results of the standard penetration tests indicated the relative density and comparative consistency of the soils and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components. The results of standard penetration tests can be found on the attached boring logs.

Strength Tests

A calibrated hand penetrometer was used to aid in determining the strength and consistency of cohesive soil samples (Qp) in the field. Split spoon samples were subjected to unconfined compressive strength testing (Qu) by the RIMAC Method as modified by IDOT. Consideration must be given to the manner in which the values of the unconfined compressive strength were obtained. Split-spoon sampling techniques provide a representative, but somewhat disturbed soil sample.

Water Level Measurements

Water level observations were made during and immediately after the boring operations and are noted on the attached boring logs. In relatively pervious, sandy soils, the water level elevations would be considered reliable. In relatively impervious, clayey soils, the accurate determination of the groundwater elevation may not be possible, even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table, and volumes of water will depend on the permeability of the soils.

LABORATORY TESTING

Scope

A supplemental laboratory-testing program was conducted to ascertain additional pertinent engineering characteristics of the foundation materials necessary in analyzing the behavior of the proposed construction. The soils laboratory work was performed in accordance with applicable ASTM standards.

The laboratory-testing program included supplementary visual classification, unconfined compressive strength on cohesive samples, and moisture contents on all samples. The results of laboratory testing are reported on the boring logs that are attached.

SUBSURFACE CONDITIONS

Subgrade Soil Conditions

The shallow depth soil conditions along the proposed alignment were comprised of 4 inches to 18 inches of black Silty CLAY to CLAY TOPSOIL over lying stiff to hard Silty CLAY, and occasionally CLAY and Sandy CLAY natural deposits. Test samples just below the Topsoil ranged from moisture content, Mc of 15 to 29 percent and unconfined compressive strengths, Qu of 1.13 to 6.71 tons per square foot. At B-19, a silty deposit recorded a Mc=26 percent and Qu = 0.62 tsf. At boring B-27, located close to Miller Road for the parking lot, Topsoil FILL and clay FILL were present to a depth of 3 feet..

Details of the soil conditions at each boring location are presented on the attached boring logs.

Groundwater Conditions

Groundwater measurements were made during and immediately after drilling operations were completed. All five-foot deep borings were dry during the field measurements. Boring B-27, made to a depth of ten feet for the parking lot encountered ground water at 7.1 to 9 feet below the surface. Details of the groundwater measurements at each boring location are presented on the attached boring logs.

PEDESTRIAN TRAIL RECOMMENDATIONS

Pavement Design Criteria

Soils encountered as the predominant subgrade materials consisted of very stiff to hard, low plasticity Silty CLAY, however in localized low ground clay with higher plasticity, higher moisture content, and lower strength was present at shallow depth, below the topsoil layer. In general, soils encountered as the predominant subgrade materials are considered to have a Subgrade Support Rating (SSR) of **'POOR'**. An assumed Illinois Bearing Ratio (IBR) of **3.0** is also considered appropriate for pavement design.

Subgrade Preparation

Topsoil and vegetation should be stripped to the suitable subgrade soil along the trail alignment. The alignment should then be filled or cut to the design subgrade elevation and proofrolled with a loaded semi-dump truck, rubber tired end loader or similar equipment with a wheel load sufficient to locate any soft or unstable areas. Soft or unstable subgrade areas that cannot be repaired with discing, drying, and recompaction procedures should be undercut and replaced with a well-graded granular material. Initial project costs should allow for some subgrade undercutting and replacement with stone and geotechnical fabric in wet conditions.

Topsoil Depths

The following is a summary of the measured Topsoil depth at the borehole locations for earthwork estimates. The Topsoil depth is not always easy to determine and in many cases dark colored transitional soil is present just below the rooted soil. The contractor should base his cost estimate on his own measurements.

TABLE 1 – Topsoil Depth

Boring No.	Topsoil Depth, in.	Boring No.	Topsoil Depth, in.
B-1	18	B-15	18
B-2	15	B-16	8
B-3	11	B-17	7
B-4	9	B-18	9
B-5	13	B-19	13
B-6	14	B-20	13
B-7	4	B-21	14
B-8	15	B-22	13
B-9	4	B-23	9
B-10	4	B-24	6
B-11	13	B-25	14
B-12	6	B-26	16
B-13	10	B-27	7
B-14	11		

Embankment Fill

If fill is required to raise the pavement grade, material used as Structural FILL should be a medium to low plasticity cohesive (clay type) material, classified as 'CL' 'CL-ML' or a clean (low fines content) granular material such as 'SP', 'SW', 'GP' or 'GW', in accordance with ASTM D-2487, Classification of Soils for Engineering Purposes. The FILL should be placed in 9-inch maximum lifts loose measure and compacted to 95 percent of the maximum dry density as defined by ASTM D-698.

Subgrade Treatment Areas

The general subgrade soil anticipated to be exposed is very stiff to hard Silty CLAY in most areas. However, lower strength, more plastic CLAYs were present in lower elevation areas of the trail. The following table outlines the lower strength subgrade soils and the recommended soil treatments identified by the soil borings:

Summary of Earthwork Remedial Treatment Areas

Boring	Subgrade Conditions	Treatment Depth	Treatment Material
B-1	Brown & Grey Silty CLAY Qu=2.91 tsf, Mc=27%	8"	Note 2
B-2	Red Brown Silty CLAY Qu=1.59 tsf, Mc=22%	10"	Note 3
B-4	Brown Silty CLAY Qu=2.83 tsf, Mc=25%	8"	Note 2
B-5	Dark Brown CLAY Qu=1.36 tsf, Mc=29%	12"	Note 3
B-11	Dark Brown Silty CLAY Qu=2.68 tsf, Mc=28%	8"	Note 2
B-12	Dark Brown Silty CLAY Qu=4.46 tsf, Mc=25%	8"	Note 2
B-14	Brown Clayey SAND Qu= 1.24, Mc=20%	12"	Note 3
B-15	Red Brown Silty CLAY Qu=1.13 tsf, Mc=25%	12"	Note 3
B-19	Red Brown CLAY Qu=1.59 tsf, Mc=21%	12"	Note 3
B-20	Dark Brown Silty CLAY Qu=1.90 tsf, Mc=25%	8"	Note 2

Notes

1. A 12" thick design pavement section is assumed.

2. Remove surface vegetation, roots, topsoil to the depth encountered, then disk, dry, and compact exposed soil. Then place and compact embankment fill in lifts to design subgrade.

3. Replacement Materials or Treatment:
   Embankment Materials and placement in accordance with Sections 205, 207 and Reoccurring Special Provision
   PGES – Porous Granular Embankment Subgrade / Aggregate Subgrade
   EMB – Suitable Embankment FILL per Section 205

Subgrade Treatment Plan Notes

Porous Granular Embankment Subgrade (PGES) should be specified for use at the locations indicated for soils that tend to be unsuitable or unstable or where additional fill is needed. The actual need for removal and replacement with PGES will be determined in the field at the time of construction by the geotechnical engineer.

All potentially unstable soils should be tested with a static cone penetrometer and treated in accordance with Article 301.04 and the undercut guidelines in the IDOT Subgrade Stability Manual. If unstable and/or unsuitable material is not encountered, then the quantity shall be deducted and no additional compensation will be due to the contractor.

Proposed Parking Lot

Borings B-26 and B-27 were made for a parking lot with access off of West Miller Road. Both of these borings encountered very stiff Silty CLAY just below 16 inches and 7 inches of surficial Topsoil. General Subgrade treatment of cut to grade, inspect with a proof roll and repair as necessary is warranted.

Surface and Groundwater Control

Groundwater was not encountered near the surface at the time of drilling. Excavations to remove topsoil at this site are not expected to expose groundwater.

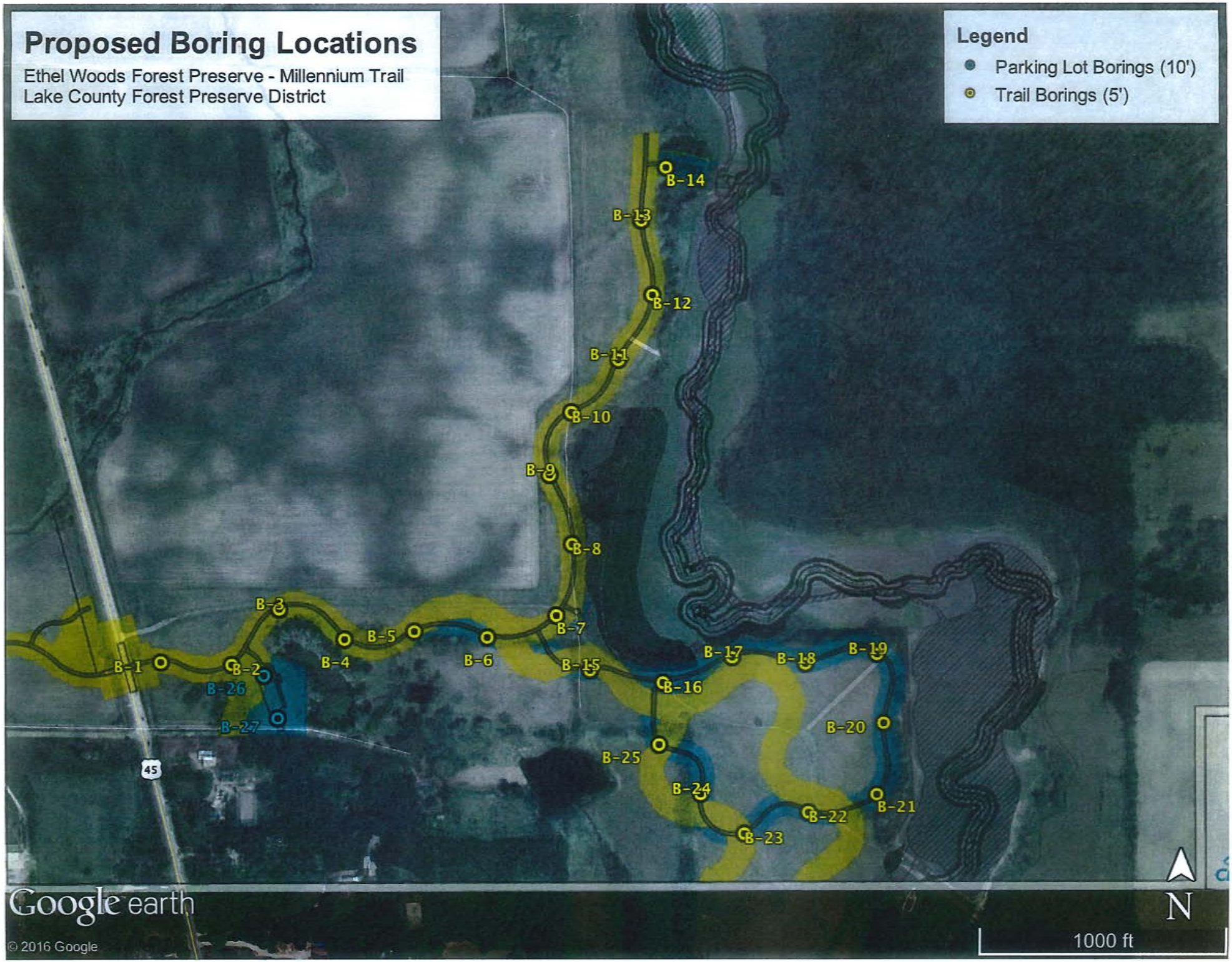
Closure

The report is based on the information available at this time and as the design progresses, we would be happy to review the soil conditions relevant to the proposed construction. Thank you for the opportunity to offer our services. If you should have any questions regarding this report, please feel free to call.

Very truly yours,
MIDLAND STANDARD ENGINEERING & TESTING, INC.

William J. Wyzgala, P.E.
Principal

Attachments: Boring Location Diagram
Boring Logs (B-1 through B-27)
Laboratory Test Data
General Notes


Proposed Boring Locations
Ethel Woods Forest Preserve - Millennium Trail
Lake County Forest Preserve District
Legend
Parking Lot Borings (10')
Trail Borings (5')
B-14
B-13
B-12
B-11
B-10
B-9
B-8
B-7
B-6
B-5
B-4
B-3
B-2
B-1
B-26
B-27
B-15
B-16
B-17
B-18
B-19
B-20
B-21
B-22
B-23
B-24
B-25
45
Google earth
© 2016 Google
N
1000 ft

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-1	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 18"	0.0							
				SS	1A	6	26			
		Brown & Grey Silty CLAY, trace Sand, trace Gravel, CL very stiff	-1.5							
2.5					1B	8	27	93	2.91	
				SS	2	6	24	90	2.41	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-2	Page 1 of 1

PROJECT: Ethel Woods - Trail

SITE LOCATION: Lake County, Illinois

BORING LOCATION: See Location Map

CLIENT: Civiltech Engineering, Inc.

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY, Topsoil 15"	0.0							
		Red Brown Silty CLAY, little Sand, CL, stiff	-1.3	SS	1	7	22	87	1.59	
2.5		Brown & Grey Silty CLAY, some Sand, little Gravel, SC, very stiff	-3.0	SS	2	14	11	122	3.5 Qp	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: dRY
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-3	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 11"	0.0							
		Brown, Grey, & Dark Grey Silty CLAY, trace Sand, CL, very stiff	-0.9	SS	1	5	18	98	2.10	
2.5		Dark Grey Silty CLAY, trace Sand, trace Gravel, CL stiff	-3.0	SS	2	5	26	94	1.94	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-4	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black SIlty CLAY Topsoil 9"	0.0							
		Brown to Brown & Grey Silty CLAY, trace to little Sand, trace Gravel, CL very stiff	-0.8	SS	1	5	25	92	2.83	
2.5										
				SS	2	8	18	107	2.17	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-5	Page 1 of 1
PROJECT: Ethel Woods - Trail	SITE LOCATION: Lake County, Illinois	
BORING LOCATION: See Location Map	CLIENT: Civiltech Engineering, Inc.	

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 13"	0.0							
		Dark Brown CLAY trace Sand, trace Gravel, CH, stiff	-1.1	SS	1	6	29	82	1.36	pH = 7.30
2.5		Brown & Grey Silty CLAY to Clayey SILT, little Sand, trace Gravel, CL-ML, stiff	-2.5							
				SS	2	11	18	126	1.63	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-6	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 14"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL, very stiff to hard	-1.2	SS	1	8	23	101	3.96	
2.5										
				SS	2	16	16	107	6.95	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING:
IMMEDIATELY AFTER DRILLING:
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-7	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 4"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-0.3	SS	1	8	16	108	3.69	
2.5										
				SS	2	22	14	117	7.42	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING:
IMMEDIATELY AFTER DRILLING:
DELAYED READING AFTER

None
Dry

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-8	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 2"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL, hard to very hard	-0.2	SS	1	15	17	101	4.66	
2.5				SS	2	18	15	114	8.85	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING:
IMMEDIATELY AFTER DRILLING:
DELAYED READING AFTER

None
Dry

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-9	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 4"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL hard to very stiff	-0.3	SS	1	9	19	107	5.08	
2.5										
				SS	2	14	18	100	2.52	
5		End of Boring at 5 feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING:
IMMEDIATELY AFTER DRILLING:
DELAYED READING AFTER

None
Dry

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-10	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 4"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL hard	-0.3							
				SS	1	10	17	107	5.12	
2.5										
				SS	2	15	17	104	6.05	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING:
IMMEDIATELY AFTER DRILLING: None
DELAYED READING AFTER: Dry

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-11	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 13"	0.0							
		Dark Brown Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-1.1	SS	1	5	28	90	2.68	
2.5										
				SS	2	14	16	108	5.28	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-12	Page 1 of 1

PROJECT: **Ethel Woods - Trail** SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map** CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 6"	0.0							
		Dark Brown Silty CLAY, trace to little Sand, trace Gravel, CL hard	-0.5							
		to Brown & Grey		SS	1	6	25	93	4.46	
2.5										
				SS	2	8	24	92	4.35	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-13	Page 1 of 1

PROJECT: Ethel Woods - Trail

SITE LOCATION: Lake County, Illinois

BORING LOCATION: See Location Map

CLIENT: Civiltech Engineering, Inc.

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Grey to Black Silty CLAY Topsoil 10"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL hrad to very stiff	-0.8	SS	1	8	18	108	4.85	
2.5										
				SS	2	8	18	101	3.26	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-14	Page 1 of 1

PROJECT: Ethel Woods - Trail

SITE LOCATION: Lake County, Illinois

BORING LOCATION: See Location Map

CLIENT: Civiltech Engineering, Inc.

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 11"	0.0							
		Brown Clayey SAND, trace Gravel, SC stiff	-0.9	SS	1	5	20	95	1.24	pH = 6.89
2.5		Brown, trace Grey Silty CLAY, little Sand, trace Gravel, CL hard	-3.0	SS	2	13	15	114	4.15	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-15	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 18"	0.0							
		Red Brown and Dark Grey Silty CLAY, little Sand, CL stiff	-1.5	SS	1A	4	25	90	2.13	pH = 7.17
2.5					1B	5	25	93	1.13	
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL very stiff	-3.0	SS	2	7	19	103	2.02	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-16	Page 1 of 1

PROJECT: **Ethel Woods - Trail** SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map** CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 8"	0.0							
		Brown, trace Grey Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-0.7	SS	1	10	16	100	3.46	
2.5										
				SS	2	16	15	114	6.79	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-17	Page 1 of 1

PROJECT: Ethel Woods - Trail

SITE LOCATION: Lake County, Illinois

BORING LOCATION: See Location Map

CLIENT: Civiltech Engineering, Inc.

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 7"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-0.6	SS	1	10	16	100	3.80	
2.5										
				SS	2	16	16	116	7.14	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-18	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown & Black Silty CLAY Topsoil 9"	0.0							
		Brown to Brown & Grey Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-0.8	SS	1	8	22	106	3.03	
2.5										
				SS	2	17	13	109	5.74	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-19	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 13"	0.0							pH = 7.06
		Red Brown CLAY, trace Sand, CH stiff	-1.1	SS	1A	4	27	93	1.59	
2.5		Brown & Grey Silty CLAY to Clayey SILT, CL-ML moist	-2.0		1B	2	26	93	0.62	
				SS	2	11	21	109	1.47	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-20	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 13"	0.0							
		Dark Brown Silty CLAY, little Sand, trace Roots, CL	-1.1	SS	1	7	25	92	1.90	
2.5										
		Red Brown Silty SAND & GRAVEL, GM-SM medium dense	-3.0	SS	2	10	11			
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-21	Page 1 of 1

PROJECT: **Ethel Woods - Trail** SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map** CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY Topsoil 14"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, Cl very stiff to hard	-1.2	SS	1	7	16	110	2.75	
2.5										
				SS	2	16	16	108	6.09	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-22	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 13"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-1.1	SS	1	7	17	101	2.95	
2.5										
				SS	2	13	16	112	4.69	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-23	Page 1 of 1

PROJECT: **Ethel Woods - Trail**

SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map**

CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 9"	0.0							
		Brown, trace Grey Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-0.8	SS	1	10	13		2.0 Qp	
2.5										
				SS	2	11	16	106	4.69	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING:
IMMEDIATELY AFTER DRILLING:
DELAYED READING AFTER

None
Dry

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-24	Page 1 of 1

PROJECT: Ethel Woods - Trail
SITE LOCATION: Lake County, Illinois
BORING LOCATION: See Location Map
CLIENT: Civiltech Engineering, Inc.

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Dark Brown Silty CLAY, little Sand, trace Gravel, CL hard	0.0							
			-0.5							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL hard		SS	1	10	15	109	4.81	
2.5										
				SS	2	14	15	111	5.63	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

Midland Standard Engineering & Testing, Inc. 558 Plate Drive Unit 6, East Dundee, IL 60118 (847) 844-1895 f(847) 844-3875

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-25	Page 1 of 1

PROJECT: **Ethel Woods - Trail** SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map** CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY Topsoil 14"	0.0							
		Brown & Grey Silty CLAY, little Sand, trace Gravel, CL hard to very stiff	-1.2	SS	1	6	16	114	6.71	
2.5										
				SS	2	12	17	100	2.48	
5		End of Boring at 5 Feet	-5.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/26/17
BORING COMPLETED: 7/26/17
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-26	Page 1 of 1

PROJECT: **Ethel Woods - Trail** SITE LOCATION: **Lake County, Illinois**

BORING LOCATION: **See Location Map** CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black Silty CLAY, Topsoil 16"	0.0							
		Brown to Brown & Grey Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-1.3	SS	1	5	22	96	3.07	
2.5										
				SS	2	11	14	120	3.96	
5										
				SS	3	19	17	117	8.92	
7.5										
				SS	4	19	17	108	5.98	
10		End of Boring at 10 feet	-10.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: None
IMMEDIATELY AFTER DRILLING: Dry
DELAYED READING AFTER

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 10 Feet
LOGGED BY: GPF
BORING METHOD: HSA

MSET PROJECT NO.: 17386	LOG OF BORING NO. B-27	Page 1 of 1

PROJECT: Ethel Woods - Trail
SITE LOCATION: Lake County, Illinois
BORING LOCATION: See Location Map
CLIENT: Civiltech Engineering, Inc.

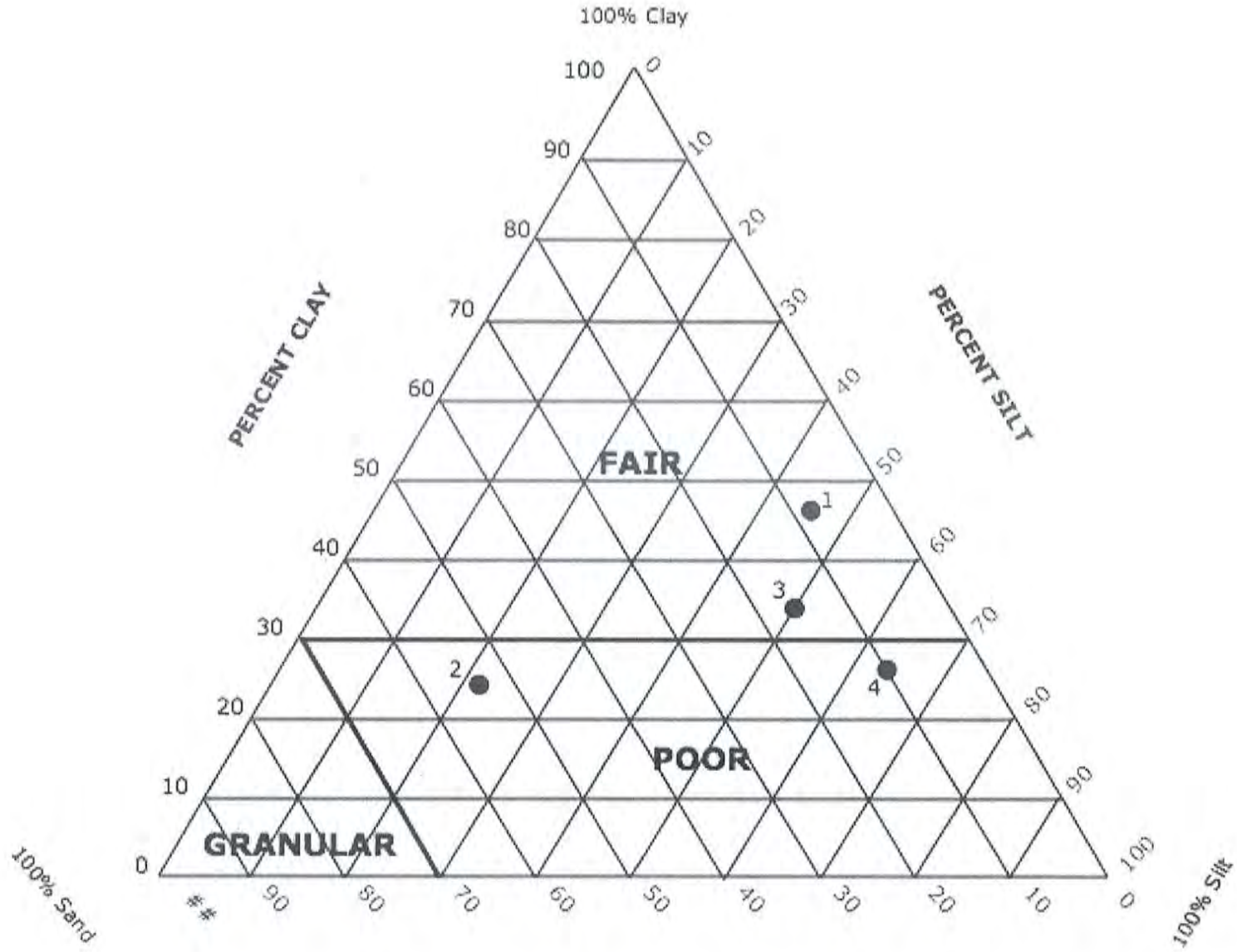
DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE TYPE/ INTERVAL	SAMPLE NO.	SAMPLE N-VALUE Blows per ft.	TESTS Wc%	TESTS Dry Unit Weight, pcf	TESTS Unconfined Compressive Strength, tsf	REMARKS
0		Black to Dark Grey Silty CLAY Topsoil 7"	0.0							
		FILL: Brown & Grey, trace Black Silty CLAY, little Sand, trace Gravel, CL very stiff	-0.6	SS	1	9	20	103	3.96	
2.5		Black Silty CLAY, trace Sand, CL	-3.0	SS	2A	6	23	94	2.95	
		Brown & Black Silty CLAY, trace Sand, CL, firm	-4.0		2B	8	23	97	0.70	
5										
		Brown to Brown & Grey Silty CLAY, little Sand, trace Gravel, CL very stiff to hard	-6.0	SS	3	6	21			
7.5										
				SS	4	12	20	99	5.43	
10		End of Boring at 10 Feet	-10.0							

WATER LEVEL OBSERVATIONS, ft.
DURING DRILLING: 9.0'
IMMEDIATELY AFTER DRILLING: 7.1'
DELAYED READING AFTER 6 hrs 8.1'

MSET

BORING STARTED: 7/24/17
BORING COMPLETED: 7/24/17
LOGGED BY: GPF
BORING METHOD: HSA

SUBGRADE SUPPORT RATING DIAGRAM



	Boring	Sample	Depth	Classification
1.	B-5	SS-1	1-2.5'	Dark Brown CLAY, trace Sand, CH
2.	B-14	SS-1	1-2.5'	Dark Brown Clayey SAND, SC
3.	B-15	SS-1B	1.5 -2.5'	Red Brn & Dk Grey Silty CLAY, little Sand, CL
4.	B-19	SS-1A	1-2'	Red Brown CLAY, trace Sand, CH

MIDLAND STANDARD ENGINEERING TESTING, INC.
558 PLATE DRIVE, UNIT 6, EAST DUNDEE, IL 60118 (847) 844-1895 F(847) 844-3875

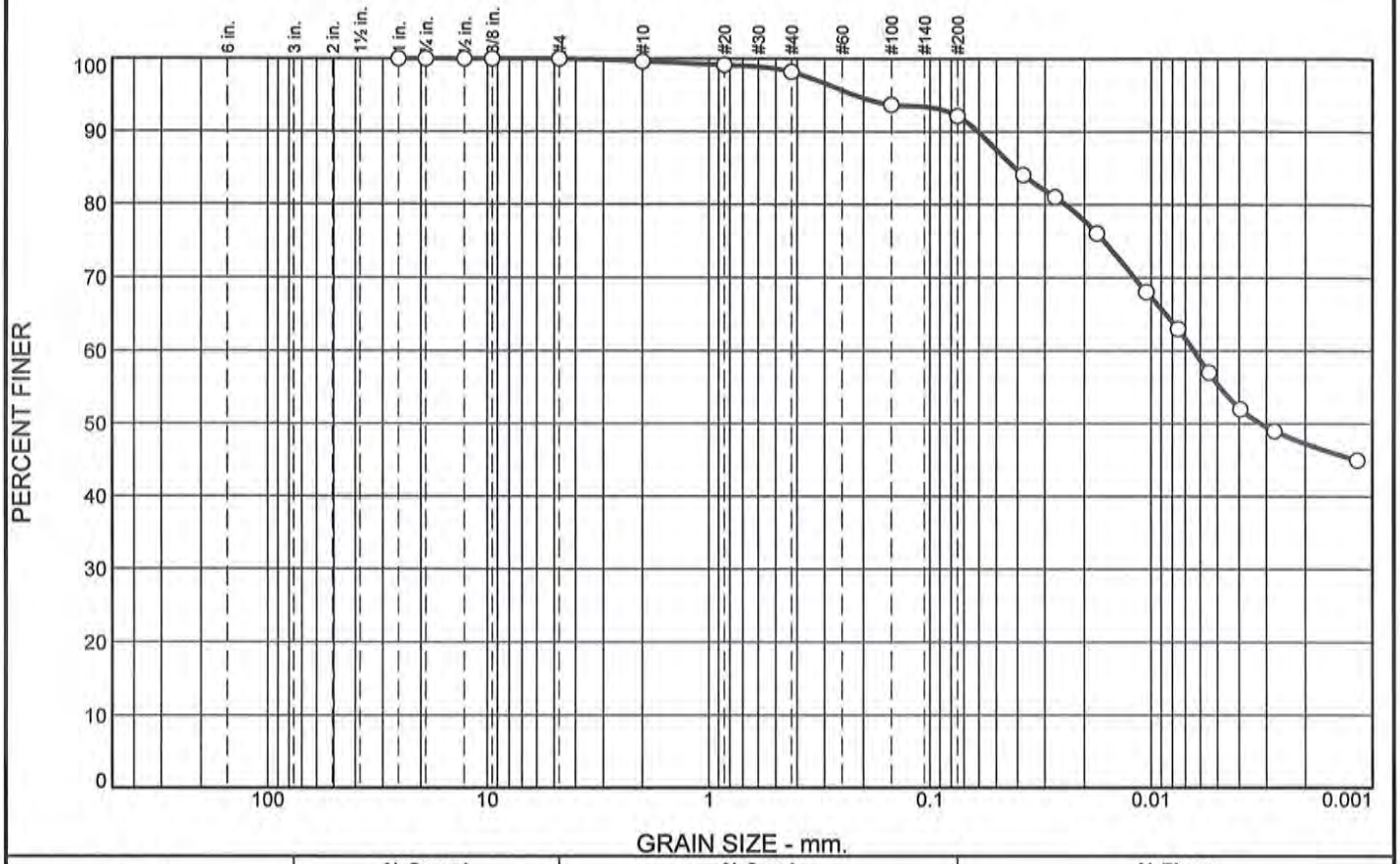
pH of Soil
ASTM D 4972 / AASHTO T289

Project # 17386
Project Name: Ethel Woods- Trail
Client: Civiltech Engineering, Inc.
Location: Lake Cook, Illinois

Date Received:
Date Tested: 9/8/17
Tested by: JDS

Sample #	Brown Fat CLAY B-5, SS-1	7.30	pH in distilled water
Sample #	Brown Fat CLAY B-19A, SS-1	7.06	pH in distilled water
Sample #	Light Brown Lean CLAY with Sand B-15B, SS-1	7.17	pH in distilled water
Sample #	Dark Brown Clayey SAND B-14, SS-1	6.89	pH in distilled water

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	2	6	45	47

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
#4	100		
#10	100		
#20	99		
#40	98		
#100	94		
#200	92		
0.0378 mm.	84		
0.0271 mm.	81		
0.0175 mm.	76		
0.0105 mm.	68		
0.0076 mm.	63		
0.0055 mm.	57		
0.0039 mm.	52		
0.0028 mm.	49		
0.0012 mm.	45		

* (no specification provided)

Soil Description

Brown Fat CLAY

Atterberg Limits

PL= 19 LL= 55 PI= 36

Coefficients

D_{90}= 0.0606 D_{85}= 0.0411 D_{60}= 0.0064
D_{50}= 0.0032 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(36)

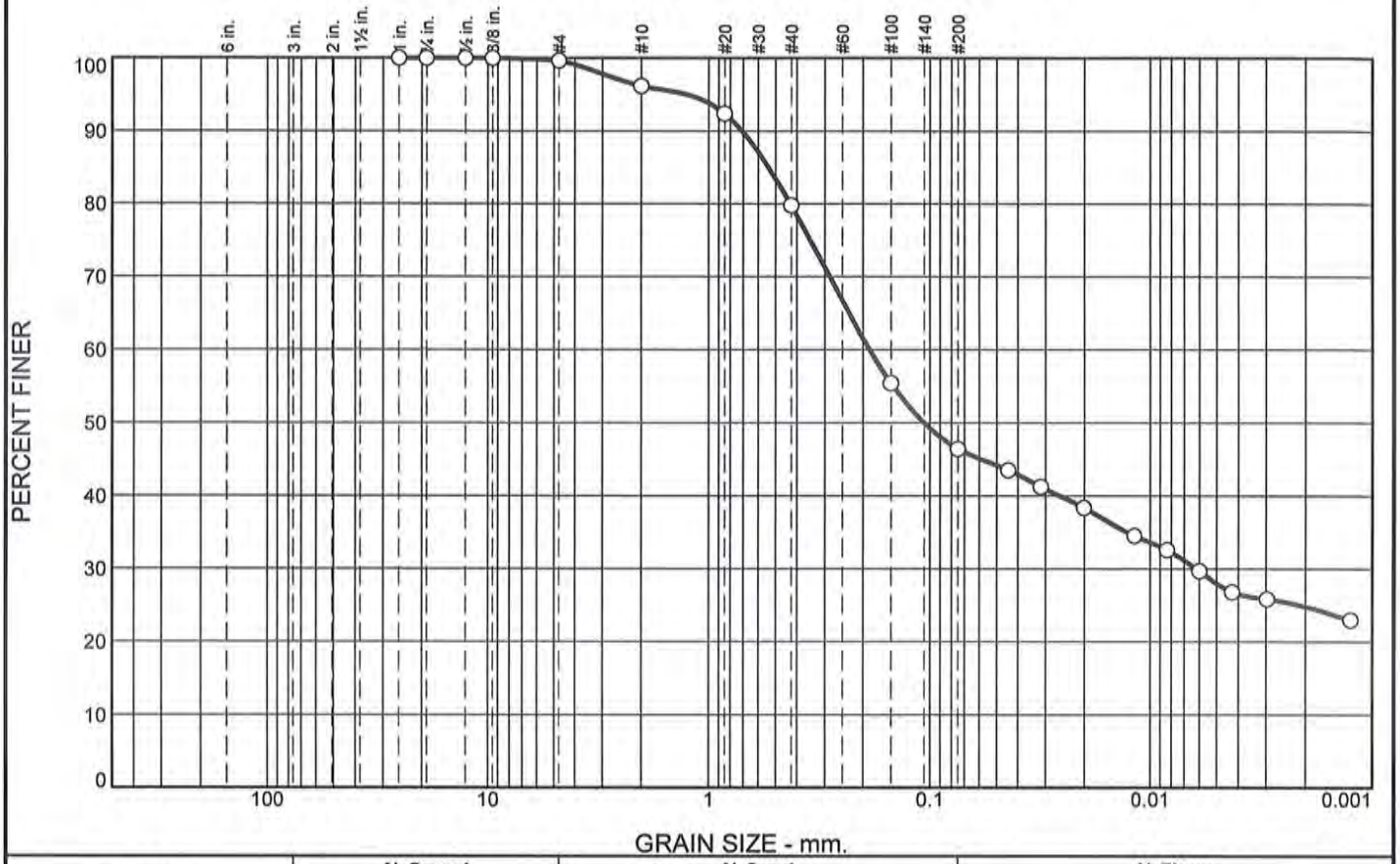
Remarks

Location: B-5
Sample Number: SS-1 **Date:**

Midland Standard Engineering & Testing	**Client:** Civiltech Engineering, Inc.
	Project: Ethel Woods - Trail
East Dundee, IL	**Project No:** 17386 **Figure**

Tested By: JDS **Checked By:** KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	4	16	34	21	25

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
#4	100		
#10	96		
#20	92		
#40	80		
#100	55		
#200	46		
0.0442 mm.	44		
0.0315 mm.	41		
0.0201 mm.	38		
0.0118 mm.	34		
0.0084 mm.	33		
0.0060 mm.	30		
0.0043 mm.	27		
0.0030 mm.	26		
0.0012 mm.	23		

* (no specification provided)

Soil Description

Dark Brown Clayey SAND

Atterberg Limits

PL= 14 LL= 44 PI= 30

Coefficients

D_{90}= 0.7089 D_{85}= 0.5382 D_{60}= 0.1872
D_{50}= 0.1064 D_{30}= 0.0062 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(9)

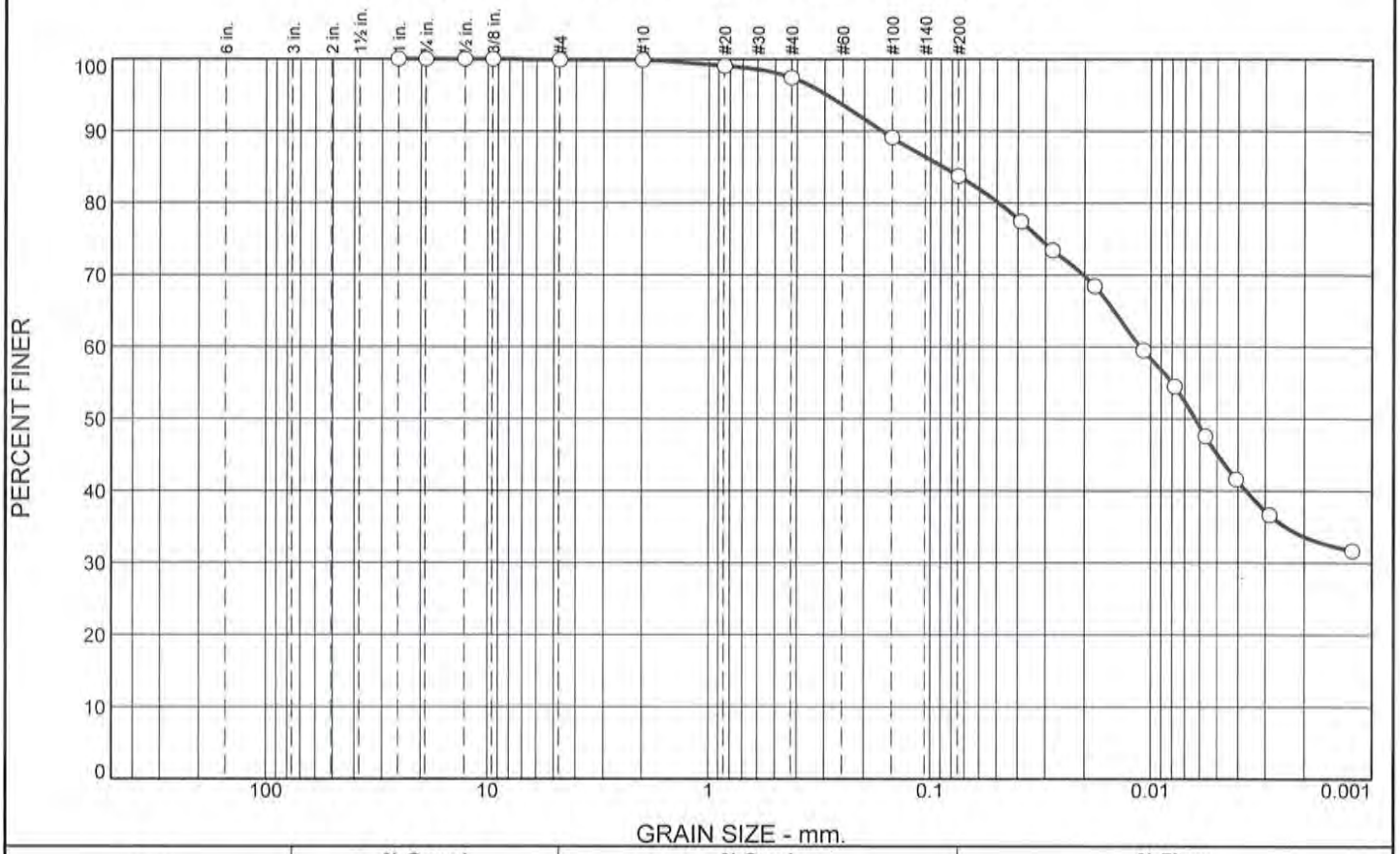
Remarks

Location: B-14
Sample Number: SS-1 **Date:**

Midland Standard Engineering & Testing	**Client:** Civiltech Engineering, Inc.
	Project: Ethel Woods - Trail
East Dundee, IL	**Project No:** 17386 **Figure**

Tested By: JDS **Checked By:** KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	2.5	13.7	50.1	33.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.9		
#10	99.9		
#20	99.0		
#40	97.4		
#100	89.1		
#200	83.7		
0.0389 mm.	77.4		
0.0280 mm.	73.4		
0.0181 mm.	68.4		
0.0108 mm.	59.5		
0.0078 mm.	54.5		
0.0057 mm.	47.6		
0.0041 mm.	41.6		
0.0029 mm.	36.7		
0.0012 mm.	31.7		

* (no specification provided)

Soil Description

Red Brown & Dark Grey Silty CLAY

Atterberg Limits

PL= 17 LL= 41 PI= 24

Coefficients

D_{90}= 0.1670 D_{85}= 0.0885 D_{60}= 0.0112
D_{50}= 0.0063 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(20)

Remarks

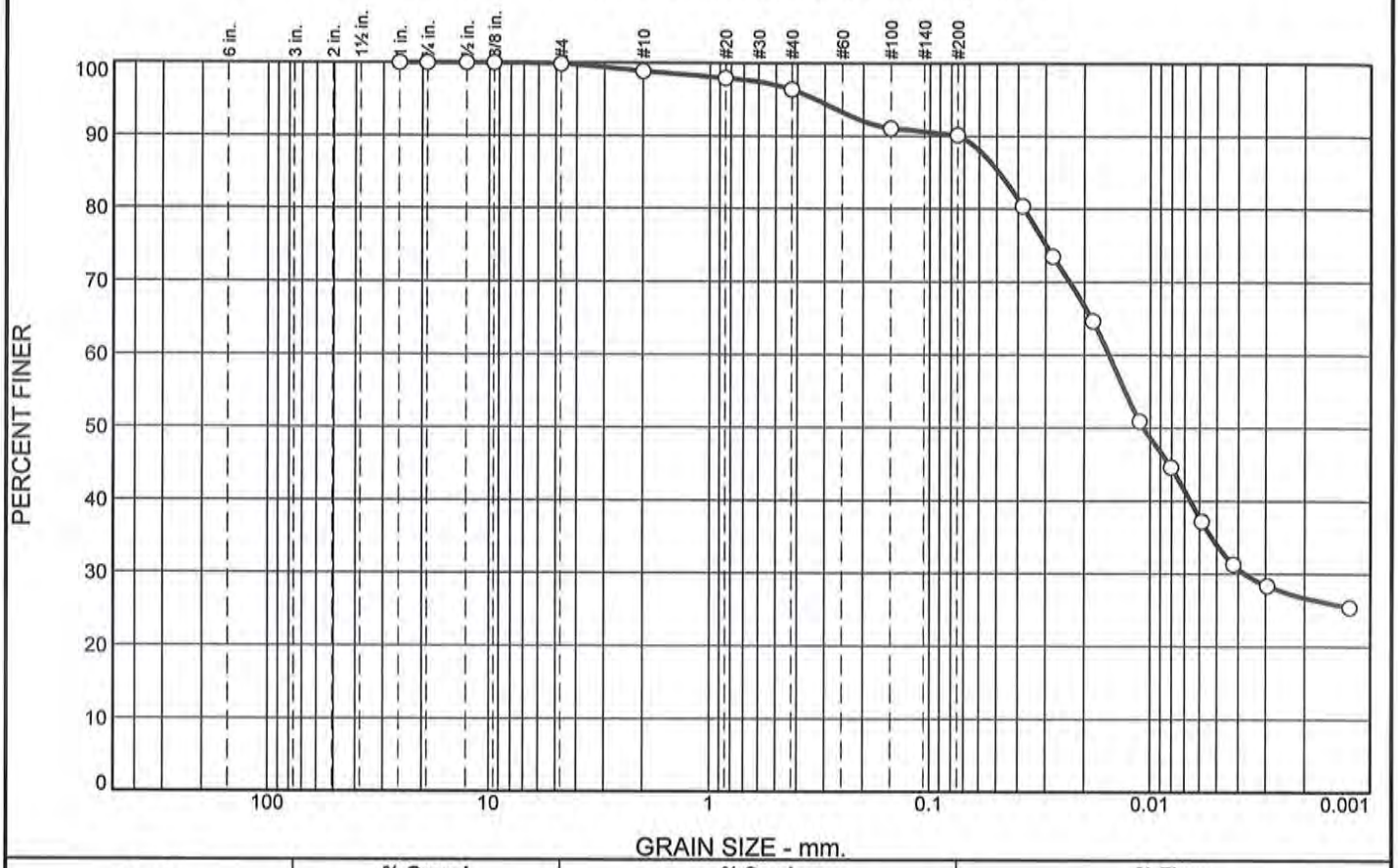
Location: B-15B
Sample Number: SS-1

Date:

Midland Standard Engineering & Testing	**Client:** Civiltech Engineering, Inc.
	Project: Ethel Woods - Trail
East Dundee, IL	**Project No:** 17386 **Figure**

Tested By: JDS **Checked By:** KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	3	6	63	27

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
#4	100		
#10	99		
#20	98		
#40	96		
#100	91		
#200	90		
0.0382 mm.	80		
0.0278 mm.	73		
0.0183 mm.	65		
0.0111 mm.	51		
0.0081 mm.	45		
0.0059 mm.	37		
0.0042 mm.	31		
0.0030 mm.	28		
0.0012 mm.	25		

* (no specification provided)

Soil Description

Brown Fat CLAY

Atterberg Limits

PL= 17 LL= 68 PI= 51

Coefficients

D_{90}= 0.0733 D_{85}= 0.0487 D_{60}= 0.0155
D_{50}= 0.0107 D_{30}= 0.0037 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(49)

Remarks

Location: B-19A
Sample Number: SS-1

Date:

Midland Standard Engineering & Testing **East Dundee, IL**	**Client:** Civiltech Engineering, Inc. **Project:** Ethel Woods - Trail **Project No:** 17386 **Figure**

Tested By: JDS **Checked By:** KP

GENERAL NOTES

PARTICLE SIZE DESCRIPTION & TERMINOLOGY

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and the fine grained soils on the basis of their strength or consistency and their plasticity.

Major Component of Sample	Size Range
Boulders	Over 8 in. (200 mm)
Cobbles	8 inches to 3 inches (200 mm to 75mm)
Gravel	3 inches to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt	Passing #200 sieve (0.075mm to 0.002mm)
Clay	Smaller than 0.002mm

Descriptive Term of Components Also Present in Sample	Approximate Quantity (Percent)
Trace	1 - 9
Little	10 - 19
Some	20 - 34
And	35 - 50

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

GRANULAR SOILS

DENSITY CLASSIFICATION	APPROXIMATE RANGE OF N *
Very Loose	0 - 3
Slightly Dense	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	50 - 80
Extremely Dense	80 +

COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH, Qu - TSF	APPROXIMATE RANGE OF N *
Very Soft	0.25	0 - 2
Soft	0.25 - 0.49	3 - 4
Firm	0.50 - 0.99	5 - 8
Stiff	1.00 - 1.99	9 - 15
Very Stiff	2.00 - 3.99	16 - 30
Hard	4.00 - 8.00	31 - 50
Very Hard	8.00 +	Over 50

* STANDARD PENETRATION TEST (ASTM D1586) - A 2.0" outside-diameter, split barrel sampler is driven into undisturbed soil by means of a 140 pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven 3 successive 6 inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).