

# **Preliminary Geotechnical Engineering Report**

## **S-48 (Columbia Avenue) Corridor Improvements**

**Lexington County (Town of Chapin),  
South Carolina**

Report prepared for

**Lexington County, SC**

**In conjunction with**

**South Carolina Department of  
Transportation**

Report prepared by



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January 2017



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January 10, 2017

Mr. Jeff McNesby  
Lexington County Public Works  
440 Ball Park Road  
Lexington, SC 29072

RE: Preliminary Geotechnical Engineering Report  
SC-48 (Columbia Avenue) Corridor Improvements  
Lexington County, South Carolina  
SCDOT Project ID: 0042383  
Mead & Hunt Project Number: 4035500-121734.01

Dear Mr. McNesby:

Mead & Hunt, Inc. (Mead & Hunt) has completed the Preliminary Geotechnical Engineering Report for the above referenced project. This report presents an overview of the subsurface explorations performed by Terracon Consultants, Inc. and preliminary geotechnical recommendations that can be used for preliminary design of the I-26 Bridge, bridge approaches, and roadways. This report has been prepared in general accordance with the South Carolina Department of Transportation (SCDOT) Geotechnical Design Manual Version 1.1, 2010.

We appreciate the opportunity to prepare this report for the project. If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,

Mead & Hunt, Inc.

James J. Botz, P.E.  
Senior Associate

Martin E. Kemps, P. E.  
Geotechnical Engineer



Enclosure

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## **1. Introduction**

This report provides a general characterization of the subsurface conditions and geotechnical recommendations for the S-48 Corridor Improvements in the Town of Chapin, Lexington County, South Carolina. Included is a summary of the subsurface conditions encountered during the subsurface exploration, anticipated foundation recommendations, liquefaction potential of the foundation soils, and analyses of embankments. Appendix A consist of the Geotechnical Data Report prepared by Terracon Consultants, Inc. This report was prepared in general accordance with Chapter 21 of the SCDOT Geotechnical Design Manual (GDM).

## **2. Project Description**

The project limits extend from Amicks Ferry Road (roughly 300' south of the intersection of Amicks Ferry Road and Zion Church Road) to approximately 1,500' east of the I-26/Columbia Avenue interchange (Exit 91). The project design consists of 1.3 miles of three (3) lane, new location roadway that originates on Amicks Ferry Road, extends east to the intersection of East Boundary Street and Stonewall Court, and then north to Columbia Avenue. Portions of Clark Street, Weisz Street, East Boundary Street, and Lexington Avenue will also be improved along the route. The project design includes a new intersection where the new roadway intersects Columbia Avenue, approximately 420 feet east of East Boundary Street. Columbia Avenue will be improved to five (5) lanes from this intersection east to the I-26 interchange with the interchange being modified to a Divergent Diamond. The total project length will be approximately 2.9 miles.

The majority of the roadway construction will require only minor grade changes. However, New Road 1 will require up to 15 feet of new fill material to establish the new subgrade elevation. Likewise, Ellett Road will require 8 to 10 feet of fill and the I-26 bridge approach at Station 107+00 will require an embankment fill with a height of 9.5 feet. The outer slope of this fill will be graded to 2H:1V. Ramp A will require a cut and fill section of up to 15 feet to establish the new ramp alignment. The cut slopes will be established at 2H:1V, while the fill slopes will be flatter than 4H:1V.

At the interchange of S-48 and I-26, the existing diamond interchange will be replaced with a diverging diamond interchange (DDI). The new bridge will consist of a two-span continuous prestressed concrete I-beam (AASHTO Type III) supported by integral end bents on mechanically stabilized engineered (MSE) walls and a cap-and-column interior bent. The total bridge length is 186'-10" (93'-5" – 93'-5" spans). The MSE walls used in this alternative will be straight and run parallel to I-26. The bridge will have an out-to-out width of 102'-3". This will provide 3-12' eastbound travel lanes, 2-12' westbound travel lanes, 10' outside shoulders, 4' inside shoulders, and an 8 foot median sidewalk.

MSE walls will be constructed at each of the bridge abutments. Each wall will have a height in the range of 10 to 15 feet. The MSE walls will not carry any bridge loading which will be supported by driven piles. The global stability of these walls will be reviewed as part of the final Geotechnical Engineering report when the wall sections and details have been finalized.

Additional roadway retaining walls (height anticipated at less than 10') will be evaluated in the final report.

### **3. Subsurface Exploration and Laboratory Testing Program**

Terracon Consultants, Inc. (Terracon) was subcontracted by Mead & Hunt to perform the subsurface exploration and laboratory testing for the project. A summary of the field and laboratory procedures is included in their Geotechnical Data Report dated May 20, 2016 which is attached as Appendix A to this report; therefore, procedures used will not be repeated herein. The following is the scope of work performed by Terracon.

#### Field Exploration

- Thirty-eight (38) standard penetration test borings: 8 for the I-26 bridge and interchange, and 30 for the roadway improvements.
- Geophysical testing consisting of Refraction Microtremor arrays for shear wave velocity profiling.

#### Laboratory Testing

- One-hundred twenty-four (124) natural moisture content tests (ASTM D2216)
- Seventy-nine (79) Atterberg Limits tests (ASTM D4318)
- Seventeen (17) sieve analysis with hydrometer (ASTM D422-63)
- Sixty-six (66) sieve analysis with #200 wash tests (ASTM D422-63)
- Five (5) Standard Proctor tests (ASTM 698)
- Five (5) California Bearing Ratio tests (ASTM D1883)
- Two (2) Triaxial tests with pore pressure readings (ASTM D4767)
- Eight (8) pH of soils (ASTM D4972)
- Eight (8) Water Soluble Sulfate in Soils (ASTM C1580)
- Eight (8) Water Soluble Chlorides in Soils (ASTM D1411)
- Eight (8) Measurement of Soil Resistivity tests (ASTM G187)
- Six (6) Moisture Ash and Organic Matter tests (ASTM D2974)

## **4. Site Conditions**

### **A. Area Geology**

The project is located in the physiographic Piedmont Unit which is the remains of an ancient mountain chain that has been eroded away. The terrain is characterized by gently rolling topography and deeply weathered bedrock with few outcrops. The overburden will generally consist of 5 to 70 feet of weathered residual soils underlain by metamorphic or igneous rocks such as granites, schists, and gneiss. The near surface soils will generally be clayey soils that transition to silts and sands where less weathering has occurred.

### **B. Soil Conditions**

#### **(1) Roadway Borings**

Borings 1 through 26 were performed in either existing or proposed roadway areas. Borings 35 through 38 were performed for roadways associated with the on/off ramps for the I-26 interchange. The generalized soil profile is summarized in Table 1. The near surface soils (upper 4 feet of the soil profile) that will control the pavement design consisted primarily of fat clays (CH), lean clays (CL), and both high and low plasticity silts (MH and ML). Generally the consistency of these soils ranged from soft to stiff as indicated by Standard Penetration Test blow counts. The soil types as encountered were very random and there was no pattern of concentrated soil types along the roadway alignments. Even the adjacent bulk sample borings sampled a few feet from the original borings varied in soil type.

No zones of ground improvement were identified by the borings along existing roadway right-of-ways. Borings 6, 7, and 8 identified near surface fill or soft silty clay soils in the new Road 1 right-of-way. If these soils will be exposed at the pavement subgrade level, some partial removal of these soils and replacement with a quality subbase may be required.

Groundwater observations were made after completion of the borings and 24 hours thereafter. The drilling method used for the boring was the rotary washed method which introduces water into the borehole which prevents any accurate water levels being made within a short time after drilling. However, the 5 bulk samples obtained using hollow stem augers did not reveal the presence of any groundwater while augering to a depth of 5 feet below grade. A more accurate assessment of the groundwater would require the installation of monitoring wells which is not deemed necessary for the roadway construction with minimal grade changes planned.

#### **(2) Structure Borings**

The near surface overburden soils encountered in the eight borings performed for the I-26 bridge (Borings 27 through 34) were similar to those soils encountered in the roadway borings discussed above. Below the upper 4 to 6 feet of the soil profile, the soils transitioned to a non-plastic silt that extended to the termination depth of the borings. The consistency of the silt ranged from firm to very stiff to a depth of 25 to 30 feet and then hard to boring termination. Below 55 to 60 feet, the silts would be considered very hard with blow counts of 50 for penetration intervals of 1 to 5

inches. Two of the borings (B-30 and B-34) reached the scheduled depth of 120 feet. The other 6 borings encountered practical refusal with the rock bit at depths ranging from 98.5 to 107.5.

Groundwater observations were not possible due to the introduction of drill water into the boreholes while advancing the borings. Observation wells will be installed as part of the final exploration to document the level of the groundwater in the area of the I-26 bridge construction.

**Table 1: Generalized Soil Profile**

Formation	Depth, feet	Soil Type	N <sub>field</sub> -values	Comments
Residuum	0 - 6	CH, CL, MH	4 to 10	Several borings have surface fill materials of similar soil type and consistency
Severely weathered bedrock	6 to 60	ML	7 to 58	Non-plastic silt
Partially weathered bedrock	60 to 120	ML, CL	50 for < 6 inches	Very hard (or extremely dense) with zones of rock fragments

### C. Seismic Site Classification

Exhibit A-10 in the attached Geotechnical Data Report (Appendix A) presents the SeisOpt ReMi method used on this project to develop the full depth shear wave velocity profile. The shear wave profile is presented as Exhibit A-9 presents the shear wave velocity profile. The average weighted shear wave velocity for the top 100 feet of the site was computed to be 1,251 feet per second.

The bridge site may be classified as Site Class C based on Table 12.22 in the SCDOT Geotechnical Design Manual, June 2010.

### D. California Bearing Ratio

California Bearing Ratio (CBR) tests were performed on the 5 bulk samples obtained across the project right-of-way. Each test sample was compacted to 95% of the Standard Proctor maximum dry density. The results ranged from 4.1 to 6.2 (0.10 inches of penetration) and are summarized in Table 2.

**Table 2: CBR Results**

Boring No.	Classifications		CBR	Maximum Dry Density, pcf	Optimum Moisture, %
	AASHTO	ASTM			
2	A-4	ML-CL	4.1	117.5	12.3
5	A-5	ML	4.1	99.3	22.2
12	A-7-6	SC	5.9	117.4	11.7
20	A-7-6	ML	6.2	108.2	16.2
26	A-6	ML	3.0	109.3	15.1

## **E. Soil Corrosion Potential**

Electro-chemical tests were performed to evaluate the potential for the deterioration of the proposed bridge foundations. The auger cuttings from the 5 bulk samples as well as split spoon samples from borings performed for the I-26 bridge were selected for pH, resistivity, sulfate, and chloride tests. Table 3 presents the results of these tests.

**Table 3: Summary of Electro-Chemical Tests**

<b>Boring</b>	<b>Depth, ft.</b>	<b>Resistivity, ohm-cm</b>	<b>Sulfate Content, mg/kg</b>	<b>Chloride Content, mg/kg</b>	<b>pH</b>
2 - bulk	0 - 5	4608	47	100	7.87
5 - bulk	0 - 5	22,504	25	12	7.48
12 - bulk	0 - 5	2037	116	45	6.70
20 - bulk	0 - 5	23,280	25	12	7.61
26 - bulk	0 - 5	2377	105	38	6.50
30	2 - 4	16,102	11	12	7.55
32	0 - 2	7760	41	25	5.97
33	0 - 2	22,310	25	12	6.29
34	0 - 2	22,213	28	12	5.87

Section 10.7.5 of the 2014 AASHTO Specifications provide guidelines for soil and site conditions that should be considered for potential pile deterioration or a corrosive environment. The following conditions are presented in the specifications:

- Resistivity less than 2,000 ohm-cm
- pH less than 5.5
- pH between 5.5 and 8.5 in soils with high organic content
- Sulfate concentrations greater than 1000 mg/kg (ppm)
- Landfill and cinder fills
- Soils subject to mine or industrial drainage
- Areas with mixture of high resistivity soils and low resistivity high alkaline soils

Based on these criteria, the soils in the vicinity of the bridge do not have a high potential for steel pile deterioration. Likewise, any steel structures along the roadway right-of-way as represented by the bulk samples have a low potential for deterioration.

## **F. Seismic Design Considerations**

The seismic bridge design will be governed by the 2008 SCDOT Seismic Design Specifications for Highway Bridges. The I-26 bridge has an Operational Classification (OC) of I. The roadway bridge approach embankments within 150 feet of the bridge with an OC = I bridge classification will have a Roadway Operational Classification (ROC) = I per the Geotechnical Design Manual (GDM). Roadway embankments located more than 150 feet from the bridge will have an ROC of III.

The SCDOT provided a three-point acceleration design response analysis spectrum (ADRS) dated November 18, 2016 for the preliminary geotechnical design. The ADRS curves for the Safety Evaluation Earthquake (SEE) and the Functional Evaluation Earthquake (FEE) design earthquakes are included in Appendix B. Table 4 summarizes the seismic design parameters for the SEE and FEE seismic design events.

**Table 4: Seismic Design Information**

Operational Classification	I	
Seismic Site Class	C	
Seismic Design Category	B	
Design Seismic Event	FEE; 15% in 75 years	SEE; 3% in 75 years
Peak ground acceleration, PGA	FEE = 0.06g	SEE = 0.16g
$S_{Ds}$	FEE = 0.10	SEE = 0.25
$S_{D1}$	FEE = 0.05	SEE = 0.13
Earthquake magnitude, $M_w$	FEE = 7.35	SEE = 7.37
Epicentral distance, R	FEE = 161.1 km	SEE = 147.58 km

We have performed a preliminary liquefaction analysis in accordance with the procedures recommended in the GDM (Idriss and Boulanger 2008). The results of these analyses are included in Appendix C. The soil profiles of Borings 30 through 34 were evaluated. Based on our preliminary analysis, factors of safety against liquefaction are generally greater than 2. Several zones of firm to stiff silts within the profiles computed factors of safety in the range of 1.2 to 1.5. In any event, soil shear strength loss and settlement of these soils is not anticipated. The deeper overburden soils consisting of stiff to hard silts and partially weathered rock will not experience liquefaction and soil shear strength loss.

## 5. Foundation Recommendations

Based on our preliminary evaluation of the subsurface conditions, it is recommended that the I-26 bridge be supported on a deep foundation consisting of driven piles.

### A. Driven Piles

Preliminary estimates of driven pile capacities were performed using procedures outlined in the FHWA Design and Construction of Driven Pile Foundations, 2014 along with the SCDOT GDM. Specifically, the Nordlund method was used to estimate the static capacity of an HP 12 x 53 steel pile driven to refusal at a depth of approximately 55 feet below grade. These piles will achieve a nominal resistance (ultimate capacity) of 345 kips. The computation was made for the pile to develop its total resistance in end bearing only. A resistance factor of 0.40 should be utilized in the design of the foundation system for redundant piles and the use of a wave equation analysis. A resistance factor of 0.65 could be used if dynamic pile monitoring is performed on the driven piles.

No significant surcharge loadings will be placed at the surface of the pile caps that would cause settlement of the overburden soils and subsequent down drag on the driven pipes. Likewise, the overburden soils are not susceptible to liquefaction and seismic settlement, so seismic induced down drag forces are also not anticipated.

The available lateral pile resistance was evaluated using the L-Pile computer model. Soil properties were obtained from the bridge abutment borings to model the soil profile. Shear loads of 3200 kips and 4600 kips were used in the model for the service and strength loading conditions, respectively. The results of these analyses are included in Appendix D and are summarized in Table 5.

**Table 5: L-pile Analysis Summary**

<b>Shear load, pounds</b>	<b>Pile Head Condition</b>	<b>Pile Axis</b>	<b>Pile Head Deflection, inches</b>	<b>Maximum Bending Moment, in-lbs</b>
3200	Free	Weak	.051	80,466
3200	Fixed	Weak	.016	79,681
4600	Free	Weak	.097	136,629
4600	Fixed	Weak	.023	89,775
3200	Free	Strong	.026	86,114
3200	Fixed	Strong	.010	99,424
4600	Free	Strong	.044	139,214
4600	Fixed	Strong	.014	143,239

The results indicate that under both loading conditions and pile head conditions that the deflection is very small and will not adversely affect the design of the pile foundations for this project.



## 6. Embankments

Embankment fills will be required for the roadway realignments and new construction while both cut and fill will be required for Ramp A. Ramp A fills will be made using the on-site cut soils while the roadway fills will be obtained from a nearby borrow source. The properties of the off-site borrow will be specified to provide a material that will meet performance requirements including subgrade support, settlement, and slope stability.

### A. Slope Stability

Preliminary slope stability analyses were performed on the Ramp A cut and fill section. These analyses were performed using the SLIDE 7.0 slope stability program (Rocscience, 2016) for both short term and long term conditions. Spencer's method was used for both static and pseudo-static conditions. The soil parameters used for each analysis are summarized in Table 6 which were derived from the soil borings performed to date and the laboratory test results. A surcharge of 250 psf was applied to the roadway to account for traffic loading. For the pseudo-static analysis, a horizontal seismic coefficient ( $k_h$ ) of 0.16, equal to the PGA, was used based on the shallow slope of less than 20 feet not requiring a wave scattering scaling factor.

**Table 6: Slope Stability Soil Parameters**

Soil Type	Moist Unit Weight, pcf	Total Stress Parameters		Effective Stress Parameters	
		Cohesion, psf	Angle of internal friction, degrees	Cohesion, psf	Angle of internal friction, degrees
Offsite fill	120	0	32	0	32
On site fill	120	288	26.5	0	31.5
Natural silts, 0 – 6 ft.	120	288	26.5	0	31.5
Natural silts, 6 to 40 ft.	125	400	32	0	36

The following table presents the calculated factors of safety and resistance factors of these analyses. These results are compared to the maximum Geotechnical Resistance Factors required per the SCDOT Geotechnical Design Manual, Table 9-9. Per the Design Manual, slope stability results are to be presented using LRFD design methodology so the Resistance Factors are also presented in the following table. The Resistance Factors are simply the inverse of the Factor of Safety (1/FS). The results of each analysis are included in Appendix E.

**Table 7: Global Embankment Slope Stability Results Summary**

Location	Loading Condition	Factor of Safety		Resistance Factor		Figure
		Analysis	Required SCDOT	Analysis	Required SCDOT	
Ramp A Cut Slope – Sta. 1106+00	Effective Stress	1.70	1.66	.59	0.60	D1
	Total Stress	1.70	1.66	.59	0.60	D2
	Earthquake loading	1.20	1.11	.83	0.90	D3
Ramp A Embankment Fill – Sta. 1106+00	Effective Stress	2.86	1.54	.35	0.65	D4
	Total Stress	2.86	1.54	.25	0.65	D5
	Earthquake loading	1.71	1.11	.58	0.90	D6
Ramp A Embankment Fill – Sta. 1110+00	Effective Stress	1.47	1.54	.68	0.65	D7
	Total stress	1.52	1.54	.66	0.65	D8
	Earthquake loading	1.06	1.11	.94	0.90	D9

Based on the above results, the proposed cut and fill slopes for Ramp A, Station 1101+00 meet the requirements as specified in the SCDOT GDM. The embankment at Station 1110+00 is marginal with respect to an adequate factor of safety (resistance factor) and will depend greatly on the soil properties off the embankment fill. The final geotechnical report will revisit the final design slope and the soil properties required to meet current design criteria.

## **B. Embankment Construction**

Embankments required for the new and existing roadways will be constructed from off-site borrow. Per SCDOT 2017 Standard Specifications for Highway Construction, Section 203.2.1.8, borrow materials for Lexington County are classified as Group B. Borrow materials in Group B require AASHTO soils A-1, A-2-4, A-2-5, A-2-6(0), A-3, and A-4(0) to be used within the top 18 inches of the embankment. Below a depth of 18 inches, A-1, A-2, A-3, A-4, and A-5 soils may be used. Below the top 5 feet of the embankment, A-6 soils may be used. The borrow materials will need to comply with these requirements. In addition, to satisfy the slope stability requirements for the planned 2H:1V fill slopes, the borrow materials should have an effective angle of internal friction of 32 degrees.

For the cut and fill required for Ramp A (Boring 36) the materials from the cut will likely be A-4 soils, suitable to be placed below a depth of 18 inches. However, the upper 18 inches of fill material will need to be imported to satisfy the SCDOT specifications.

## **C. Settlement**

Settlements of the embankment fills required for Ramp A have been computed. Elastic settlement resulting from the 10 feet of embankment fill placed on the foundation soils is estimated to be 1.5 inches (Appendix F). Additional post construction settlements of the embankment fill soils should be anticipated if the on-site silts are used for the embankment. For the ML silt soils a typical compression value would be 0.9 percent (DM-7, 7.2, Table 1, 1986). For the 10 foot fill height, an additional compression of 1 inch

should be expected for a total settlement of 2.5 inches at the high point of the fill placement which will occur at the crest of the fill due to the sloping foundation grade.

Approximately 15 feet of fill will be placed for New Road 1 near Station 422+00, in the area of Boring 3. Settlement in the foundation soils are estimated to be 3 inches. Additional post construction settlements in the embankment fill soils should be expected depending on the type of soil used to construct the embankment. If high quality sands and gravel are used, post construction settlements would be negligible. However, if soils similar to the on-site silts are used, embankment fill settlements could approach 1.25 inches. Therefore, total settlements will likely be in the range of 3 to 4 inches.

## **7. Report Limitations**

We have prepared this Preliminary Bridge/Roadway Geotechnical Report to be used in the preliminary design of the S-48 (Columbia Avenue) Corridor Improvements. The preliminary analysis was based on the preliminary geotechnical subsurface exploration performed by Terracon Consultants, Inc. dated May 20, 2016, information provided by SCDOT, and other information as discussed in this report. This report was prepared in generally accepted geotechnical engineering practices and procedures, no other warranty, either expressed or implied, is made. This report does not reflect variations which can and do occur between boring locations, the nature and extent of which may not become evident until construction begins. If variations are encountered, it may be necessary to make a re-evaluation of the recommendations of this report after making on-site observations and noting the characteristics of these variations.

The water level data collected during this preliminary exploration was very limited due to the drilling techniques used to advance the borings. In addition, water levels will vary seasonally and annually. Additional groundwater data collection will be part of the final subsurface exploration program.

**Appendix A.      Geotechnical Data Report, Terracon Consultants, Inc.  
May 20, 2016**

# Geotechnical Data Report

**S-48 (Columbia Avenue) Corridor Improvements  
Lexington County, South Carolina**

May 20, 2016

SCDOT Project Pin: 42383

Terracon Project No. 73155095

**Prepared for:**

Mead & Hunt

Lexington, South Carolina

**Prepared by:**

Terracon Consultants, Inc.

Columbia, South Carolina

Offices Nationwide  
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Established in 1965  
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# Terracon

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

May 20, 2016



Mead & Hunt, Inc.  
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Lexington, South Carolina 29072

Attn: Mr. Zack Haney, P.E.  
Transportation Project Manager

Re: Geotechnical Data Report  
S-48 (Columbia Avenue) Roadway Improvements  
Lexington County, South Carolina  
SCDOT Project Pin: 42383  
Terracon Project Number: 73155095

Dear Mr. Haney:

Terracon Consultants Inc. (Terracon) has completed the geotechnical exploration and testing services for the above referenced project. These services were conducted in general accordance with the Mead & Hunt, Inc. Scope of Services, dated May 1, 2014. This geotechnical data report presents the findings of the subsurface exploration and laboratory testing along with an overview of testing activities.

## 1.0 INTRODUCTION

Mead & Hunt, Inc. has contracted Terracon to perform subsurface exploration and laboratory testing for the S-48 (Columbia Avenue) Corridor Improvements in Lexington County, South Carolina. The corridor runs from Amicks Ferry Road to east of the intersection of Columbia Avenue and Comalander Drive along the proposed and existing right of way.

The purpose this work is to develop information relative to subsurface soil and groundwater conditions along the proposed and existing roadway alignment and at the bent locations for the S-48/I-26 interchange. This report presents the results of that work. No geotechnical recommendations are associated with the requested scope of study.

The following sections of this report contain a summary of the activities our field exploration and laboratory testing. The logs of the soil test borings, ReMi array, the Site Location Map and the Boring Location Plans are included in Appendix A of this report. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included in Appendix B of this report. Descriptions of the field exploration and laboratory testing are included in their respective appendices.



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Geotechnical



Environmental



Construction Materials



Facilities

## **2.0 PROJECT DESCRIPTION**

The project sites is located along the proposed and existing S-48 (Columbia Avenue) alignment near Chapin in Lexington County, SC as shown in Exhibits A-1 to A-7 in Appendix A. It is our understanding that the project will include the widening of S-48, improvement of the intersections and the removal/replacement of the existing bridge and will be replaced with a new wider structure on the existing or similar horizontal alignment. The existing bridge is a 4-span structure that is supported on a deep foundation system.

## **3.0 GEOTECHNICAL TESTING**

The geotechnical exploration for this project, including field and laboratory testing, was performed between December 3, 2015 and March 15, 2016. The results of our field work and our associated laboratory testing are included in Appendices A and B of this report.

### **3.1 Field Exploration**

Our field exploration at the site consisted of the following:

- Thirty Eight (38) Standard Penetration Test (SPT) Borings (B-1 through B-38)
- Geophysical testing consisting of three (1) Refraction Microtremor (ReMi) arrays (ReMi-1)

The shear wave velocity profile is provided in Appendix A. The 100-foot average shear wave velocity value shown on each profile is based on the data obtained below the fill embankment.

The tests were performed at the locations requested by Mead & Hunt. A description of our testing methods and graphical logs outlining the soil conditions at each test location are presented in Appendix A. Test locations were established in the field by Terracon and surveyed by Mead & Hunt after completion.

### **3.2 Laboratory Testing**

As directed in the Summary of Laboratory Assignment, dated February 24, 2016 by Mead & Hunt, the following laboratory tests were performed on the soil samples collected at the site:

- One-hundred twenty-four (124) Natural Moisture Content Tests (ASTM D2216)
- Seventy-nine (79) Atterberg Limits Tests (ASTM D4318)
- Seventeen (17) Sieve Analysis with Hydrometer (ASTM D422-63)
- Five (5) Standard Proctor Test (ASTM D698)
- Five (5) California Bearing Ratio Tests (ASTM D1883)
- Two (2) Tri-axial tests with Pore Pressure Tests (ASTM D4767)
- Eight (8) pH of Soils (ASTM D4972)



## Geotechnical Data Report

S-48 (Columbia Avenue) Corridor Improvements ■ Lexington County, SC  
May 20, 2016 ■ Terracon Project No. 73155095



- Eight (8) Water-Soluble Sulfate in Soils (ASTM C1580)
- Eight (8) Water-Soluble Chlorides in Soils (ASTM D1411)
- Eight (8) Measurement of Soil Resistivity Tests (ASTM G187)
- Six (6) Moisture, Ash, and Organic Matter Tests (ASTM D2974)
- Sixty-six (66) Sieve Analysis with #200 Wash Tests (ASTM D422-63)

The laboratory procedures and results of the laboratory tests are presented in Appendix B.

## 4.0 CLOSURE

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

Joseph D.M. Fredendall, E.I.T.  
Field Engineer

Phillip A. Morrison, P.E.  
Geotechnical Department Manager  
SC Registration No. 17275

### Attachments

Copies: Addressee (1 via email)  
File (1)

**APPENDIX A**  
**FIELD EXPLORATION**

- Exhibit A-1 – Site Location Map**
- Exhibits A-2 – A-7 – Boring Location Plans**
- Exhibit A-8 – Field Testing Summary**
- Exhibits A-9 – ReMi Results**
- Exhibit A-10 – Field Testing Description**
- Exhibit A-11 – Soil Description Terms**
- Exhibit A-12 to A-64 – Boring Logs**



AERIAL PHOTOGRAPHY PROVIDED BY  
MICROSOFT BING MAPS

DIAGRAM IS FOR GENERAL LOCATION ONLY,  
AND IS NOT INTENDED FOR CONSTRUCTION  
PURPOSES

Project Manager:  
PAM

Drawn by:  
JDF

Checked by:  
PAM

Approved by:  
PAM

Project No.  
73155095

Scale:  
AS SHOWN

File Name:  
A-1

Date:  
May, 2016

**Terracon**

521 Clemson Rd  
Columbia, SC 29229-4307

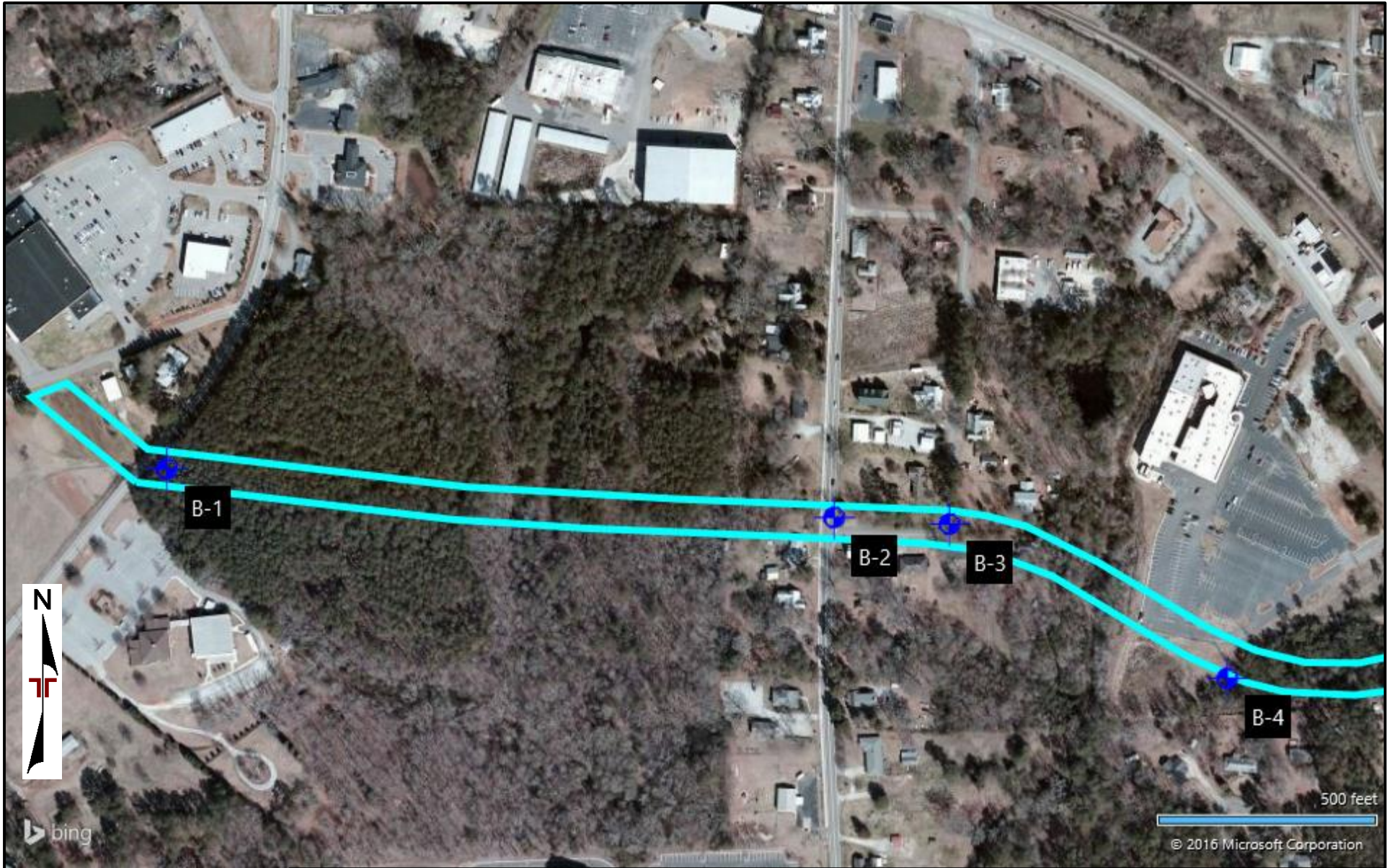
## SITE LOCATION PLAN

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, South Carolina

Exhibit

**A-1**





AERIAL PHOTOGRAPHY PROVIDED BY  
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DIAGRAM IS FOR GENERAL LOCATION ONLY,  
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PURPOSES

Project Manager: PAM  
Drawn by: JDF  
Checked by: PAM  
Approved by: PAM

Project No. 73155095  
Scale: AS SHOWN  
File Name: A-2  
Date: May, 2016

**Terracon**  
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Columbia, SC 29229-4307

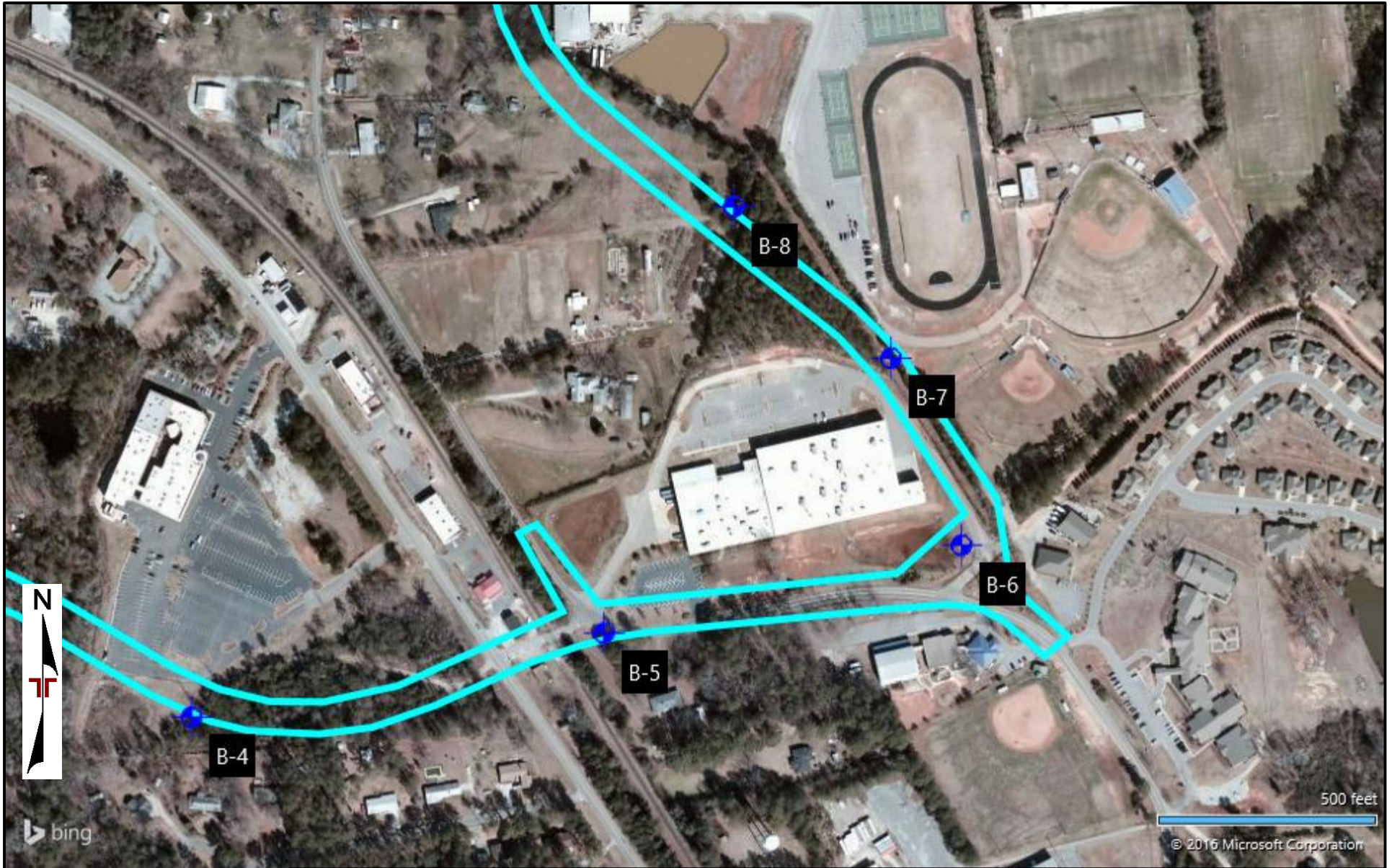
## BORING LOCATION PLAN

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, South Carolina

Exhibit

A-2





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PURPOSES

Project Manager: PAM

Drawn by: JDF

Checked by: PAM

Approved by: PAM

Project No. 73155095

Scale: AS SHOWN

File Name: A-3

Date: May, 2016

**Terracon**

521 Clemson Rd  
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## BORING LOCATION PLAN

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, South Carolina

Exhibit

A-3





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DIAGRAM IS FOR GENERAL LOCATION ONLY,  
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PURPOSES

Project Manager: PAM  
Drawn by: JDF  
Checked by: PAM  
Approved by: JDF

Project No. 73155095  
Scale: AS SHOWN  
File Name: A-4  
Date: May, 2016

**Terracon**  
521 Clemson Rd  
Columbia, SC 29229-4307

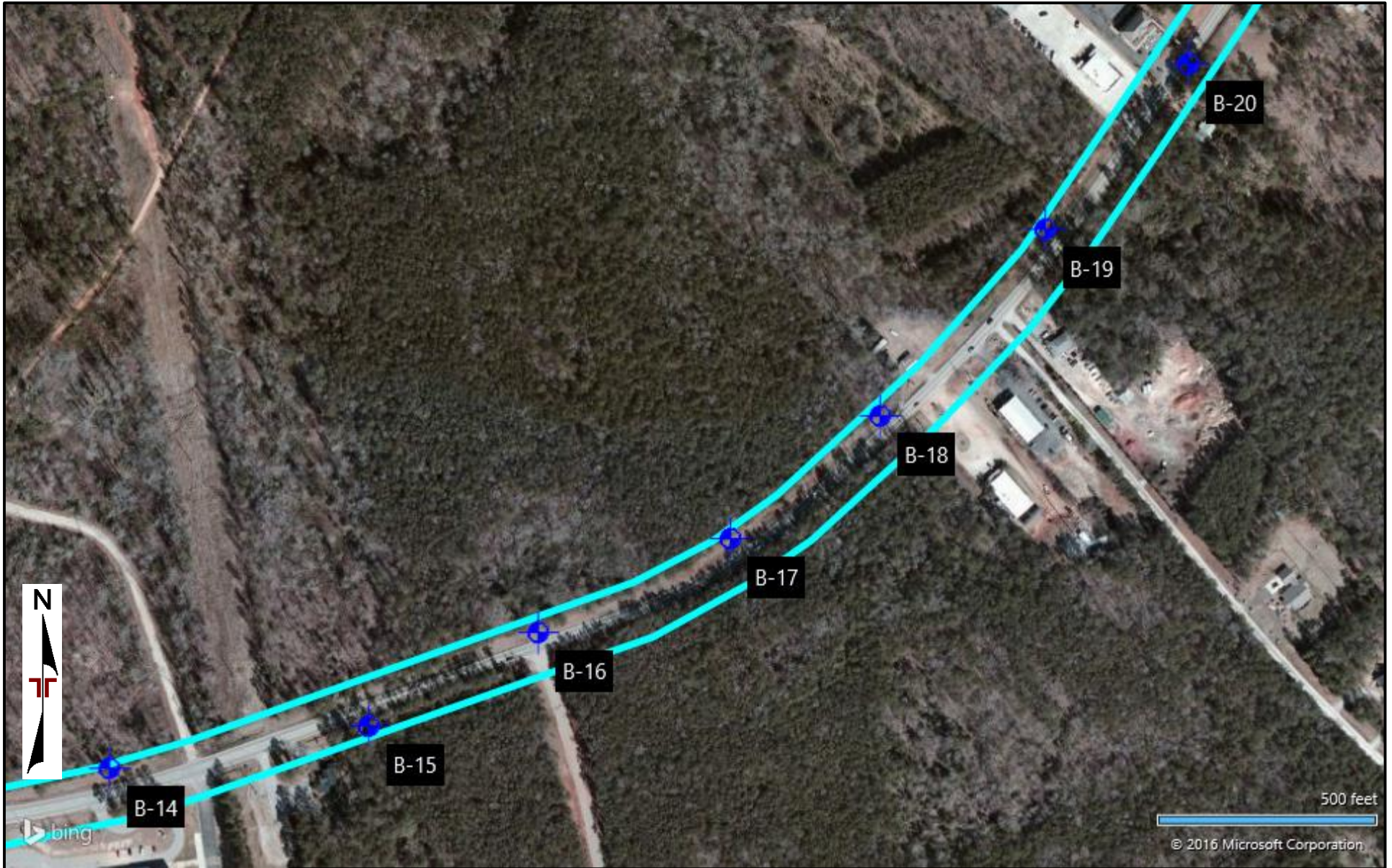
## BORING LOCATION PLAN

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, South Carolina

Exhibit

**A-4**





AERIAL PHOTOGRAPHY PROVIDED BY  
MICROSOFT BING MAPS

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PURPOSES

Project Manager: PAM  
Drawn by: JDF  
Checked by: PAM  
Approved by: PAM

Project No. 73155095  
Scale: AS SHOWN  
File Name: A-5  
Date: May, 2016

**Terracon**  
521 Clemson Rd  
Columbia, SC 29229-4307

## BORING LOCATION PLAN

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, South Carolina

Exhibit

A-5





AERIAL PHOTOGRAPHY PROVIDED BY  
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DIAGRAM IS FOR GENERAL LOCATION ONLY,  
AND IS NOT INTENDED FOR CONSTRUCTION  
PURPOSES

Project Manager: PAM  
Drawn by: JDF  
Checked by: PAM  
Approved by: PAM

Project No. 73155095  
Scale: AS SHOWN  
File Name: A-6  
Date: May, 2016

**Terracon**  
521 Clemson Rd  
Columbia, SC 29229-4307

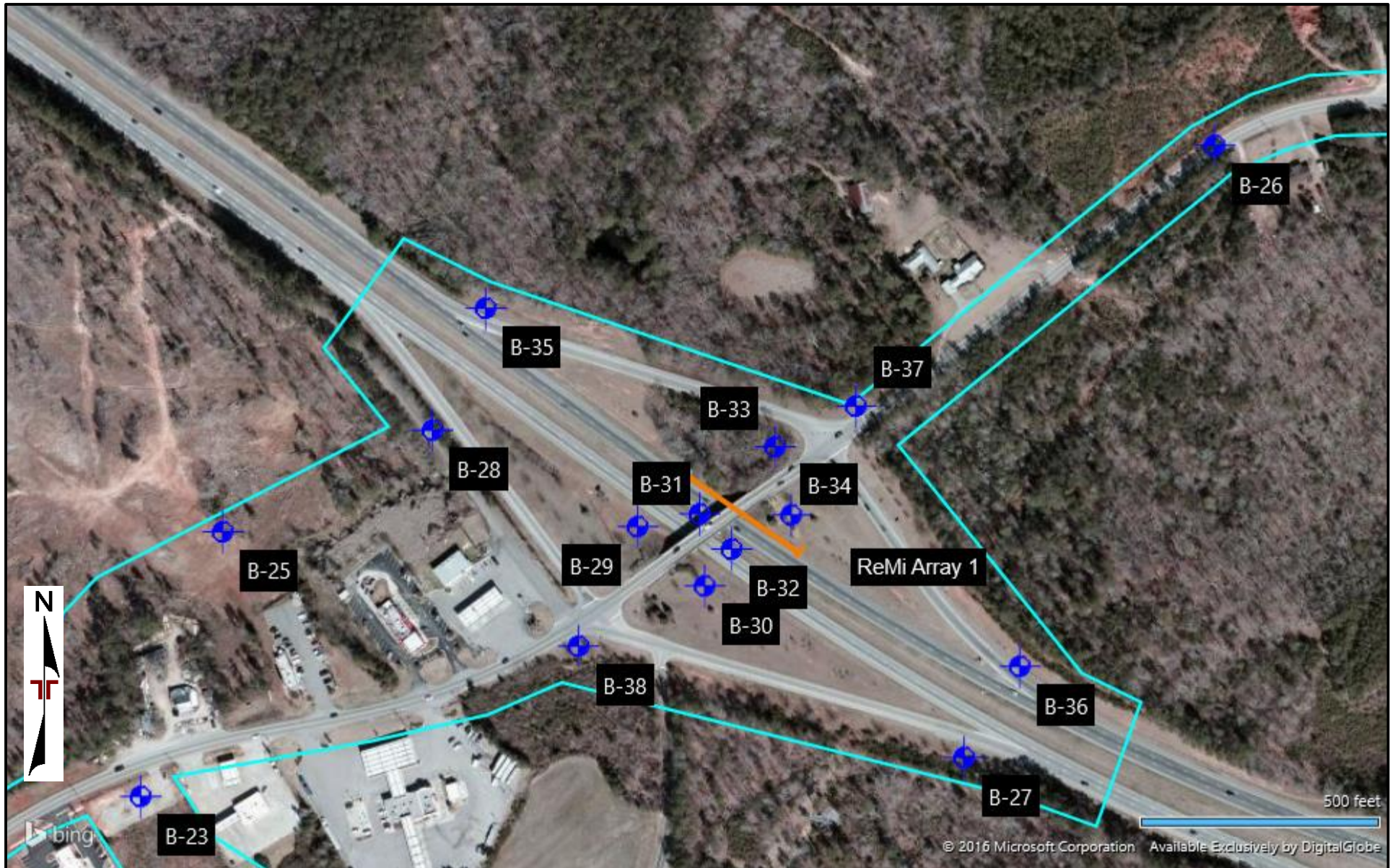
## BORING LOCATION PLAN

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, South Carolina

Exhibit

A-6





AERIAL PHOTOGRAPHY PROVIDED BY  
MICROSOFT BING MAPS

DIAGRAM IS FOR GENERAL LOCATION ONLY,  
AND IS NOT INTENDED FOR CONSTRUCTION  
PURPOSES

Project Manager:  
PAM

Drawn by:  
JDF

Checked by:  
PAM

Approved by:  
PAM

Project No.  
73155095

Scale:  
AS SHOWN

File Name:  
A-7

Date:  
May, 2016

**Terracon**

521 Clemson Rd  
Columbia, SC 29229-4307

## BORING LOCATION PLAN

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, South Carolina

Exhibit

**A-7**

**Geotechnical Data Report**

S-48 (Columbia Avenue) Corridor Improvements ■ Lexington County, SC

May 20, 2016 ■ Terracon Project No. 73155095

**Field Testing Summary**

Boring No.	Ground Elevation (ft)	Test Depth (ft)	Northing	Easting	Latitude	Longitude
B-01	445.2	20	847763.7	1892581.6	34.16290765	-81.35513975
B-02	458.6	20	847648.2	1894109.7	34.16260462	-81.35008638
B-02 BULK	458.6	5	847649.2	1894110.7	34.16260462	-81.35008702
B-03	461.6	20	847632.3	1894373.7	34.16256333	-81.34921337
B-04	440.7	20	847278.7	1895009.0	34.16159761	-81.34710920
B-05	464.8	20	847467.0	1895953.8	34.16212374	-81.34398747
B-05 BULK	464.8	5	847467.0	1895954.8	34.16212256	-81.34398747
B-06	458.7	20	847664.9	1896773.4	34.16267513	-81.34127990
B-07	472.7	20	848091.8	1896613.1	34.16384685	-81.34181472
B-08	466.9	20	848438.3	1896254.7	34.16479581	-81.34300346
B-09	472.8	20	849036.8	1895713.6	34.16643581	-81.34479901
B-10	474.3	20	849414.4	1895779.1	34.16747400	-81.34458671
B-11	475.7	20	849447.4	1896191.8	34.16756856	-81.34322259
B-12	478.5	20	849488.3	1896753.8	34.16768591	-81.34136484
B-12 BULK	478.5	5	849488.3	1896755.8	34.16768591	-81.34136394
B-13	470.0	20	849576.7	1897098.0	34.16793200	-81.34022765
B-14	456.2	20	849688.4	1897603.7	34.16824360	-81.33855704
B-15	457.0	20	849782.6	1898197.6	34.16850779	-81.33659435
B-16	470.8	20	849995.0	1898586.4	34.16909514	-81.33531114
B-17	456.2	20	850207.5	1899027.2	34.16968294	-81.33385583
B-18	440.7	20	850486.5	1899371.2	34.17045271	-81.33272162
B-19	439.6	20	850911.0	1899750.7	34.17162268	-81.33147126
B-20	433.5	20	851284.4	1900075.3	34.17265171	-81.33040187
B-20 BULK	433.5	5	851285.4	1900076.3	34.17265205	-81.33040296
B-21	421.0	20	851710.7	1900310.7	34.17382553	-81.32962803
B-22	416.3	20	852193.5	1900673.1	34.17515553	-81.32843476
B-23	422.1	20	852387.9	1901206.3	34.17569435	-81.32667372

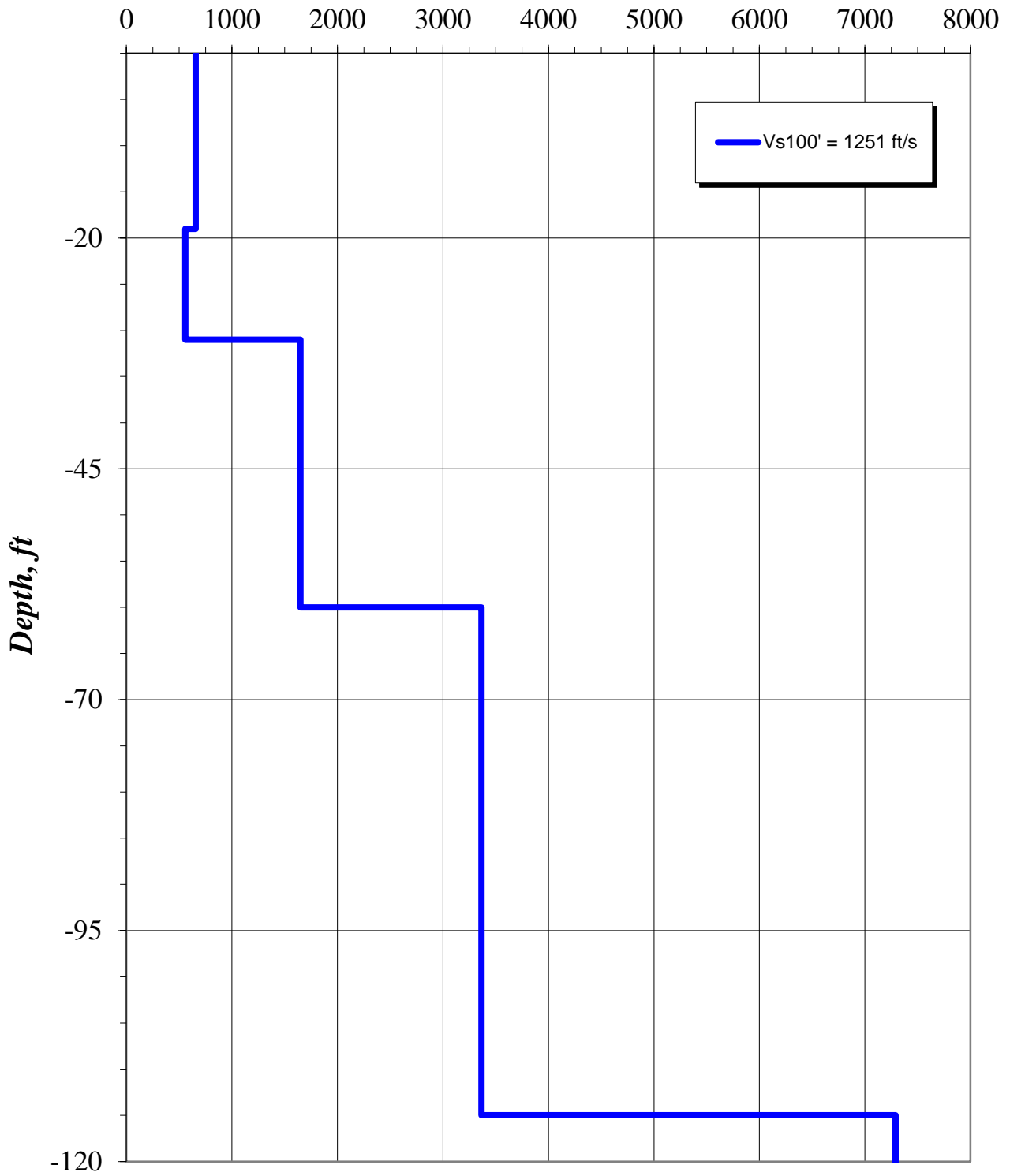
**Geotechnical Data Report**

S-48 (Columbia Avenue) Corridor Improvements ■ Lexington County, SC  
May 20, 2016 ■ Terracon Project No. 73155095



Boring No.	Ground Elevation (ft)	Test Depth (ft)	Northing	Easting	Latitude	Longitude
B-24	390.4	20	851667.6	1902132.5	34.17372281	-81.32360384
B-25	406.9	20	852939.8	1901380.1	34.17721259	-81.32610491
B-26	392.9	20	853740.0	1903461.0	34.17942959	-81.31923207
B-26 BULK	392.9	5	853740.0	1903462.0	34.17942865	-81.31923108
B-27	390.1	30	852463.8	1902932.3	34.17591777	-81.32096728
B-28	387.8	30	853150.5	1901820.4	34.17779560	-81.32465110
B-29	392.8	103.5	852947.9	1902249.8	34.17724242	-81.32322918
B-30	399.4	120	852823.8	1902389.8	34.17690257	-81.32276508
B-31	390.2	105	852974.2	1902379.7	34.17731581	-81.32280001
B-32	391.9	98.5	852900.4	1902446.6	34.17711363	-81.32257805
B-33	397.8	107.5	853113.7	1902538.5	34.17770061	-81.32227634
B-34	396.2	120	852971.2	1902571.7	34.17730917	-81.32216508
B-35	377.7	30	853404.6	1901932.6	34.17849480	-81.32428267
B-36	383.2	30	852653.6	1903049.7	34.17644057	-81.32058116
B-37	402.6	50	853198.1	1902707.9	34.17793384	-81.32171697
B-38	410.8	50	852698.6	1902125.1	34.17655625	-81.32363898

# *Shear-Wave Velocity, ft/s*



Project Mngr.	JDF
Drawn By:	PTK
Checked By:	JDF
Approved By:	PAM
Project No.	73155095
Scale:	As Shown
File Name:	A-9
Date:	May, 2016

**Terracon**  
Consulting Engineers & Scientists

521 CLEMSON ROAD COLUMBIA, SC 29229  
PH. (803) 741-9000 FAX. (803) 741-9900

## **SHEAR WAVE VELOCITY PROFILE**

Columbia Avenue(S-48) Roadway  
Improvements  
Lexington County, South Carolina

Exhibit

**A-9**



## **FIELD EXPLORATION DESCRIPTION**

### **Overview**

The testing locations were provided by Mead & Hunt and located in the field by Terracon by taking measurements from existing structures shown on the provided drawings. The borings were surveyed by Mead & Hunt after testing and drilling was complete. The locations as shown in the Exploration Location Plan are shown to the scale indicated.

A field log of each test location was prepared by our engineer. The final boring logs included with this report represent the engineer's description of the encountered conditions modified as necessary based on laboratory test results of the individual samples.

### **Soil Test Borings (STB)**

All boring and sampling operations were conducted in general accordance with the following procedures:

- SCDOT Geotechnical Design Manual 2010
- ASTM D5783, "Standard Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geo-environmental Exploration"
- ASTM D1586 "Test Method for Penetration Test and Split-Barrel Sampling of Soils"
- ASTM D4220 "Standard Practices for Preserving and Transporting Soil"

Each soil test boring was advanced using rotary wash drilling techniques. Five samples were collected in the upper 10 feet. Below that depth, samples were obtained at 5 foot intervals. Soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-barrel sampler, also known as a standard split-spoon. The sampler is advanced into the soil a total of 18 inches by striking the drill rod using a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler for each of three, 6-inch increments is recorded. The sum of the number of blows for the second and third increments is called the "Standard Penetration Value", or N-value ( $N_{meas}$ , blows per foot). The N-value, when properly evaluated, is an index to the soil strength.

Soil Classification provides a general guide to the engineering properties of various soil types and enables the engineer to apply his experience to current situations. In our exploration, samples obtained during drilling operations are examined and visually classified by a geotechnical engineer using the procedures outlined in ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). Laboratory testing was also performed on select split-spoon samples to evaluate index properties for further classification. The soils are described according to color, texture, and relative density or consistency (based on standard penetration resistance). The designations shown on the logs are described on Exhibit A-11 and Exhibit C-2.

**Geotechnical Data Report**

S-48 (Columbia Avenue) Corridor Improvements ■ Lexington County, SC

May 20, 2016 ■ Terracon Project No. 73155095



Due to the drilling method (i.e. rotary wash), time-of-drilling water levels were not be recorded. The 24-hour groundwater readings were collected from those borings that could be maintained open overnight (those not in the existing roadways) and are indicated on the boring logs. At the conclusion of the work, the boreholes were backfilled with drill cuttings and capped with cold-patch asphalt. Those in the interstate right-of-way were backfilled with a cement-bentonite grout.

**Seismic Surface Wave Testing**

Terracon utilized the SeisOpt® ReMi™ method to develop the full depth shear wave velocity profile at the site for use in determining the seismic site class. This method employs non-linear optimization technology to derive one-dimensional S-wave velocities from refraction microtremor (ambient noise) recordings using a typical seismograph and standard, low frequency, refraction geophones. We utilized 12 receivers (geophones) set along a straight-line array with a 27±-foot receiver spacing for a total length of about 345 feet along Array 1 shown on the attached Boring Location Plans (Exhibits A-2 and A-3). Unfiltered, 30-second records were recorded using the background 'noise' created by the moving traffic and other ambient vibrations. The collected data, the response spectrum in the 5 to 40 Hz range, was processed using the computer software SeisOpt® ReMi™ by Optim, LLC with the results plotted as a conventional shear wave velocity vs. depth profile. The shear wave velocity profile obtained using the SeisOpt® ReMi™ data reduction method is shown on Exhibit A-9.

## SOIL DESCRIPTION TERMS

### Relative Density/Consistency Terms

#### Relative Density<sup>1</sup>

Descriptive Term	Relative Density	SPT Blow Count	Descriptive Term	Unconfined Compression Strength (q <sub>u</sub> ) (tsf)	SPT Blow Count
Very Loose	0 to 15%	4 and less	Very Soft	0.25 and less	2 and less
Loose	16 to 35%	5 to 10	Soft	0.26 to 0.50	3 to 4
Medium Dense	36 to 65%	11 to 30	Firm	0.51 to 1.00	5 to 8
Dense	66 to 85%	31 to 50	Stiff	1.01 to 2.00	9 to 15
Very Dense	86 to 100%	51 and more	Very Stiff	2.01 to 4.00	16 to 30
			Hard	4.01 and more	31 and more

### Moisture Condition

#### Descriptive Term

#### Criteria

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually in coarse-grained soils below the water table

### Color

Describe the sample color while sample is still moist.

### Angularity<sup>1</sup>

#### Descriptive Term

#### Criteria

Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

### HCl Reaction<sup>3</sup>

#### Descriptive Term

#### Criteria

None Reactive	No visible reaction
Weakly Reactive	Some reaction, with bubbles forming slowly
Strongly Reactive	Violent reaction, with bubbles forming immediately

### Cementation<sup>3</sup>

#### Descriptive Term

#### Criteria

Weakly Cemented	Crumbles or breaks with handling or little finger pressure
Moderately Cemented	Crumbles or breaks with considerable finger pressure
Strongly Cemented	Will not crumble or break with finger pressure

### Particle-Size Range<sup>1</sup>

<u>Gravel</u>	Diameter, mm	Sieve Size	<u>Sand</u>	Diameter, mm	Sieve Size
Fine	4.76 to 19.1	#4 to ¾ inch	Fine	0.074 to 0.42	#200 to #40
Coarse	19.1 to 76.2	¾ inch to 3 inch	Medium	0.42 to 2.00	#40 to #10
			Coarse	4.00 to 4.76	#10 to #4

### Primary Soil Type<sup>1, 2</sup>

The primary soil type will be shown in all capital letters.

### USCS Soil Designation

Indicate USCS soil designation as defined in ASTM D-2487 and D-2488

### AASHTO Soil Designation

Indicate AASHTO soil designation as defined in AASHTO M-145 and ASTM D-3282

<sup>1</sup> Applies to coarse-grained soils (major portion retained on No. 200 sieve)

<sup>2</sup> Applies to fine-grained soils (major portion passing No. 200 sieve)

<sup>3</sup> Use as required

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-01
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	445.2 ft	<b>Latitude:</b>	34.16290765	<b>Longitude:</b>	-81.35513975
<b>Date Started:</b>	12/21/2015				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	12/22/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	74.2%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	2 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL X</div> <div>MC O</div> <div>LL X</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grassed Shoulder								
	0.3	Topsoil (3 inches)		0.0	SS-1	2	3	3	6	<div> <div>●</div> <div>X X</div> <div>▲</div> </div>
	2.0	<b>RESIDUUM</b> - Firm, moist, brown, lean CLAY (CL) (A-4) 7.5YR 4/4 @SS-1 LL=32, PL=23, PI=9, NMC=27.5, %200=91.6		2.0	SS-2	2	3	3	6	<div> <div>●</div> <div>O X</div> <div>▲</div> </div>
	4.0	Firm, moist, reddish yellow, Sandy fat CLAY (CH) (A-7-6) 7.5YR 6/8 @SS-2 LL=59, PL=29, PI=30, NMC=26.7, %200=53.9		4.0	SS-3	1	6	8	14	<div> <div>●</div> </div>
440.2	6.0	Stiff, dry, brown, SILT (ML) (A-4) 7.5YR 5/1 to 7.5 YR 5/2		6.0	SS-4	WOH	4	6	10	<div> <div>●</div> </div>
		Stiff to very stiff, dry, light brown, Sandy SILT (ML) (A-6) 7.5YR 6/1		8.0	SS-5	4	6	9	15	<div> <div>●</div> <div>O X</div> <div>▲</div> </div>
435.2		@SS-5 LL=40, PL=27, PI=13, NMC=24.3, %200=60.2								
				13.5	SS-6	9	13	17	30	<div> <div>●</div> </div>
430.2										
				18.5	SS-7	6	7	10	17	<div> <div>●</div> </div>
425.2	20.0	<b>Boring Terminated at 20 feet</b>								

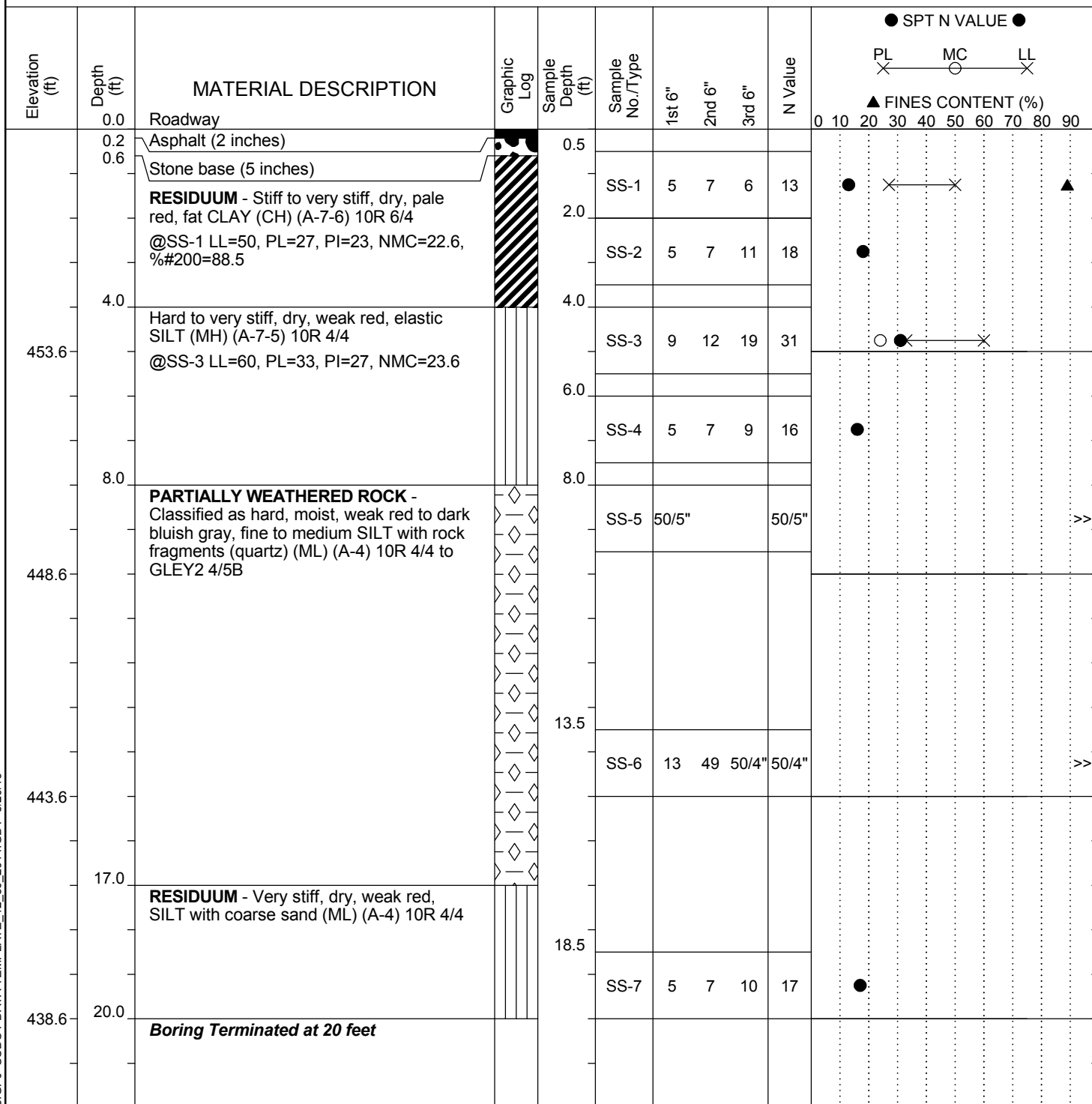
## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-02
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	458.6 ft	<b>Latitude:</b>	34.16260462	<b>Longitude:</b>	-81.35008638
<b>Date Started:</b>	1/11/2016				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/11/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.A.				



## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-02 BULK
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	458.6 ft	<b>Latitude:</b>	34.16260462	<b>Longitude:</b>	-81.35008702
<b>Date Started:</b>	1/11/2016				
<b>Total Depth:</b>	5 ft	<b>Soil Depth:</b>	5 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/11/2016				
<b>Bore Hole Diameter (in):</b>	6-1/2	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	HSA	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.E.
<b>24HR</b>	N.A.				

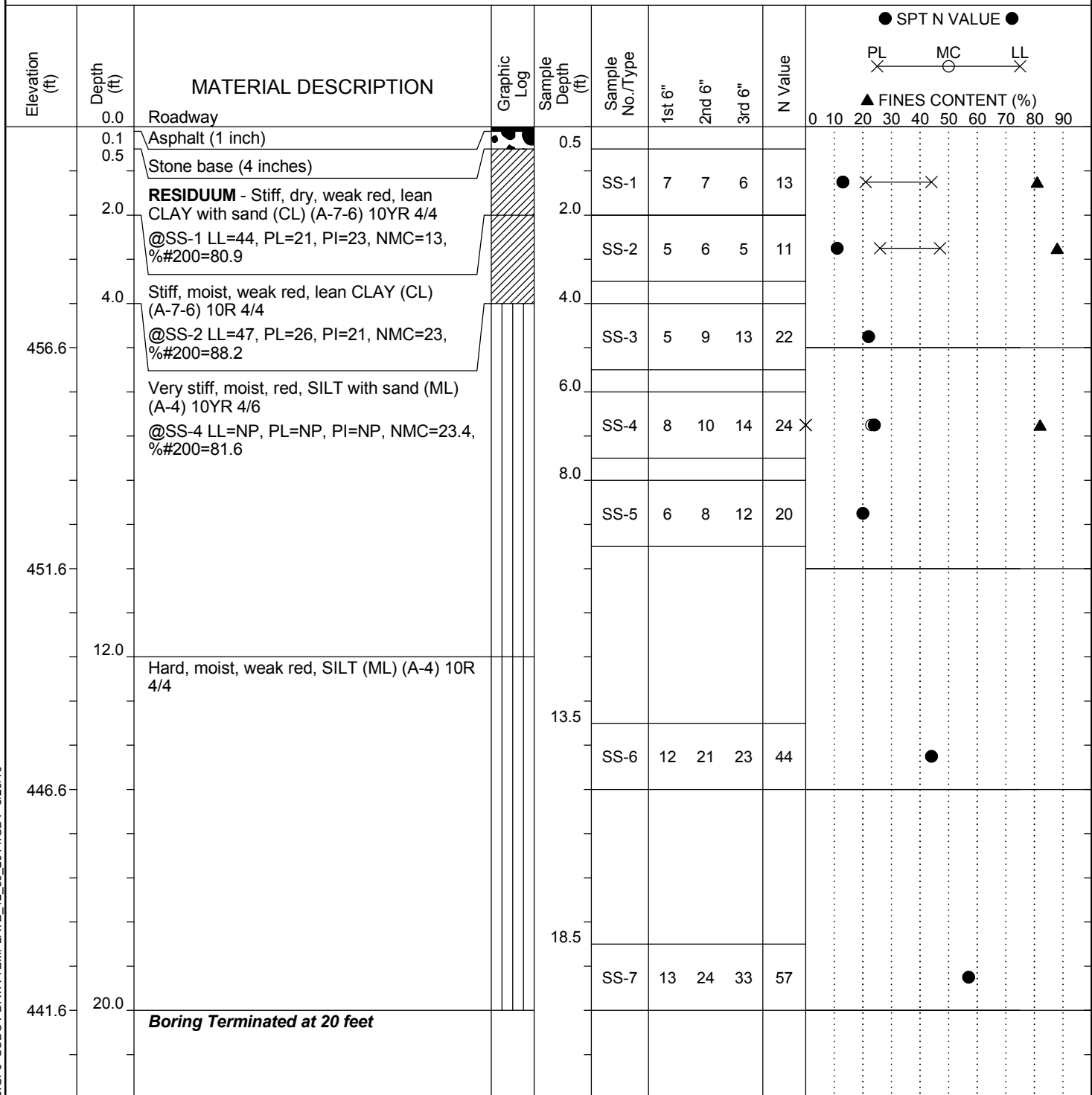
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE ● PL — MC — LL ▲ FINES CONTENT (%)
	0.0	Roadway								0 10 20 30 40 50 60 70 80 90
	0.2	Asphalt (2 inches)		0.0						
	0.6	Stone base (5 inches)								
		<b>RESIDUUM</b> - Dry, pale red, sandy silty CLAY with gravel (CL-ML) (A-4) 10R 6/4 LL=25, PL=18, PI=7, NMC=16, %200=56								
453.6	5.0	<b>Boring Terminated at 5 feet</b>								
448.6										
443.6										
438.6										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-03		
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48	
Eng./Geo.: JF		Boring Location: -			Offset: -		Alignment: Proposed	
Elev.: 461.6 ft		Latitude: 34.16256333		Longitude: -81.34921337		Date Started:		1/11/2016
Total Depth: 20 ft		Soil Depth: 20 ft		Core Depth: 0 ft		Date Completed:		1/11/2016
Bore Hole Diameter (in): 2.94		Sampler Configuration			Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-45C		Drill Method: RW		Hammer Type: Automatic		Energy Ratio:		71.8%
Core Size: N.A.		Driller: JP		Groundwater: TOB N.A.		24HR		N.A.



## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-04
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	440.7 ft	<b>Latitude:</b>	34.16159761	<b>Longitude:</b>	-81.3471092
<b>Date Started:</b>	1/12/2016				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/13/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	5 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grassed Lawn								
	0.3	Topsoil (4 inches)		0.0	SS-1	2	4	4	8	
	2.0	<b>RESIDUUM</b> - Firm, moist, light red, lean CLAY (CL) (A-7-6) 10R 6/8 @SS-1 LL=46, PL=22, PI=24, NMC=25.6, %200=88.1  Stiff to very stiff, moist, red, lean CLAY (CL) (A-7-6) 10R 5/8 @SS-2 LL=43, PL=26, PI=17, NMC=23.7, %200=89.7		2.0	SS-2	2	4	6	10	
435.7	6.0	Stiff, moist, reddish yellow, fat CLAY (CH) (A-7-6) 5YR 7/8 @SS-4 LL=54, PL=23, PI=31, NMC=23.2		4.0	SS-3	4	8	11	19	
				6.0	SS-4	3	6	7	13	
430.7				8.0	SS-5	3	5	9	14	
	12.0	Very stiff, moist, reddish yellow, Sandy SILT (ML) (A-4) 5YR 6/6		13.5	SS-6	6	12	16	28	
425.7				18.5	SS-7	7	9	11	20	
420.7	20.0	<b>Boring Terminated at 20 feet</b>								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-05		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	JF		Boring Location:	-		Offset:	-		Alignment:	Proposed	
Elev.:	464.8 ft		Latitude:	34.16212374		Longitude:	-81.34398747		Date Started:	1/15/2016	
Total Depth:	20 ft		Soil Depth:	20 ft		Core Depth:	0 ft		Date Completed:	1/19/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-550X		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	74.2%	
Core Size:	N.A.		Driller:	AL		Groundwater:	TOB	N.A.		24HR	N.E.

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL MC LL </div> <div> ▲ FINES CONTENT (%) </div> </div>
	0.0	Unimproved Shoulder								
	2.0	RESIDUUM - Stiff, dry, weak red, elastic SILT (MH) (A-7-5) 10R 4/4 @SS-1 LL=66, PL=37, PI=29, NMC=26.6, %200=93.1		0.0	SS-1	5	6	8	14	● ○ × — × ▲
	4.0	Hard, dry, weak red, elastic SILT (MH) (A-7-5) 10R 4/4 @SS-2 LL=72, PL=39, PI=33, NMC=25.3, %200=94.9		2.0	SS-2	10	17	19	36	○ ● × — × ▲
459.8		Very stiff to stiff, dry, weak red, elastic SILT (MH) (A-7-5) 10R 4/4		4.0	SS-3	6	8	9	17	●
				6.0	SS-4	4	6	9	15	●
454.8				8.0	SS-5	2	4	5	9	●
	12.0	Stiff to very stiff, dry, dark yellowish brown, SILT (ML) (A-4) 10YR 4/6		13.5	SS-6	4	6	7	13	●
449.8				18.5	SS-7	3	6	10	16	●
444.8	20.0	<b>Boring Terminated at 20 feet</b>								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-05 BULK
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	464.8 ft	<b>Latitude:</b>	34.16212256	<b>Longitude:</b>	-81.34398747
<b>Date Started:</b>	1/15/2016				
<b>Total Depth:</b>	5 ft	<b>Soil Depth:</b>	5 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/15/2016				
<b>Bore Hole Diameter (in):</b>	6-1/2	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	HSA	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.E.
<b>24HR</b>	N.A.				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE ● PL — MC — LL ▲ FINES CONTENT (%)
	0.0	Unimproved Shoulder								0 10 20 30 40 50 60 70 80 90
		<b>RESIDUUM</b> - Dry, weak red, SILT (ML) (A-5) 10R 4/4 LL=43, PL=35, PI=8, NMC=25.9, %200=90.7		0.0						
459.8	5.0	<b>Boring Terminated at 5 feet</b>								
454.8										
449.8										
444.8										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-06
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	458.7 ft	<b>Latitude:</b>	34.16267513	<b>Longitude:</b>	-81.3412799
<b>Date Started:</b>	1/15/2016				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/19/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	74.2%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.E.				

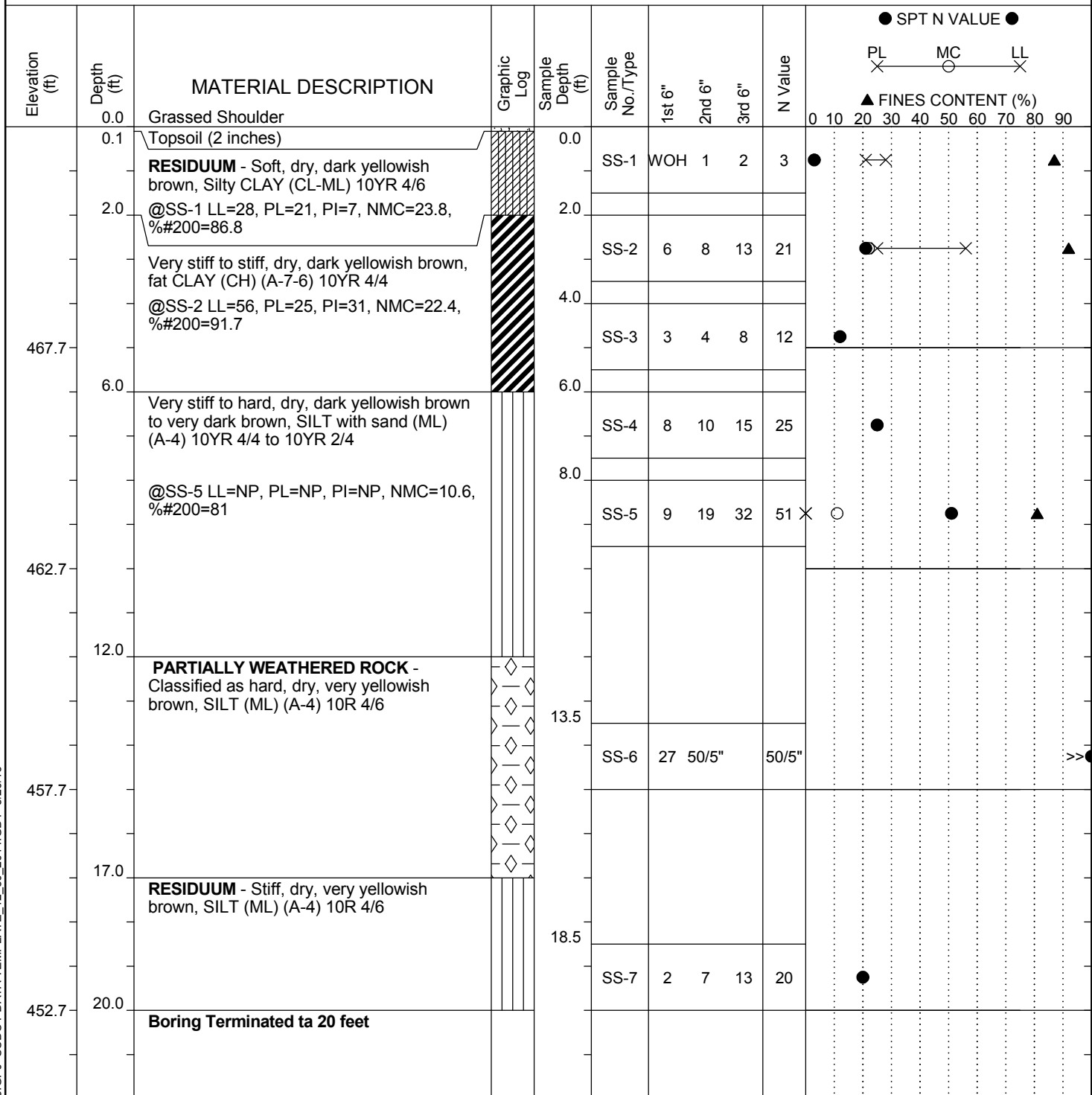
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grassed Shoulder								
	0.1	Topsoil (1 inch)		0.0	SS-1	3	1	2	3	●
	2.0	<b>FILL</b> - Soft, dry, dark yellowish brown, lean CLAY (CL) (A-6) 10YR 4/6 @SS-1 LL=37, PL=21, PI=16, NMC=22.5, %200=85.8		2.0	SS-2	2	2	4	6	●
		<b>FILL</b> - Firm, dry, dark yellowish brown, lean CLAY (CL) (A-6) 10YR 4/6 @SS-2 LL=41, PL=22, PI=19, NMC=25.6, %200=91.5 @SS-3 NMC=27		4.0	SS-3	3	3	3	6	●
453.7	6.0	<b>RESIDUUM</b> - Very stiff, dry, dark yellowish brown, elastic SILT with sand (MH) (A-7-5) 10YR 4/4 @SS-4 LL=57, PL=32, PI=25, NMC=26.4, %200=79.6 Stiff, dry, reddish brown, SILT (ML) (A-4) 5YR 4/4		6.0	SS-4	5	8	9	17	●
	8.0			8.0	SS-5	4	6	8	14	●
448.7	12.0	Very stiff, dry, brown, SILT (ML) (A-4) 10YR 4/3		13.5	SS-6	4	8	12	20	●
443.7				18.5	SS-7	8	10	11	21	●
438.7	20.0	Boring Terminated at 20 feet								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-07
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	472.7 ft	<b>Latitude:</b>	34.16384685	<b>Longitude:</b>	-81.34181472
<b>Date Started:</b>	2/4/2016				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	2/5/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	CF	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.E.				



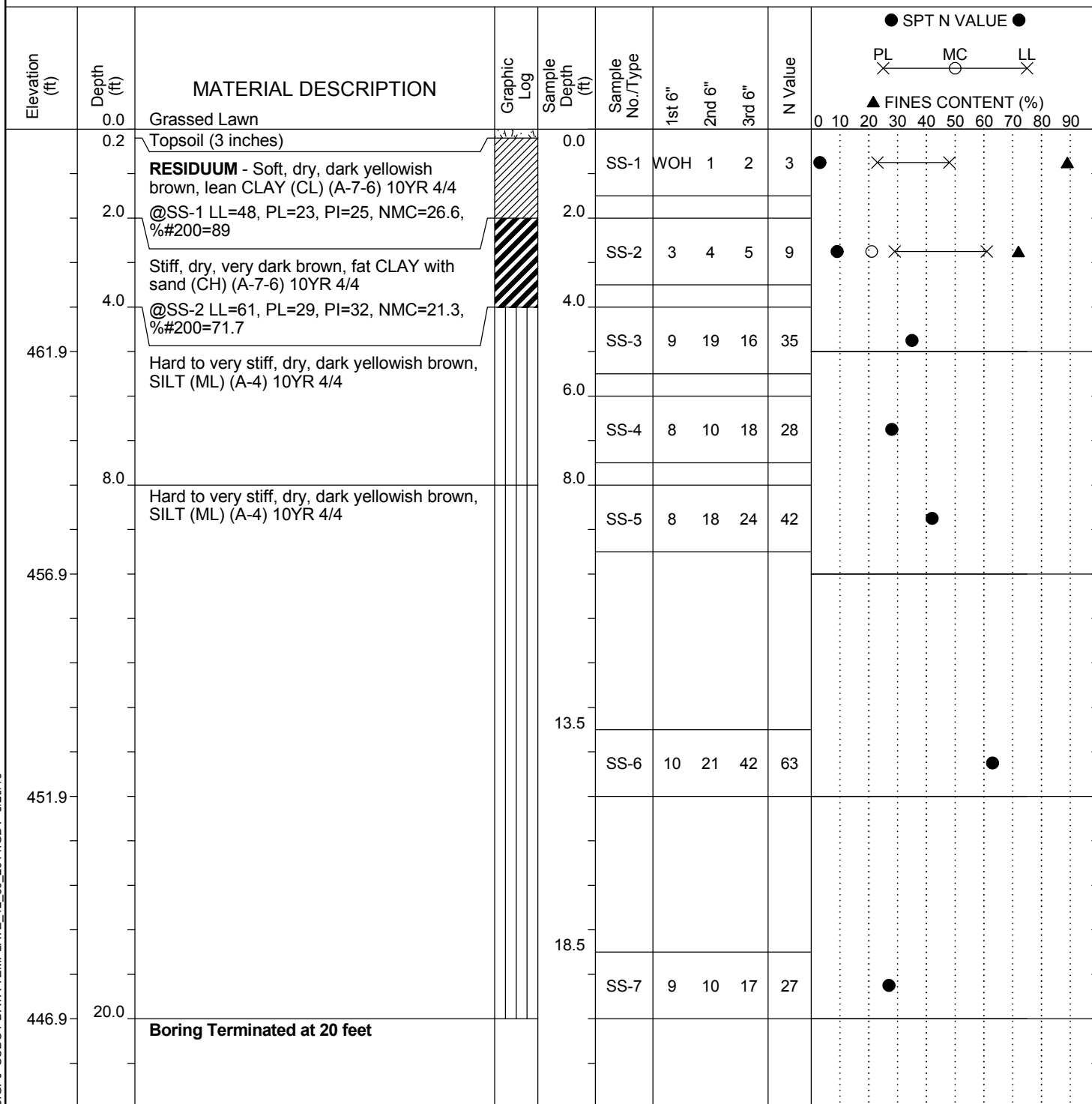
## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-08
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	466.9 ft	<b>Latitude:</b>	34.16479581	<b>Longitude:</b>	-81.34300346
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Date Started:</b>	2/4/2016
<b>Core Depth:</b>	0 ft	<b>Date Completed:</b>	2/5/2016		
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Energy Ratio:</b>	81.9%
<b>Core Size:</b>	N.A.	<b>Driller:</b>	CF	<b>Groundwater:</b>	TOB N.A.
				<b>24HR</b>	N.E.



## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-09		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	RS		Boring Location:	-		Offset:	-		Alignment:	Proposed	
Elev.:	472.8 ft		Latitude:	34.16643581		Longitude:	-81.34479901		Date Started:	1/12/2016	
Total Depth:	20 ft		Soil Depth:	20 ft		Core Depth:	0 ft		Date Completed:	1/13/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-45C		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	71.8%	
Core Size:	N.A.		Driller:	JP		Groundwater:	TOB	N.A.		24HR	6 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL X</div> <div>MC ○</div> <div>LL X</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grassed Lawn								
	0.3	Topsoil (3 inches)		0.0	SS-1	3	7	7	14	●
	2.0	<b>FILL</b> - Stiff, dry, red, lean CLAY with crushed aggregate (CL) (A-6) 5R 5/8 @SS-1 NMC=20.1, %200=73.0		2.0						
		<b>RESIDUUM</b> - Very stiff, dry, light red, SILT with sand (ML) (A-4) 10R 6/8 @SS-2 LL=NP, PL=NP, PI=NP, NMC=23.8, %200=82.9		4.0	SS-2	9	11	11	22 X	●
467.8					SS-3	6	9	8	17	●
	6.0	Stiff, dry, pale red, SILT with sand (ML) (A-4) 10R 6/4 @SS-5 NMC=38.9, %200=82.4		6.0	SS-4	4	5	6	11	●
462.8					SS-5	4	5	7	12	●
				13.5	SS-6	4	6	9	15	●
457.8										
				18.5	SS-7	4	6	9	15	●
452.8	20.0	<b>Boring Terminated at 20 feet</b>								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-10
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	474.3 ft	<b>Latitude:</b>	34.167474	<b>Longitude:</b>	-81.34458671
<b>Date Started:</b>	12/21/2015				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	12/22/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)	<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW
<b>Hammer Type:</b>	Automatic	<b>Energy Ratio:</b>	74.2%	<b>Core Size:</b>	N.A.
<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB	<b>N.A.</b>	24HR
<b>3 feet</b>					

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> </div> <div> <div>▲ FINES CONTENT (%)</div> <div>0 10 20 30 40 50 60 70 80 90</div> </div> </div>
	0.0	Grassed Shoulder								
	0.2	Topsoil (2 inches)		0.0	SS-1	2	3	3	6	<div> <div>●</div> <div> <div>×</div> <div>×</div> </div> <div>▲</div> </div>
	2.0	<b>RESIDUUM</b> - Firm, dry, red, lean CLAY with sand (CL) (A-6) 10R 4/8 @SS-1 LL=37, PL=19, PI=18, NMC=22.5, %200=74.0		2.0						
		Stiff to very stiff, dry, red, lean CLAY with sand (CL) (A-7-6) 10R 4/8			SS-2	3	5	9	14	<div> <div>●</div> <div> <div>×</div> <div>×</div> </div> <div>▲</div> </div>
		@SS-2 LL=41, PL=23, PI=18, NMC=24.2, %200=84.8		4.0						
469.3					SS-3	3	6	13	19	<div> <div>●</div> <div></div> <div></div> </div>
	6.0	Stiff, dry, red, elastic SILT (MH) (A-7-5) 10R 6/6		6.0						
		@SS-5 LL=71, PL=42, PI=29, NMC=19.7, %200=95.7			SS-4	2	5	9	14	<div> <div>●</div> <div></div> <div></div> </div>
				8.0						
464.3					SS-5	2	4	6	10	<div> <div>●</div> <div> <div>×</div> <div>×</div> </div> <div>▲</div> </div>
				13.5						
459.3					SS-6	3	5	7	12	<div> <div>●</div> <div></div> <div></div> </div>
				18.5						
454.3	20.0	<b>Boring Terminated at 20 feet</b>			SS-7	2	5	5	10	<div> <div>●</div> <div></div> <div></div> </div>

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS	- Split Spoon	NQ	- Rock Core, 1-7/8"
UD	- Undisturbed Sample	CU	- Cuttings
AWG	- Rock Core, 1-1/8"	CT	- Continuous Tube
		HSA	- Hollow Stem Auger
		CFA	- Continuous Flight Augers
		DC	- Driving Casing
		RW	- Rotary Wash
		RC	- Rock Core

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-11
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	475.7 ft	<b>Latitude:</b>	34.16756856	<b>Longitude:</b>	-81.34322259
<b>Date Started:</b>	12/21/2015				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	12/22/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	74.2%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.E.				

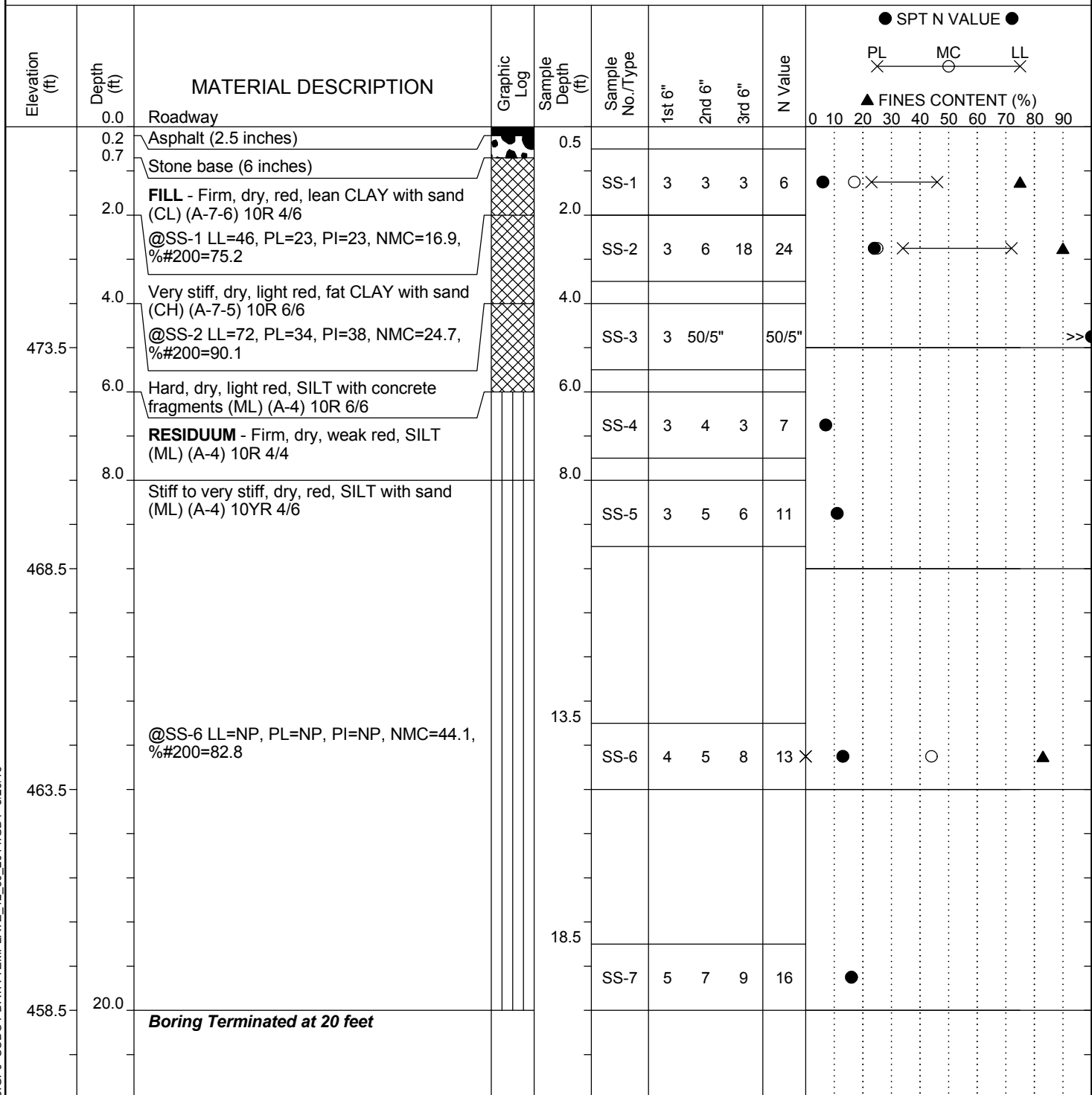
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grassed Shoulder								
	0.2	Topsoil (2 inches)		0.0	SS-1	1	2	4	6	<div> <div>●</div> <div> <div> <div>×</div> <div>×</div> </div> </div> <div>▲</div> </div>
		<b>RESIDUUM</b> - Firm, moist, red, fat CLAY (CH) (A-7-6) 10R 4/8 @SS-1 LL=56, PL=25, PI=31, NMC=24.9, % <sub>#200</sub> =86.4 @SS-2 NMC=27.7		2.0						
					SS-2	1	4	6	10	<div> <div>●</div> <div>○</div> </div>
	4.0	Stiff to very stiff, moist, red, elastic SILT (MH) (A-7-5) 10R 4/8 @SS-3 LL=68, PL=40, PI=28, NMC=40.1, % <sub>#200</sub> =87.1		4.0						
					SS-3	3	4	5	9	<div> <div>●</div> <div> <div> <div>×</div> <div>×</div> </div> </div> <div>▲</div> </div>
				6.0						
					SS-4	1	3	7	10	<div> <div>●</div> </div>
				8.0						
					SS-5	1	5	8	13	<div> <div>●</div> </div>
	12.0	Stiff, dry, pale red, SILT (ML) (A-4) 10R 7/4		13.5						
					SS-6	2	5	5	10	<div> <div>●</div> </div>
				18.5						
					SS-7	2	7	10	17	<div> <div>●</div> </div>
	20.0	<b>Boring Terminated at 20 feet</b>								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-12
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	478.5 ft	<b>Latitude:</b>	34.16768591	<b>Longitude:</b>	-81.34136484
<b>Date Started:</b>	1/11/2016				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/11/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.A.				






## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-12 BULK
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	478.5 ft	<b>Latitude:</b>	34.16768591	<b>Longitude:</b>	-81.34136394
<b>Date Started:</b>	1/11/2016				
<b>Total Depth:</b>	5 ft	<b>Soil Depth:</b>	5 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/11/2016				
<b>Bore Hole Diameter (in):</b>	6-1/2	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	HSA	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.E.
<b>24HR</b>	N.A.				

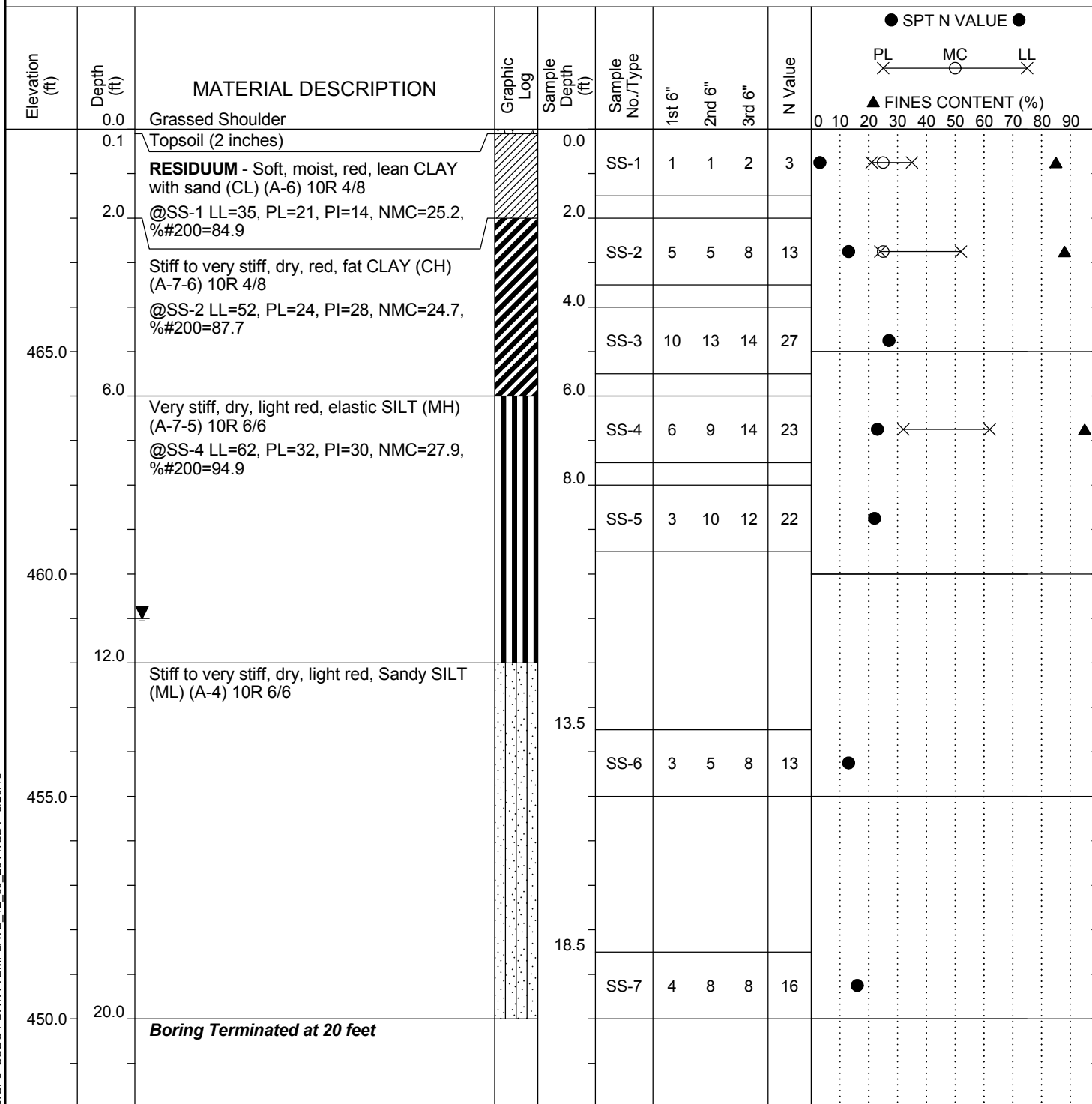
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE ● PL — MC — LL ▲ FINES CONTENT (%)
	0.0	Roadway								0 10 20 30 40 50 60 70 80 90
	0.2	Asphalt (2.5 inches)		0.0						
	0.7	Stone base (6 inches)								
		FILL - Dry, red, clayey SAND with gravel (SC) (A-2-4) 10R 4/6 LL=28, PL=18, PI=10, NMC=13.9, %200=31.0								
473.5	5.0	Boring Terminated at 5 feet								
468.5										
463.5										
458.5										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-13
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	470.0 ft	<b>Latitude:</b>	34.167932	<b>Longitude:</b>	-81.34022765
<b>Date Started:</b>	12/24/2015				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	12/29/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	74.2%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	11 feet				

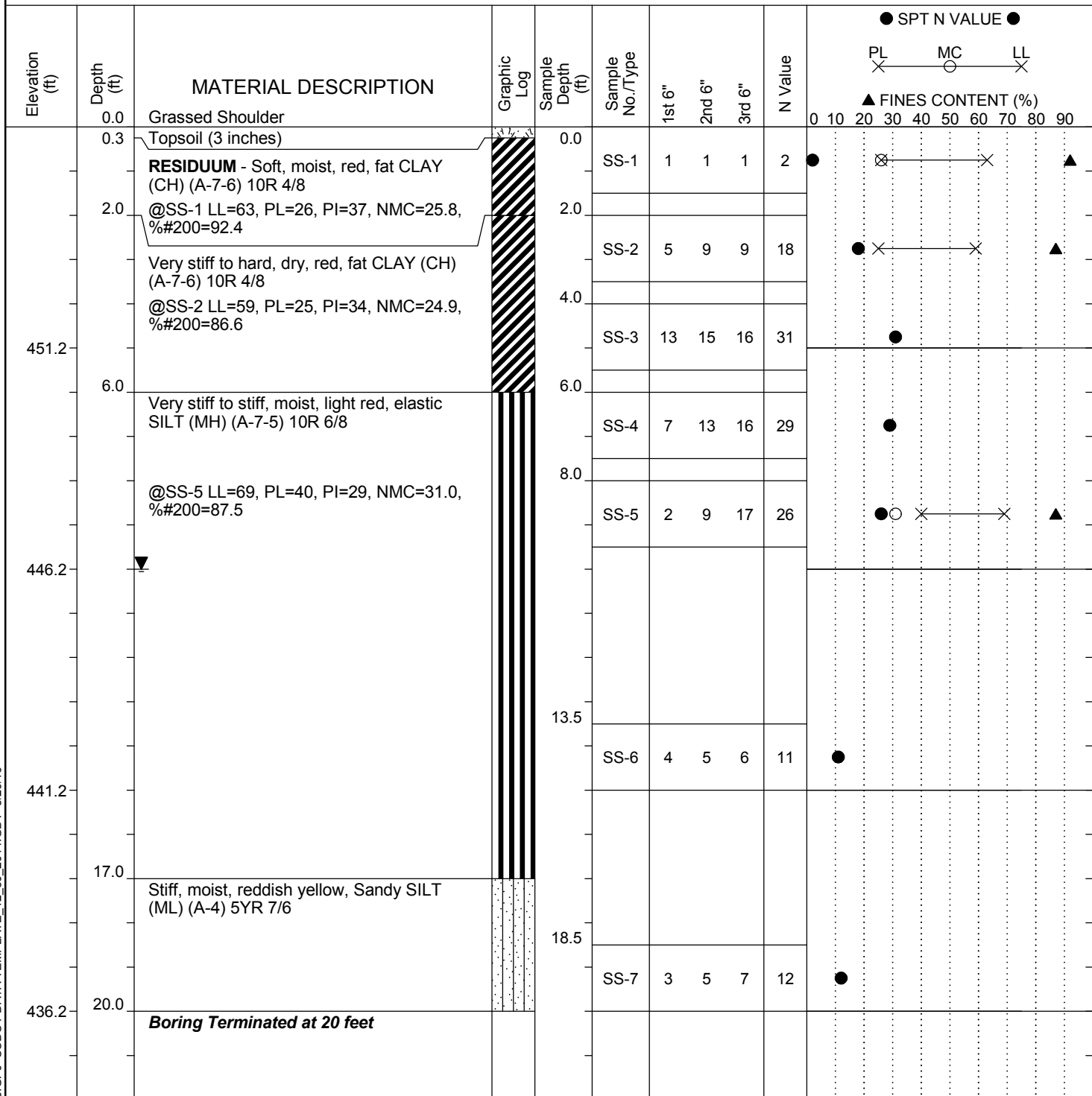


## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-14		
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48					
Eng./Geo.: RS		Boring Location: -			Offset: -		Alignment: Existing	
Elev.: 456.2 ft	Latitude: 34.1682436	Longitude: -81.33855704		Date Started:		12/24/2015		
Total Depth: 20 ft		Soil Depth: 20 ft		Core Depth: 0 ft		Date Completed: 12/29/2015		
Bore Hole Diameter (in): 2.94		Sampler Configuration			Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 74.2%		
Core Size: N.A.		Driller: JP		Groundwater: TOB N.A.		24HR 10 feet		



## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-15
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	457.0 ft	<b>Latitude:</b>	34.16850779	<b>Longitude:</b>	-81.33659435
<b>Date Started:</b>	12/24/2015				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	12/29/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	74.2%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.E.				

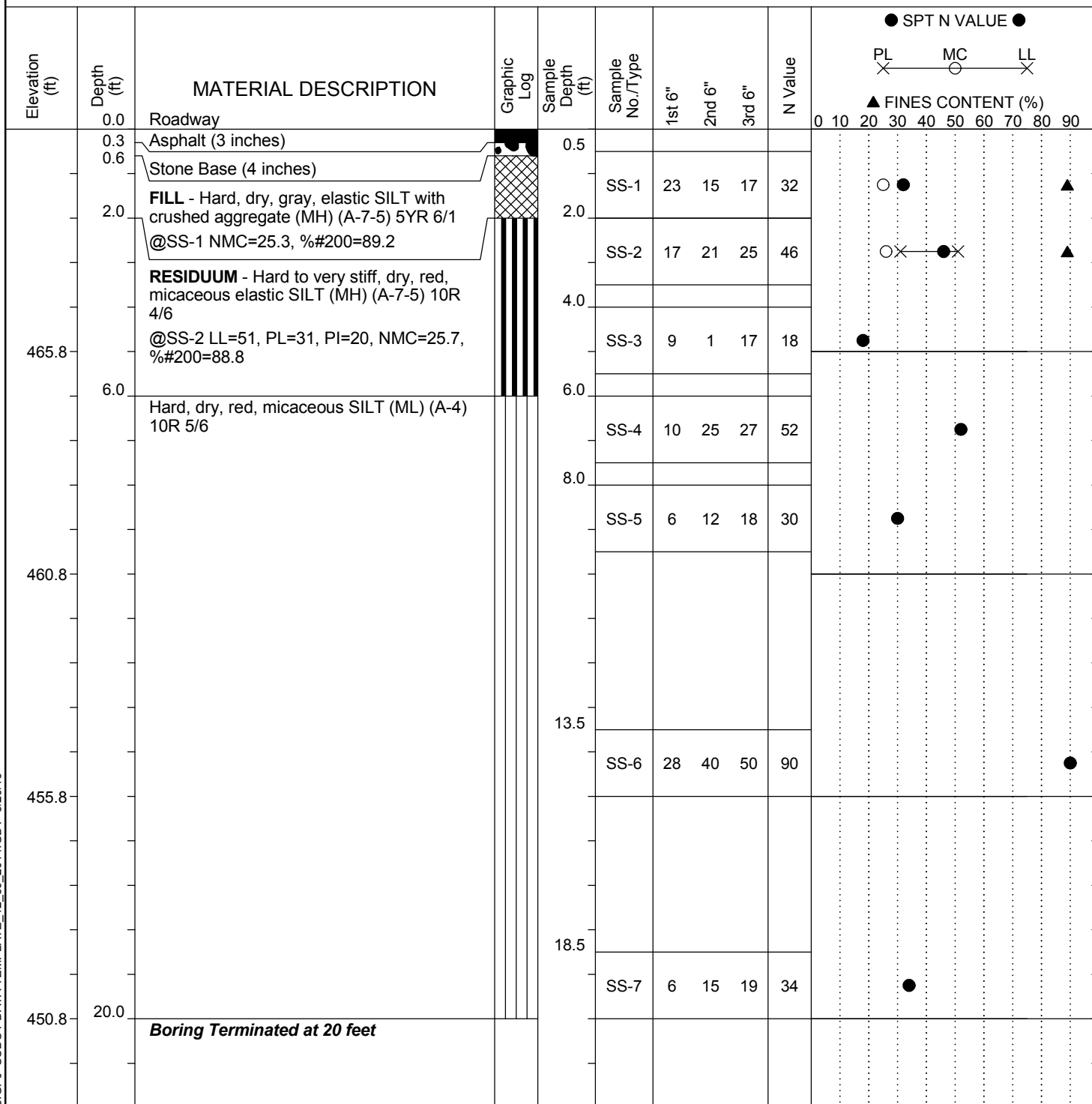
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
	0.0	Grassed Shoulder								
	0.3	Topsoil (3 inches)		0.0	SS-1	1	1	2	3	●
	2.0	<b>RESIDUUM</b> - Soft, moist, red, fat CLAY (CH) (A-7-6) 10R 4/8 @SS-1 NMC=27.1, %200=91 Very stiff, moist, red, fat CLAY (CH) (A-7-6) 10R 4/8 @SS-2 LL=59, PL=27, PI=32, NMC=27.1, %200=89.3		2.0	SS-2	6	10	11	21	●
452.0	4.0	Very stiff, dry, red, elastic SILT (MH) (A-7-5) 10R 4/8		4.0	SS-3	4	9	9	18	●
	8.0			6.0	SS-4	8	13	16	29	●
		Very stiff to stiff, dry, light red, SILT (ML) (A-4) 10R 6/6		8.0	SS-5	7	8	11	19	●
447.0				13.5	SS-6	3	4	6	10	●
442.0	17.0	Firm, dry, light red, SILT (ML) (A-4) 10R 7/6		18.5	SS-7	2	4	4	8	●
437.0	20.0	<b>Boring Terminated at 20 feet</b>								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-16
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	470.8 ft	<b>Latitude:</b>	34.16909514	<b>Longitude:</b>	-81.33531114
<b>Date Started:</b>	12/3/2015				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	12/7/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)	<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	RW
<b>Hammer Type:</b>	Automatic	<b>Energy Ratio:</b>	71.8%		
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.E.				



## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-17
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	456.2 ft	<b>Latitude:</b>	34.16968294	<b>Longitude:</b>	-81.33385583
<b>Date Started:</b>	12/29/2015				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	12/30/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	74.2%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.E.				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grassed Shoulder								
	0.2	Topsoil (2 inches)		0.0	SS-1	1	2	1	3	●
	2.0	<b>RESIDUUM</b> - Soft, dry, red, elastic SILT with sand (MH) (A-7-5) 10R 5/8 @SS-1 LL=54, PL=30, PI=24, NMC=31.5, % $\#200$ =75.3 Soft to firm, dry, red, lean CLAY with sand (CL) (A-7-6) 10R 4/8 @SS-2 NMC=38.3, % $\#200$ =86.8 @SS-3 LL=47, PL=25, PI=22, NMC=31.4		2.0	SS-2	1	1	1	2	●
451.2	4.0			4.0	SS-3	3	3	3	6	●
	6.0	Stiff to firm, dry, red, SILT (ML) (A-4) 10R 4/8		6.0	SS-4	2	3	6	9	●
	8.0			8.0						
					SS-5	1	3	5	8	●
446.2										
	12.0	Stiff, dry, light red, SILT (ML) (A-4) 10R 6/8		13.5	SS-6	3	5	7	12	●
441.2										
	17.0	Stiff, dry, reddish yellow, Sandy SILT (ML) (A-4) 5YR 6/8		18.5						
					SS-7	4	5	9	14	●
436.2	20.0	<b>Boring Terminated at 20 feet</b>								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-18
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	440.7 ft	<b>Latitude:</b>	34.17045271	<b>Longitude:</b>	-81.33272162
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Started:</b>	12/29/2015				
<b>Date Completed:</b>	12/30/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>			
<b>Liner Required:</b>	Y	<b>Liner Used:</b>	Y		
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	74.2%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB
<b>24HR</b>	2 feet				

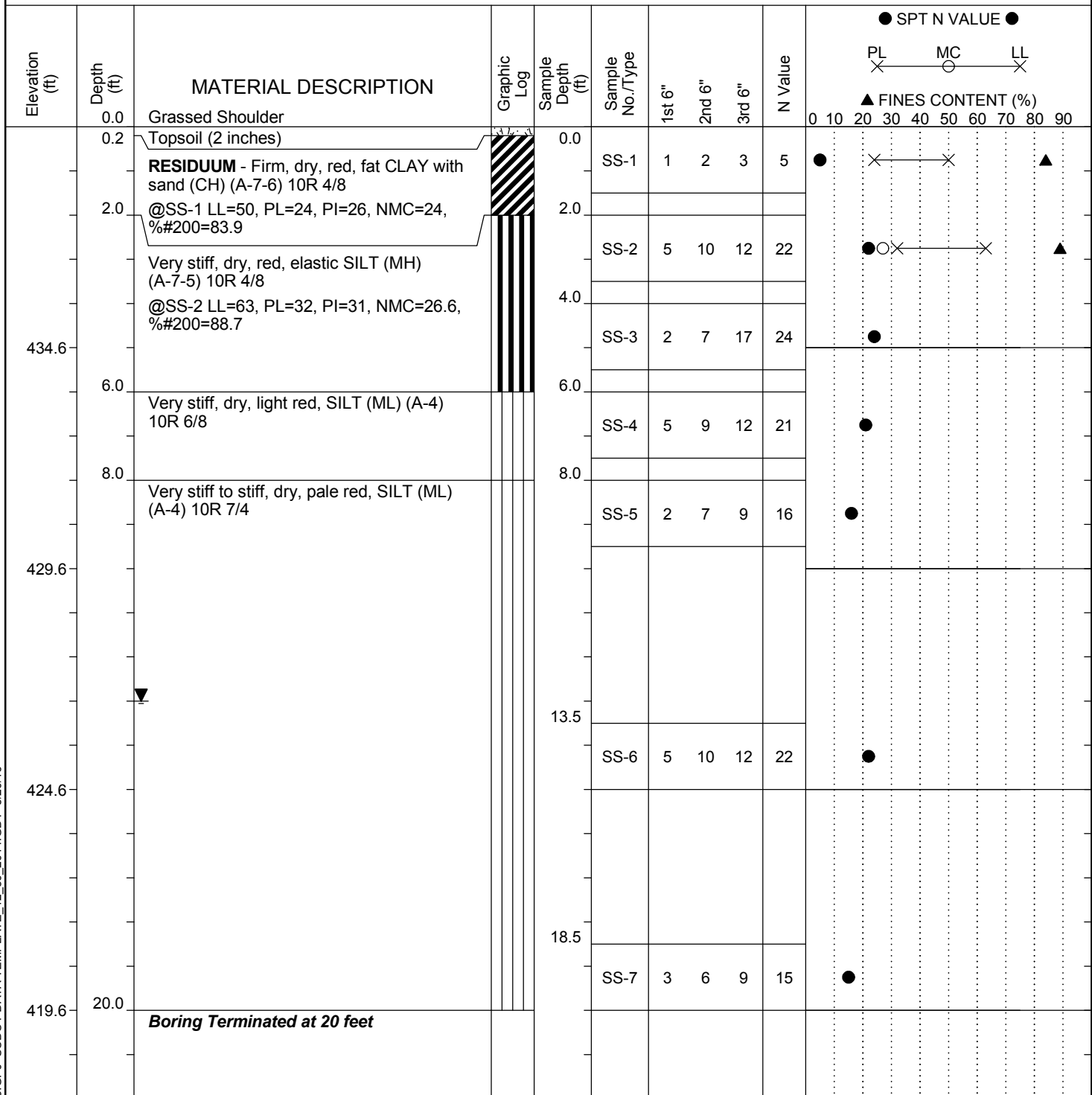
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grassed Shoulder								
	0.3	Topsoil (3 inches)		0.0	SS-1	1	1	2	3	●
		<b>RESIDUUM</b> - Soft to firm, moist, red, lean CLAY with sand (CL) (A-7-6) 10R 4/8								
		▼@SS-1 NMC=33.8		2.0						
		@SS-2 LL=41, PL=23, PI=18, NMC=30.5, % <sub>#200</sub> =82			SS-2	1	1	2	3	●
				4.0						
					SS-3	1	2	3	5	●
435.7	6.0	Stiff, dry, light red, SILT (ML) (A-4) 10R 6/8		6.0						
					SS-4	4	5	8	13	●
	8.0	Very stiff to stiff, dry, reddish yellow, Sandy SILT (ML) (A-4) 5YR 6/8		8.0						
					SS-5	3	9	13	22	●
430.7										
				13.5						
					SS-6	6	9	15	24	●
425.7										
				18.5						
					SS-7	2	5	9	14	●
420.7	20.0	<b>Boring Terminated at 20 feet</b>								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS	- Split Spoon	NQ	- Rock Core, 1-7/8"
UD	- Undisturbed Sample	CU	- Cuttings
AWG	- Rock Core, 1-1/8"	CT	- Continuous Tube
HSA	- Hollow Stem Auger	RW	- Rotary Wash
CFA	- Continuous Flight Augers	RC	- Rock Core
DC	- Driving Casing		

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-19	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.: 439.6 ft		Latitude: 34.17162268		Longitude: -81.33147126		Date Started: 12/29/2015	
Total Depth: 20 ft		Soil Depth: 20 ft		Core Depth: 0 ft		Date Completed: 12/30/2015	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 74.2%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR 13 feet	



## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-20
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	433.5 ft	<b>Latitude:</b>	34.17265171	<b>Longitude:</b>	-81.33040187
<b>Date Started:</b>	1/12/2016				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/12/2015				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	N.A.				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Roadway								
	0.2	Asphalt (2 inches)		0.5						
	0.6	Stone base (5 inches)								
	2.0	RESIDUUM - Very stiff, dry, weak red, elastic SILT (MH) (A-7-5) 10R 4/4 @SS-1 LL=64, PL=34, PI=30, NMC=22, %200=96.6		2.0	SS-1	9	11	16	27	
		Very stiff, dry, red, elastic SILT with sand (MH) (A-7-5) 10R 5/8 @SS-2 LL=56, PL=33, PI=23, NMC=20.2, %200=84.3		4.0	SS-2	7	9	12	21	
428.5					SS-3	7	11	12	23	
	6.0	Stiff to firm, dry, red, SILT (ML) (A-4) 7.5R 5/8 @SS-5 LL=NP, PL=NP, PI=NP, NMC=33, %200=95.7		6.0	SS-4	5	5	7	12	
				8.0	SS-5	4	4	4	8	
423.5										
	12.0	Very stiff to hard, dry, dark yellowish brown, SILT (ML) (A-4) 10YR 4/6		13.5	SS-6	5	7	12	19	
418.5										
				18.5	SS-7	8	12	21	33	
413.5	20.0	Boring Terminated at 20 feet								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-20 BULK
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	433.5 ft	<b>Latitude:</b>	34.17265205	<b>Longitude:</b>	-81.33040296
<b>Date Started:</b>	1/12/2016				
<b>Total Depth:</b>	5 ft	<b>Soil Depth:</b>	5 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/12/2016				
<b>Bore Hole Diameter (in):</b>	6-1/2	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	HSA	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.E.
<b>24HR</b>	N.A.				

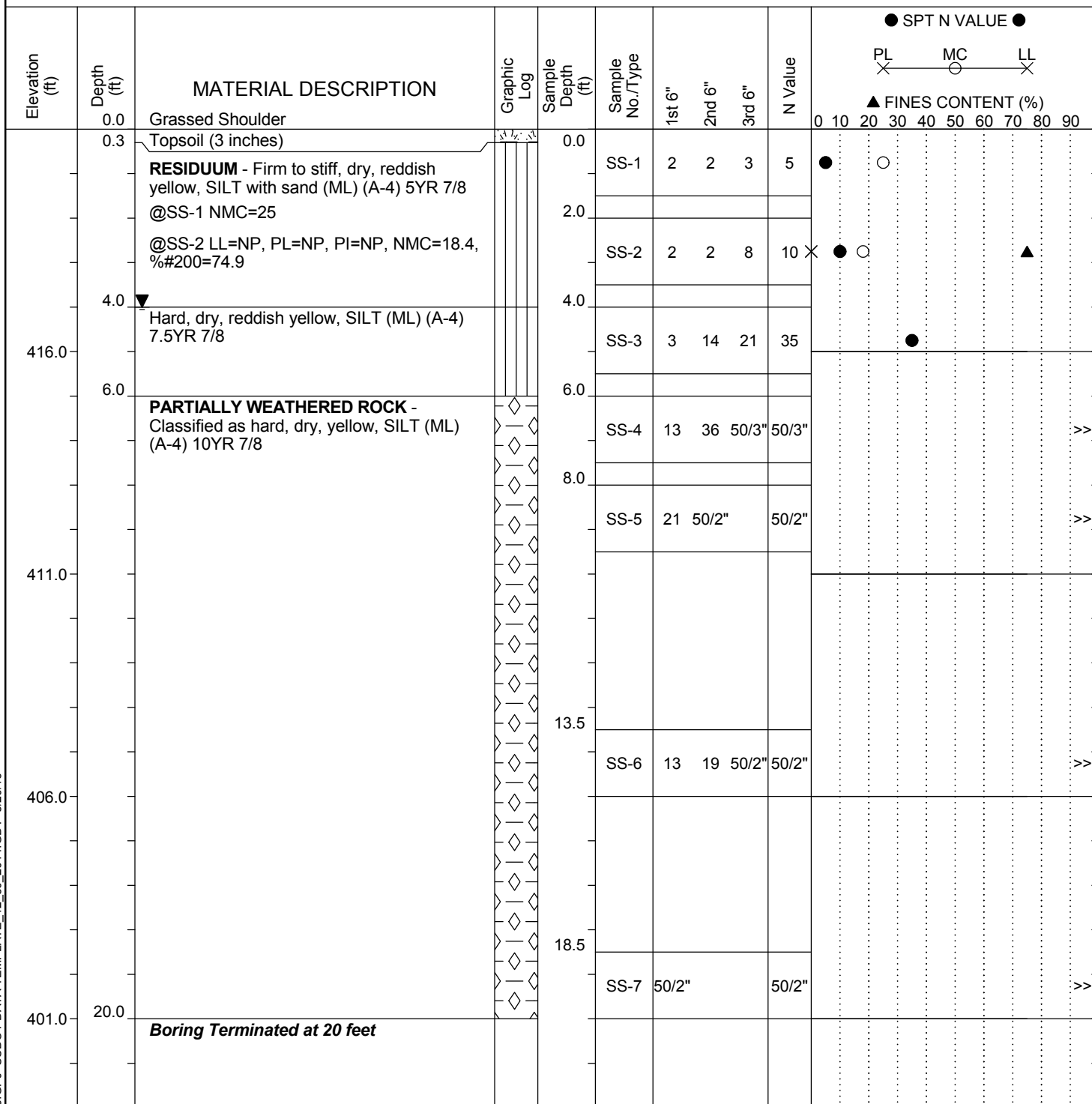
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE ● PL — MC — LL ▲ FINES CONTENT (%)
	0.0	Roadway								
	0.2	Asphalt (2 inches)		0.0						
	0.6	Stone base (5 inches)								
		Dry, red, SILT with sand (ML) (A-7-6) 10R 5/8								
		LL=46, PL=28, PI=18, NMC=21.6, %200=76.6								
428.5	5.0	<b>Boring Terminated at 5 feet</b>								
423.5										
418.5										
413.5										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-21	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	421.0 ft	Latitude:	34.17382553	Longitude:	-81.32962803	Date Started: 12/29/2015	
Total Depth: 20 ft		Soil Depth: 20 ft		Core Depth: 0 ft		Date Completed: 12/30/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 74.2%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 4 feet	



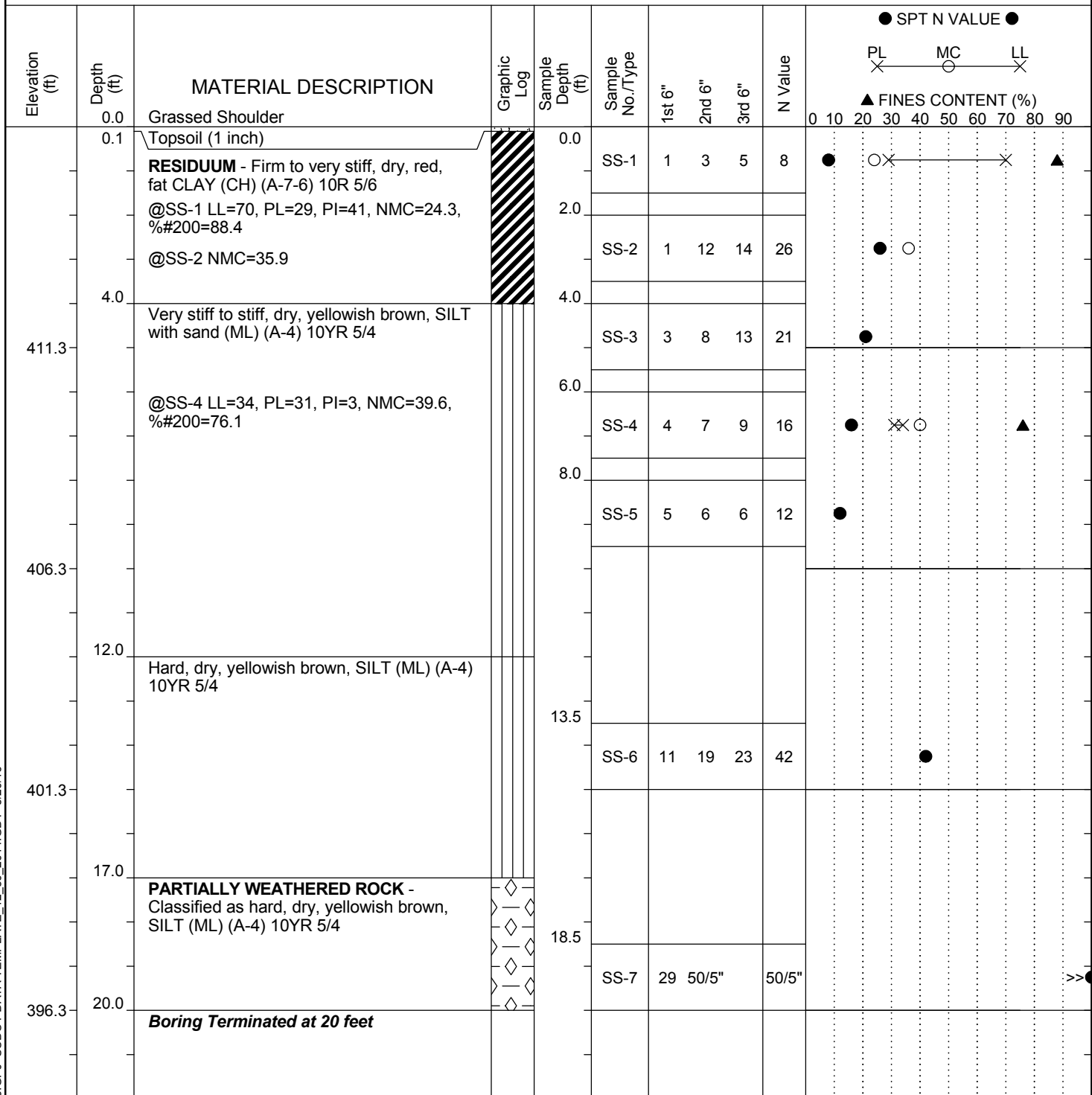
## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington			Boring No.:	B-22							
Site Description:		Columbia Avenue (S-48) Roadway Improvements							Route:	S-48							
Eng./Geo.:	JF		Boring Location:			-		Offset:	-		Alignment:	Existing					
Elev.:	416.3 ft		Latitude:	34.17515553		Longitude:	-81.32843476		Date Started:		01/04/2016						
Total Depth:		20 ft		Soil Depth:		20 ft		Core Depth:		0 ft		Date Completed:		1/6/2016			
Bore Hole Diameter (in):			2.94		Sampler Configuration			Liner Required:		Y (N)		Liner Used:		Y (N)			
Drill Machine:		CME-55		Drill Method:		RW		Hammer Type:		Automatic		Energy Ratio:		81.9%			
Core Size:		N.A.		Driller:		AL		Groundwater:		TOB		N.A.		24HR		N.E.	



## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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Project ID:	42383				County:	Lexington		Boring No.:	B-23	
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48	
Eng./Geo.:	JF		Boring Location:	-		Offset:	-		Alignment:	Proposed
Elev.:	422.1 ft		Latitude:	34.17569435		Longitude:	-81.32667372		Date Started:	01/04/2016
Total Depth:	20 ft		Soil Depth:	20 ft		Core Depth:	0 ft		Date Completed:	1/6/2016
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)
Drill Machine:	CME-55		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	81.9%
Core Size:	N.A.		Driller:	AL		Groundwater:	TOB	N.A.	24HR	N.E.

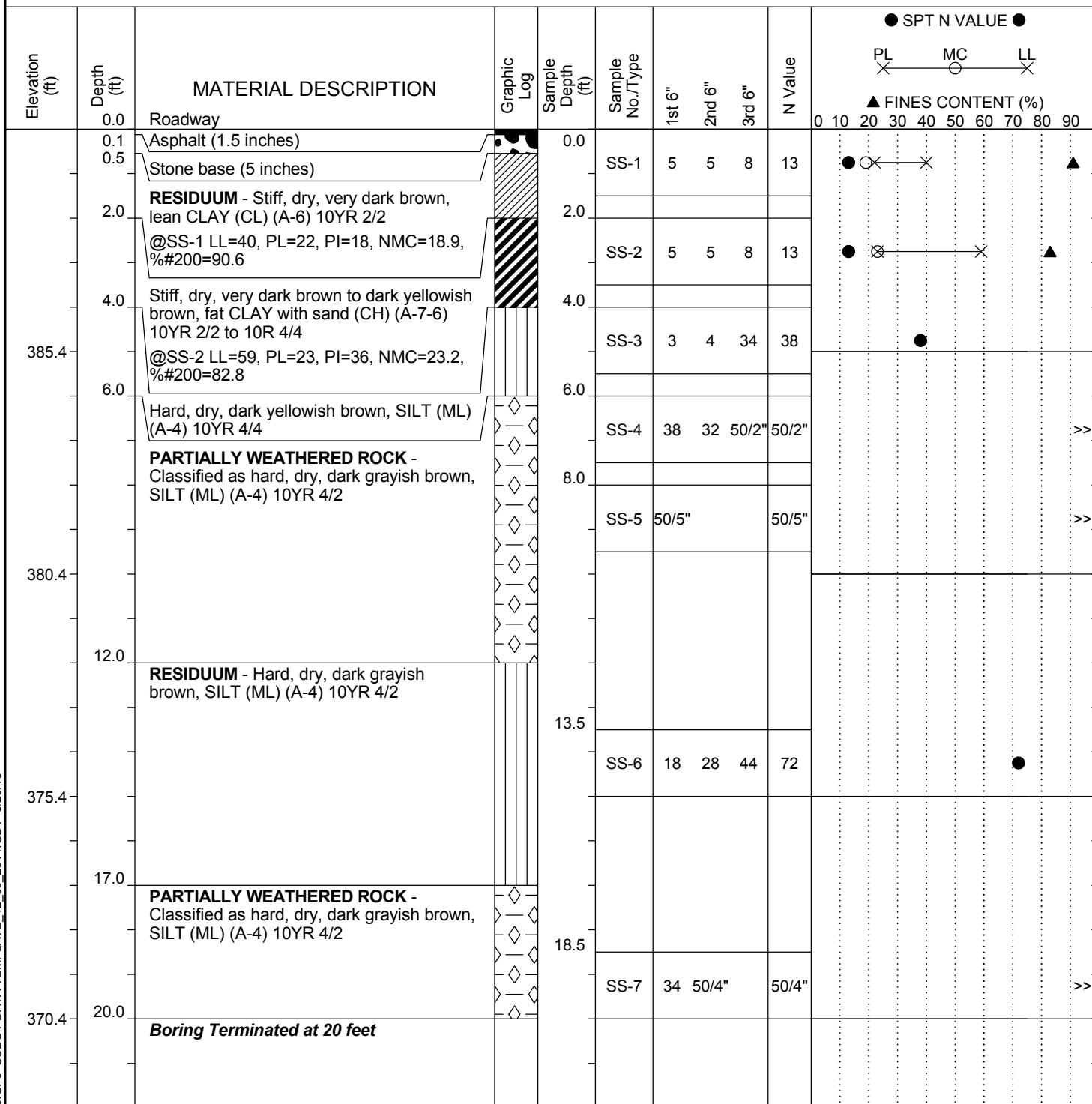
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE	PL	MC	LL	FINES CONTENT (%)
	0.0	Gravel Shoulder		0.0										
	0.3	Crushed aggregate (3 inches)		0.0	SS-1	7	5	8	13					
		<b>RESIDUUM</b> - Very stiff to hard, dry, red, elastic SILT (MH) (A-7-5) 10R 4/6 @SS-1 NMC=28.2 @SS-2 LL=77, PL=39, PI=38, NMC=29.9, % $\#200$ =93.8		2.0										
	4.0	Very stiff, dry, red, SILT (ML) (A-4) 10R 4/6		4.0	SS-2	7	12	21	33					
417.1				6.0										
				8.0	SS-3	13	10	12	22					
				10.0										
				12.0	SS-4	7	9	11	20					
				14.0										
412.1		Firm, dry, dusky red, SILT (ML) (A-4) 10R 3/4		16.0	SS-5	1	2	5	7					
				18.0										
	12.0	Very stiff, dry, pale red, SILT (ML) (A-4) 10R 7/3		20.0	SS-6	5	7	9	16					
407.1				22.0										
				24.0										
				26.0										
				28.0										
402.1	20.0	Boring Terminated at 20 feet		30.0	SS-7	4	8	13	21					

### LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-24
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	390.4 ft	<b>Latitude:</b>	34.17372281	<b>Longitude:</b>	-81.32360384
<b>Date Started:</b>	1/11/2016				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/11/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.A.
<b>24HR:</b>	N.A.				

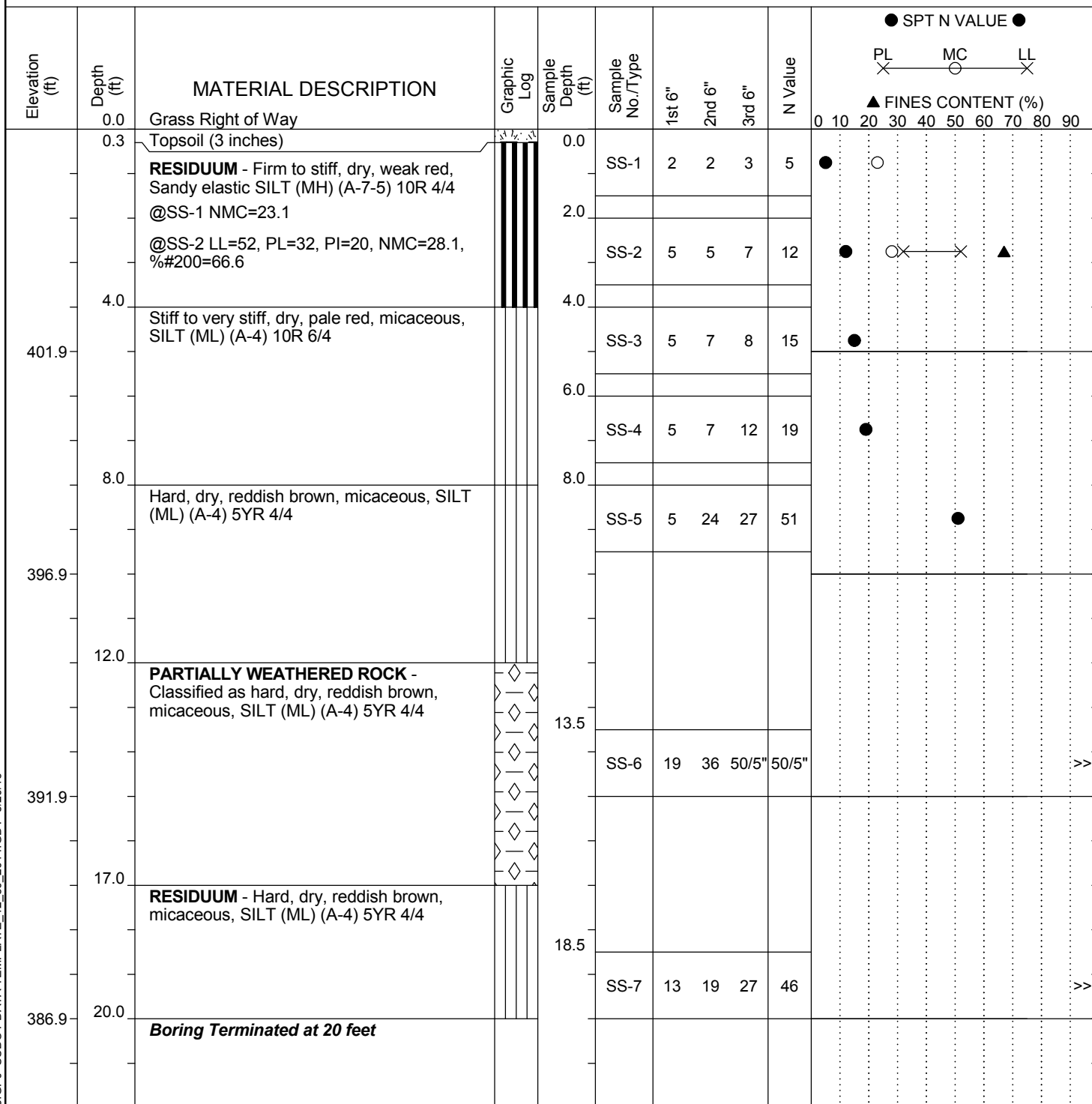


## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-25
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	406.9 ft	<b>Latitude:</b>	34.17721259	<b>Longitude:</b>	-81.32610491
<b>Date Started:</b>	1/15/2016				
<b>Total Depth:</b>	20 ft	<b>Soil Depth:</b>	20 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/16/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-550X	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	74.2%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR:</b>	N.E.				



## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

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# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-26		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	JF		Boring Location:	-		Offset:	-		Alignment:	Existing	
Elev.:	392.9 ft		Latitude:	34.17942959		Longitude:	-81.31923207		Date Started:	1/12/2016	
Total Depth:	20 ft		Soil Depth:	20 ft		Core Depth:	0 ft		Date Completed:	1/12/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-45C		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	71.8%	
Core Size:	N.A.		Driller:	JP		Groundwater:	TOB	N.A.		24HR	N.A.

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL MC LL </div> <div> ▲ FINES CONTENT (%) </div> </div>
	0.0	Roadway								
	0.2	Asphalt (2 inches)		0.5						
	0.7	Stone base (6 inches)								
		<b>RESIDUUM</b> - Very stiff to stiff, dry, light red, elastic SILT (MH) (A-7-5) 10R 6/8		2.0	SS-1	13	14	16	30	
		@SS-1 LL=54, PL=33, PI=21, NMC=17.5, % <sub>#200</sub> =85.1								
		@SS-2 NMC=16.9			SS-2	4	5	8	13	
	4.0	Hard to very stiff, dry, light red to pale red, SILT (ML) (A-4) 10R 6/8 to 10R 6/4		4.0						
387.9		@SS-4 NMC=26.5		6.0	SS-3	19	20	25	45	
	8.0	Stiff, dry, weak red, SILT (ML) (A-4) 10R 4/4		8.0						
					SS-4	8	9	11	20	
382.9										
	12.0	Very stiff, dry, very dusky red, SILT (ML) (A-4) 10R 2.5/2		13.5	SS-5	5	6	8	14	
377.9										
	17.0	Very stiff, dry, light red, SILT (ML) (A-4) 10R 6/6		18.5	SS-6	9	11	14	25	
372.9	20.0	<b>Boring Terminated at 20 feet</b>			SS-7	12	7	10	17	

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS	- Split Spoon	NQ	- Rock Core, 1-7/8"
UD	- Undisturbed Sample	CU	- Cuttings
AWG	- Rock Core, 1-1/8"	CT	- Continuous Tube
HSA	- Hollow Stem Auger	RW	- Rotary Wash
CFA	- Continuous Flight Augers	RC	- Rock Core
DC	- Driving Casing		

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-26 BULK
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	392.9 ft	<b>Latitude:</b>	34.17942865	<b>Longitude:</b>	-81.31923108
<b>Date Started:</b>	1/12/2016				
<b>Total Depth:</b>	5 ft	<b>Soil Depth:</b>	5 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/12/2016				
<b>Bore Hole Diameter (in):</b>	6-1/2	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-45C	<b>Drill Method:</b>	HSA	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	71.8%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	JP	<b>Groundwater:</b>	TOB N.E.
<b>24HR</b>	N.A.				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE ● PL — MC — LL ▲ FINES CONTENT (%)
	0.0	Roadway								
	0.2	Asphalt (2 inches)		0.0						
	0.7	Stone base (6 inches)								
		RESIDUUM - Dry, light red, sandy SILT (ML) (A-6) 10R 6/8 LL=36, PL=25, PI=11, NMC=18.9, %200=67.1								
387.9	5.0	Boring Terminated at 5 feet								
382.9										
377.9										
372.9										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-27	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: JF		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	390.1 ft	Latitude:	34.17591777	Longitude:	-81.32096728	Date Started: 1/4/2016	
Total Depth: 30 ft		Soil Depth: 30 ft		Core Depth: 0 ft		Date Completed: 1/6/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 10 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grass Shoulder								
	0.3	Topsoil (3 inches)		0.0	SS-1	6	9	13	22	
	2.0	RESIDUUM - Very stiff, dry, red, elastic SILT (MH) (A-7-5) 10R 4/6 @SS-1 NMC=26.1		2.0						
		Hard, dry, red, SILT (ML) (A-4) 10R 4/6 @SS-2 LL=NP, PL=NP, PI=NP, NMC=30.6, %200=93.4 @SS-3 NMC=30		4.0	SS-2	18	21	16	37 X	
385.1					SS-3	12	15	29	44	
	6.0	Stiff to very stiff, dry, red, SILT (ML) (A-4) 10R 4/6		6.0	SS-4	3	7	7	14	
				8.0						
					SS-5	2	5	7	12	
380.1										
				13.5						
					SS-6	5	9	14	23	
375.1										
				18.5						
					SS-7	3	5	12	17	
370.1										
	22.0									

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-27	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: JF		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	390.1 ft	Latitude:	34.17591777	Longitude:	-81.32096728	Date Started: 1/4/2016	
Total Depth: 30 ft		Soil Depth: 30 ft		Core Depth: 0 ft		Date Completed: 1/6/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 10 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
365.1	23.5	Very stiff, dry, red, SILT (ML) (A-4) 10R 4/6			SS-8	3	8	10	18	●
360.1	27.0	Very stiff, moist, red, SILT (ML) (A-4) 10YR 5/6		28.5	SS-9	3	7	11	18	●
	30.0	<b>Boring Terminated at 30 feet</b>								
355.1										
350.1										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-28
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	387.8 ft	<b>Latitude:</b>	34.1777956	<b>Longitude:</b>	-81.3246511
<b>Date Started:</b>	1/4/2016				
<b>Total Depth:</b>	30 ft	<b>Soil Depth:</b>	30 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/6/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	12 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
	0.0	Grassed Shoulder								
	0.2	Topsoil (2 inches)		0.0	SS-1	2	3	4	7	●
		<b>RESIDUUM</b> - Firm to stiff, dry, red, SILT with sand (ML) (A-4) 10R 4/6								
		@SS-1 NMC=26.6		2.0						
		@SS-2 LL=NP, PL=NP, PI=NP, NMC=33.7, %200=73.1			SS-2	3	3	3	6	●
		@SS-3 NMC=41.8		4.0						
					SS-3	3	4	7	11	●
382.8	6.0	Soft, dry, yellowish brown, SILT (ML) (A-4) 10YR 5/4		6.0						
		@SS-4 NMC=30.6			SS-4	1	1	2	3	●
	8.0	Firm, dry, brownish yellow, SILT with sand (ML) (A-4) 10YR 6/8		8.0						
					SS-5	1	3	4	7	●
377.8	12.0	Soft, moist, dark brown, SILT with sand (ML) (A-4) 10YR 3/3		13.5						
		@SS-6 NMC=28			SS-6	1	1	2	3	●
372.8	17.0	Stiff, dry, light gray, lean CLAY (CL) (A-6) 10YR 7/1		18.5						
					SS-7	2	4	8	12	●
367.8	22.0									

## LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-28		
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48	
Eng./Geo.: JF		Boring Location: -		Offset: -		Alignment: Existing		
Elev.:	387.8 ft	Latitude:	34.1777956	Longitude:	-81.3246511	Date Started: 1/4/2016		
Total Depth: 30 ft		Soil Depth: 30 ft		Core Depth: 0 ft		Date Completed: 1/6/2016		
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)		
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%		
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 12 feet		

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> </div> <div>▲ FINES CONTENT (%)</div> </div>
362.8	27.0	Very stiff, dry, white, SILT (ML) (A-4) 10YR 8/1		23.5	SS-8	4	8	18	26	●
357.8	30.0	Very stiff, dry, yellow, SILT (ML) (A-4) 10YR 7/8		28.5	SS-9	5	9	14	23	●
<b>Boring Terminated at 30 feet</b>										
352.8										
347.8										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-29	
Site Description: Columbia Avenue (S-48) Roadway Improvements					Route: S-48		
Eng./Geo.: KZ		Boring Location: -		Offset: -		Alignment: Existing	
Elev.: 392.8 ft	Latitude: 34.17724242	Longitude: -81.32322918		Date Started:		1/14/2016	
Total Depth: 103.5 ft	Soil Depth: 103.5 ft	Core Depth: 0 ft		Date Completed:		1/15/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55	Drill Method: RW	Hammer Type: Automatic		Energy Ratio:		81.9%	
Core Size: N.A.	Driller: CF	Groundwater: TOB		N.A.		24HR	8 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC X LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
	0.0	Toe of Slope								
	0.1	Topsoil (1 inch)		0.0	SS-1	2	3	5	8	●
	2.0	RESIDUUM - Firm, moist, light red, SILT (ML) (A-4) 10R 6/8 @SS-1 NMC=32.2		2.0						
		Stiff to very stiff, moist, red, SILT (ML) (A-4) 10R 5/8 @SS-2 LL=NP, PL=NP, PI=NP, NMC=30.4, %200=90.7		4.0	SS-2	3	7	7	14 X	●
387.8		@SS-3 NMC=28.8			SS-3	6	7	9	16	●
	6.0	Very stiff, dry, light red, SILT (ML) (A-4) 10R 7/8 @SS-4 NMC=25.9		6.0	SS-4	4	11	12	23	●
				8.0	SS-5	2	7	13	20	●
382.8										
		@SS-6 NMC=24.3		13.5	SS-6	6	10	13	23	●
377.8										
	17.0	Very stiff, dry, yellow to brownish yellow, SILT (ML) (A-4) 10YR 8/6 to 10YR6/6		18.5	SS-7	8	10	16	26	●
372.8										

## LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-29		
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48	
Eng./Geo.: KZ		Boring Location: -			Offset: -		Alignment: Existing	
Elev.:	392.8 ft	Latitude:	34.17724242	Longitude:	-81.32322918	Date Started:		1/14/2016
Total Depth:		103.5 ft	Soil Depth:	103.5 ft	Core Depth:	0 ft	Date Completed: 1/15/2016	
Bore Hole Diameter (in):		2.94	Sampler Configuration		Liner Required:	Y (N)	Liner Used:	Y (N)
Drill Machine:		CME-55	Drill Method:	RW	Hammer Type:	Automatic	Energy Ratio:	81.9%
Core Size:		N.A.	Driller:	CF	Groundwater:	TOB N.A.	24HR	8 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
367.8	27.0	Hard, dry, very pale brown, SILT (ML) (A-4) 10YR 8/2		23.5	SS-8	6	9	14	23	●
362.8	32.0	PARTIALLY WEATHERED ROCK- Classified as hard, dry, very pale brown, SILT (ML) (A-4) 10YR 8/2		28.5	SS-9	13	25	40	65	●
357.8	37.0	RESIDUUM - Hard, dry, yellow, SILT (ML) (A-4) 10YR 7/6		33.5	SS-10	50/5"		50/5"		>>●
352.8	42.0	PARTIALLY WEATHERED ROCK- Classified as hard, dry, very pale brown, SILT (ML) (A-4) 10YR 7/4		38.5	SS-11	21	35	44	79	●
				43.5						

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-29		
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48	
Eng./Geo.: KZ		Boring Location: -			Offset: -		Alignment: Existing	
Elev.:	392.8 ft	Latitude:	34.17724242	Longitude:	-81.32322918	Date Started:		1/14/2016
Total Depth:		103.5 ft	Soil Depth:	103.5 ft	Core Depth:	0 ft	Date Completed: 1/15/2016	
Bore Hole Diameter (in):		2.94	Sampler Configuration		Liner Required:	Y (N)	Liner Used:	Y (N)
Drill Machine:		CME-55	Drill Method:	RW	Hammer Type:	Automatic	Energy Ratio:	81.9%
Core Size:		N.A.	Driller:	CF	Groundwater:	TOB N.A.	24HR	8 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
347.8	47.0	RESIDUUM - Very stiff to hard, dry, very pale brown to brownish yellow, SILT with sand (ML) (A-4) 10YR 7/4 to 10YR 6/8			SS-12	23	48	50/5"	50/5"	
				48.5						
342.8					SS-13	7	10	14	24	●
				53.5						
337.8		@SS-14 LL=NP, PL=NP, PI=NP, NMC=30.3, % #200=77.9			SS-14	8	11	10	21 X	● ○ ▲
				58.5						
332.8					SS-15	13	14	17	31	●
				63.5						
327.8	62.0	PARTIALLY WEATHERED ROCK- Classified as hard, dry, brownish yellow, Sandy SILT (ML) (A-4) 10YR 6/6			SS-16	50/4"			50/4"	

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-29		
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48	
Eng./Geo.: KZ		Boring Location: -			Offset: -		Alignment: Existing	
Elev.:	392.8 ft	Latitude:	34.17724242	Longitude:	-81.32322918	Date Started:		1/14/2016
Total Depth:		103.5 ft	Soil Depth:	103.5 ft	Core Depth:	0 ft	Date Completed: 1/15/2016	
Bore Hole Diameter (in):		2.94	Sampler Configuration		Liner Required:	Y (N)	Liner Used:	Y (N)
Drill Machine:		CME-55	Drill Method:	RW	Hammer Type:	Automatic	Energy Ratio:	81.9%
Core Size:		N.A.	Driller:	CF	Groundwater:	TOB N.A.	24HR	8 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> </div> <div>▲ FINES CONTENT (%)</div> </div>
322.8				68.5	SS-17	17	34	50/4"	50/4"	>>●
317.8				73.5	SS-18	50/2"		50/2"		>>●
312.8				78.5	SS-19	32	50/4"		50/4"	>>●
307.8				83.5	SS-20	50/5"		50/5"		>>●
87.0		<b>PARTIALLY WEATHERED ROCK-</b> Classified as hard, dry, olive, Sandy SILT								

## LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-29		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	KZ		Boring Location:	-		Offset:	-		Alignment:	Existing	
Elev.:	392.8 ft		Latitude:	34.17724242		Longitude:	-81.32322918		Date Started:	1/14/2016	
Total Depth:	103.5 ft		Soil Depth:	103.5 ft		Core Depth:	0 ft		Date Completed:	1/15/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-55		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	81.9%	
Core Size:	N.A.		Driller:	CF		Groundwater:	TOB	N.A.		24HR	8 feet

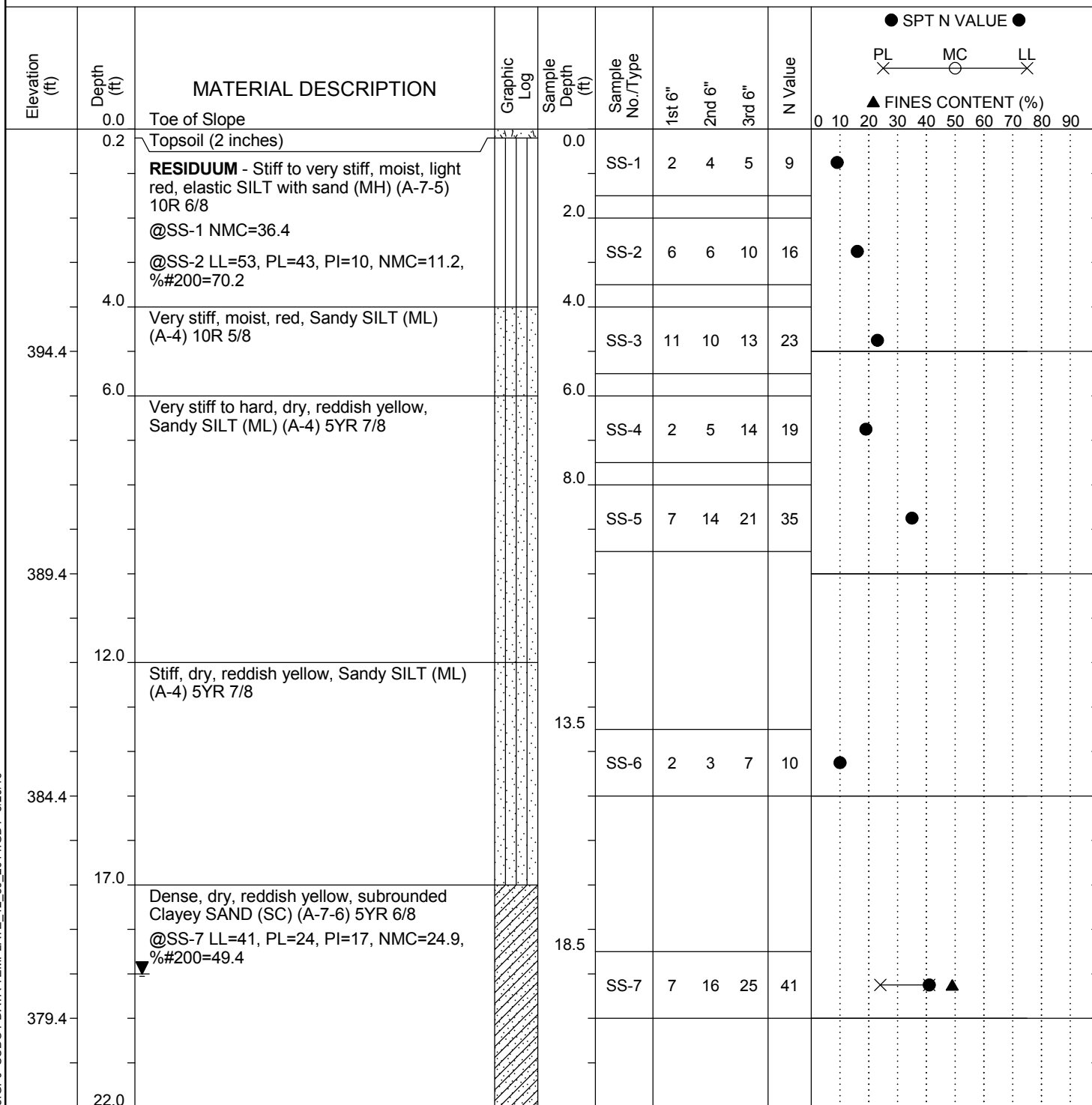
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
302.8		(ML) (A-4) 5Y 4/4 @SS-21 NMC=12.7		88.5						
					SS-21	50/3"			50/3"	>>●
297.8				93.5						
					SS-22	50/1"			50/1"	>>●
97.0		PARTIALLY WEATHERED ROCK- No sample recovered		98.5						
292.8					SS-23	50/1"			50/1"	>>●
103.5		Boring Terminated at 103.5 feet		103.5						
287.8					SS-24	50/0"			50/0"	>>●

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-30
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	399.4 ft	<b>Latitude:</b>	34.17690257	<b>Longitude:</b>	-81.32276508
<b>Date Started:</b>	1/13/2016				
<b>Total Depth:</b>	120 ft	<b>Soil Depth:</b>	120 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/14/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>			
<b>Liner Required:</b>	Y	<b>Liner Used:</b>	Y		
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB
<b>24HR</b>	19 feet				



## LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-30			
Site Description: Columbia Avenue (S-48) Roadway Improvements						Route: S-48			
Eng./Geo.: RS			Boring Location: -			Offset: -		Alignment: Existing	
Elev.: 399.4 ft		Latitude: 34.17690257		Longitude: -81.32276508		Date Started:		1/13/2016	
Total Depth: 120 ft		Soil Depth: 120 ft		Core Depth: 0 ft		Date Completed:		1/14/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration			Liner Required: Y (N)		Liner Used: Y (N)		
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio:		81.9%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR		19 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
374.4	27.0	<b>PARTIALLY WEATHERED ROCK</b> - Classified as hard, dry, yellowish red, Sandy SILT (ML) (A-4) 5YR 5/8		23.5	SS-8	14	34	50/4"	50/4"	>>●
369.4	32.0	<b>RESIDUUM</b> - Hard, dry, yellow, Sandy SILT (ML) (A-4) 10YR 7/8		28.5	SS-9	9	22	28	50	●
364.4	38.5	<b>PARTIALLY WEATHERED ROCK</b> - Classified as hard, dry, yellowish brown, Sandy SILT (ML) (A-4) 10YR 6/8		33.5	SS-10	20	47	50/3"	50/3"	>>●
359.4	42.0	<b>RESIDUUM</b> - Hard, dry, brownish yellow, Sandy SILT (ML) (A-4) 10YR 6/8		43.5	SS-11	16	32	50/4"	50/4"	>>●

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-30	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	399.4 ft	Latitude:	34.17690257	Longitude:	-81.32276508	Date Started: 1/13/2016	
Total Depth: 120 ft		Soil Depth: 120 ft		Core Depth: 0 ft		Date Completed: 1/14/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 19 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> 0 10 20 30 40 50 60 70 80 90 </div> </div>
354.4	47.0	PARTIALLY WEATHERED ROCK - Classified as hard, dry, olive brown, Sandy SILT (ML) (A-4) 2.5Y 5/6			SS-12	11	22	30	52	●
349.4				48.5	SS-13	50/4"			50/4"	>>●
344.4				53.5	SS-14	50/2"			50/2"	>>●
339.4		PARTIALLY WEATHERED ROCK - Classified as hard, dry, brownish yellow, Sandy SILT (ML) (A-4) 10YR 6/8		58.5						
					SS-15	50/1"			50/1"	>>●
334.4	62.0			63.5	SS-16	46 50/2"			50/2"	>>●

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

Project ID: 42383				County: Lexington		Boring No.: B-30	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.: 399.4 ft	Latitude: 34.17690257	Longitude: -81.32276508	Date Started: 1/13/2016				
Total Depth: 120 ft	Soil Depth: 120 ft	Core Depth: 0 ft	Date Completed: 1/14/2016				
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55	Drill Method: RW	Hammer Type: Automatic		Energy Ratio: 81.9%			
Core Size: N.A.	Driller: AL	Groundwater: TOB N.A.		24HR: 19 feet			

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE ●									
										PL	MC	LL							
										▲ FINES CONTENT (%)									
										0	10	20	30	40	50	60	70	80	90
329.4	72.0	PARTIALLY WEATHERED ROCK - Classified as hard, dry, light olive brown, Sandy SILT (ML) (A-4) 2.5Y 5/6																	

## LEGEND

*Continued Next Page*

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-30	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	399.4 ft	Latitude:	34.17690257	Longitude:	-81.32276508	Date Started: 1/13/2016	
Total Depth: 120 ft		Soil Depth: 120 ft		Core Depth: 0 ft		Date Completed: 1/14/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 19 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
309.4		@SS-21 NMC=22.6		88.5	SS-21	50/5"		50/5"		>>●
304.4				93.5	SS-22	50/3"		50/3"		>>●
299.4		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, dry, olive gray, Sandy SILT (ML) (A-4) 5Y 5/2		98.5	SS-23	50/4"		50/4"		>>●
294.4		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, dry, grayish green to pale green, Sandy SILT (ML) (A-4) GLEY1 5/2 to GLEY1 6/2		103.5	SS-24	50/5"		50/5"		>>●
				108.5	SS-25	35 50/5"		50/5"		>>●

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

Project ID: 42383			County: Lexington		Boring No.: B-30		
Site Description: Columbia Avenue (S-48) Roadway Improvements				Route: S-48			
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.: 399.4 ft	Latitude: 34.17690257	Longitude: -81.32276508	Date Started: 1/13/2016				
Total Depth: 120 ft	Soil Depth: 120 ft	Core Depth: 0 ft	Date Completed: 1/14/2016				
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55	Drill Method: RW	Hammer Type: Automatic		Energy Ratio: 81.9%			
Core Size: N.A.	Driller: AL	Groundwater: TOB N.A.		24HR: 19 feet			

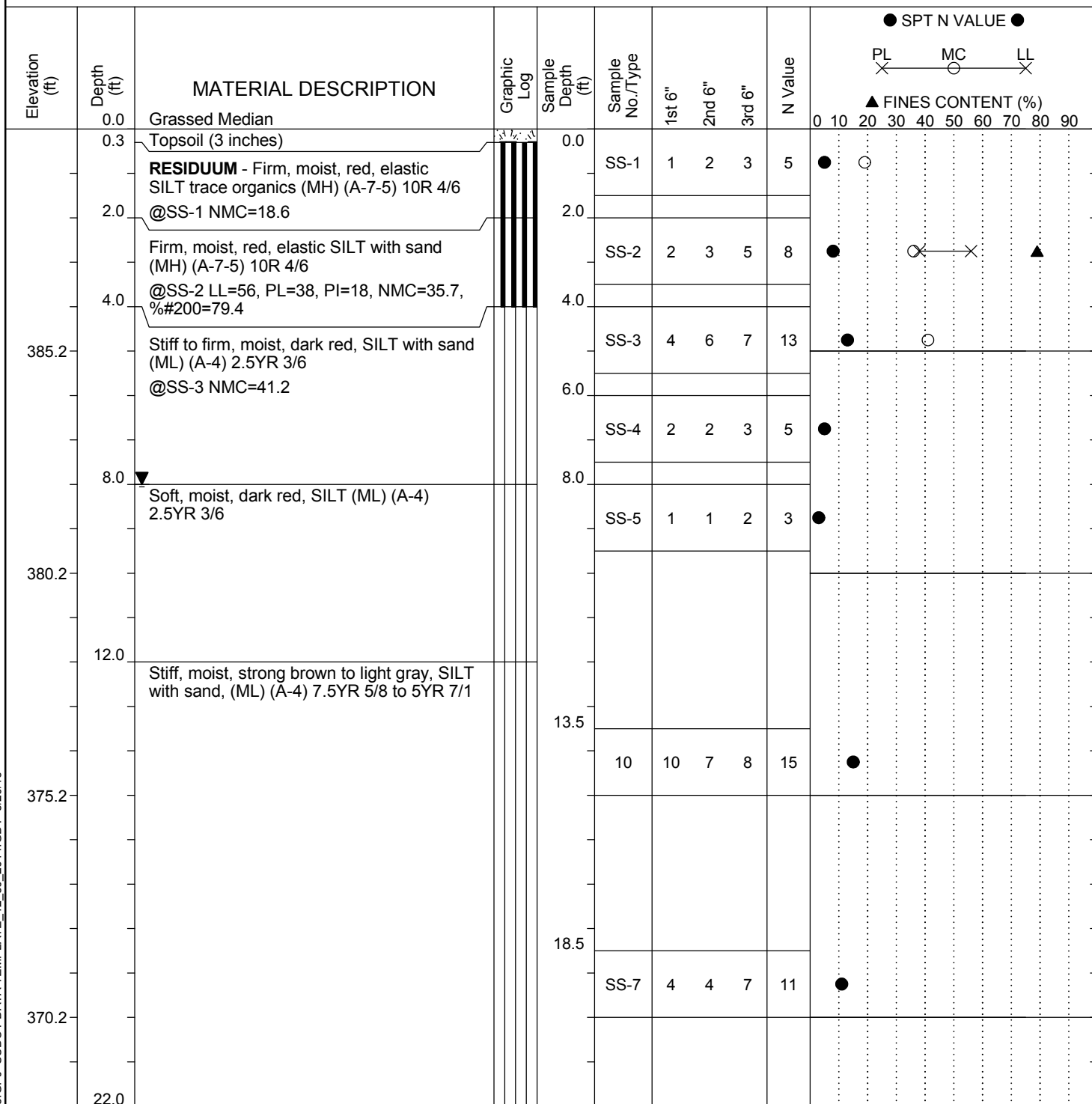
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
284.4				113.5	SS-26	48	50/3"	50/3"		>>●
279.4	120.0	Boring Terminated at 120 feet.		118.5	SS-27	50/3"	50/3"	50/3"		>>●
274.4										
269.4										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-31						
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48					
Eng./Geo.: KZ		Boring Location: -			Offset: -		Alignment: Existing					
Elev.:	390.2 ft	Latitude:	34.17731581	Longitude:	-81.32280001	Date Started:		1/17/2016				
Total Depth:		105 ft	Soil Depth:	105 ft	Core Depth:		0 ft	Date Completed:		1/18/2016		
Bore Hole Diameter (in):		2.94	Sampler Configuration			Liner Required:		Y (N)	Liner Used:		Y (N)	
Drill Machine:		CME-55	Drill Method:		RW	Hammer Type:		Automatic	Energy Ratio:		81.9%	
Core Size:		N.A.	Driller:		CF	Groundwater:		TOB	N.A.		24HR	8 feet



## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-31
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	KZ	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	390.2 ft	<b>Latitude:</b>	34.17731581	<b>Longitude:</b>	-81.32280001
<b>Date Started:</b>	1/17/2016				
<b>Total Depth:</b>	105 ft	<b>Soil Depth:</b>	105 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/18/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>			
<b>Liner Required:</b>	Y	<b>Liner Used:</b>	Y		
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	CF	<b>Groundwater:</b>	TOB
<b>24HR</b>	8 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
365.2	27.0	Very stiff, moist, very pale brown, SILT with sand (ML) (A-4) 10YR 8/4		23.5	SS-8	10	9	12	21	●
360.2		Hard, moist, yellowish brown to light gray, SILT with sand (ML) (A-4) 10YR 5/6 and 10YR 7/7		28.5	SS-9	13	23	22	45	●
355.2		@SS-10 NMC=25.7		33.5	SS-10	28	29	31	60	○ ●
350.2				38.5	SS-11	6	14	18	32	●
	42.0	Stiff, moist, pale yellow, SILT (ML) (A-4) 5Y 7/4		43.5						

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-31	
Site Description: Columbia Avenue (S-48) Roadway Improvements					Route: S-48		
Eng./Geo.: KZ		Boring Location: -		Offset: -		Alignment: Existing	
Elev.: 390.2 ft		Latitude: 34.17731581		Longitude: -81.32280001		Date Started: 1/17/2016	
Total Depth: 105 ft		Soil Depth: 105 ft		Core Depth: 0 ft		Date Completed: 1/18/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: CF		Groundwater: TOB N.A.		24HR 8 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
345.2	47.0	Hard, moist, strong brown, SILT with quartz fragments, (ML) (A-4) 7.5YR 4/6		48.5	SS-12	3	5	8	13	●
340.2	52.0	PARTIALLY WEATHERED ROCK - Classified as hard, moist, yellowish brown, SILT (ML) (A-4) 7.5YR 4/6		53.5	SS-13	13	15	33	48	●
335.2	58.5	PARTIALLY WEATHERED ROCK - Classified as very dense, wet, light brown, angular, strongly cemented, fine to coarse SAND with quartz rock fragments (SP) (A-3) 7.5YR 6/3		63.5	SS-14	13	28	50/5"	50/5"	>>●
330.2	62.0			63.5	SS-15	18	36	50/5"	50/5"	>>●
325.2					SS-16	50/5"			50/5"	>>●

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-31
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	KZ	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	390.2 ft	<b>Latitude:</b>	34.17731581	<b>Longitude:</b>	-81.32280001
<b>Date Started:</b>	1/17/2016				
<b>Total Depth:</b>	105 ft	<b>Soil Depth:</b>	105 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/18/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	CF	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	8 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> 0 10 20 30 40 50 60 70 80 90 </div> </div>
67.0		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, moist, strong brown, SILT with quartz fragments (ML) (A-4) 7.5YR 4/6		68.5	SS-17	39	47	50/5"	50/5"	>>●
320.2				73.5	SS-18	22	45	50/5"	50/5"	>>●
315.2				78.5	SS-19	24	39	50/5"	50/5"	>>●
310.2		@SS-19 NMC=18.9								
82.0		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, moist, dark brown, lean CLAY trace sand (CL) (A-6) 7.5YR 3/3		83.5	SS-20	30	50/3"		50/3"	>>●
305.2										
87.0		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, moist, dark brown, SILT								

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-31
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	KZ	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	390.2 ft	<b>Latitude:</b>	34.17731581	<b>Longitude:</b>	-81.32280001
<b>Date Started:</b>	1/17/2016				
<b>Total Depth:</b>	105 ft	<b>Soil Depth:</b>	105 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/18/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	CF	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	8 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL X</div> <div>MC ○</div> <div>LL X</div> </div> <div>▲ FINES CONTENT (%)</div> <div>0 10 20 30 40 50 60 70 80 90</div> </div>
300.2		(ML) (A-4) 7.5YR 3/3		88.5						
					SS-21	50/3"			50/3"	>>●
92.0		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, moist, dark greenish gray, lean CLAY with rock fragments (CL) (A-6) 5GY 4/2		93.5						
295.2					SS-22	50/2"			50/2"	>>●
				98.5						
290.2					SS-23	50/1"			50/1"	>>●
				103.5						
285.2	105.0	@ SS-24: No Recovery			SS-24	50/0"			50/0"	>>●
		<b>Boring Terminated at 105 feet</b>								

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

Project ID:		42383			County:		Lexington		Boring No.:		B-32							
Site Description:			Columbia Avenue (S-48) Roadway Improvements							Route:		S-48						
Eng./Geo.:			KZ		Boring Location:			-		Offset:		-		Alignment:		Existing		
Elev.:		391.9 ft		Latitude:		34.17711363		Longitude:		-81.32257805		Date Started:		1/18/2016				
Total Depth:		98.5 ft		Soil Depth:		98.5 ft		Core Depth:		0 ft		Date Completed:		1/19/2016				
Bore Hole Diameter (in):				2.94		Sampler Configuration			Liner Required:		Y (N)		Liner Used:		Y (N)			
Drill Machine:		CME-55			Drill Method:		RW		Hammer Type:		Automatic		Energy Ratio:		81.9%			
Core Size:		N.A.			Driller:		CF		Groundwater:		TOB		N.A.		24HR		10 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE ●	PL MC LL	▲ FINES CONTENT (%)
	0.0	Grassed Median										
	0.3	Topsoil (3 inches)		0.0	SS-1	2	2	2	4	●		
	2.0	<b>FILL</b> - Soft, moist, reddish brown, elastic SILT (MH) (A-7-5) 5YR 4/4 @SS-1 NMC=12.3		2.0								
	4.0	<b>RESIDUUM</b> - Stiff, moist, red, elastic SILT with sand (MH) (A-7-5) 5R 4/6 @SS-2 NMC=35.5			SS-2	4	4	6	10	●	○	
386.9		Stiff to firm, moist, yellowish red, SILT with sand (ML) (A-4) 5YR 4/6		4.0								
				6.0								
					SS-3	4	4	5	9	●		
				8.0								
					SS-4	2	3	7	10	●		
381.9					SS-5	2	3	7	10	●		
				13.5								
		@SS-6 LL=NP, PL=NP, PI=NP, NMC=45.7, % <sub>#200</sub> =75.2			SS-6	3	3	4	7	●	○	▲
376.9												
				18.5								
					SS-7	2	3	4	7	●		
371.9												
22.0												

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-32		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	KZ		Boring Location:	-		Offset:	-		Alignment:	Existing	
Elev.:	391.9 ft		Latitude:	34.17711363		Longitude:	-81.32257805		Date Started:	1/18/2016	
Total Depth:	98.5 ft		Soil Depth:	98.5 ft		Core Depth:	0 ft		Date Completed:	1/19/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-55		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	81.9%	
Core Size:	N.A.		Driller:	CF		Groundwater:	TOB	N.A.		24HR	10 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
366.9	27.0	Stiff, moist, yellow, SILT with sand (ML) (A-4) 10YR 7/6		23.5	SS-8	4	6	7	13	●
361.9		Hard, moist, very pale brown, SILT with sand (ML) (A-4) 10YR 8/2		28.5	SS-9	8	13	19	32	●
356.9				33.5	SS-10	8	12	18	30	●
351.9				38.5	SS-11	10	18	26	44	●
				43.5						

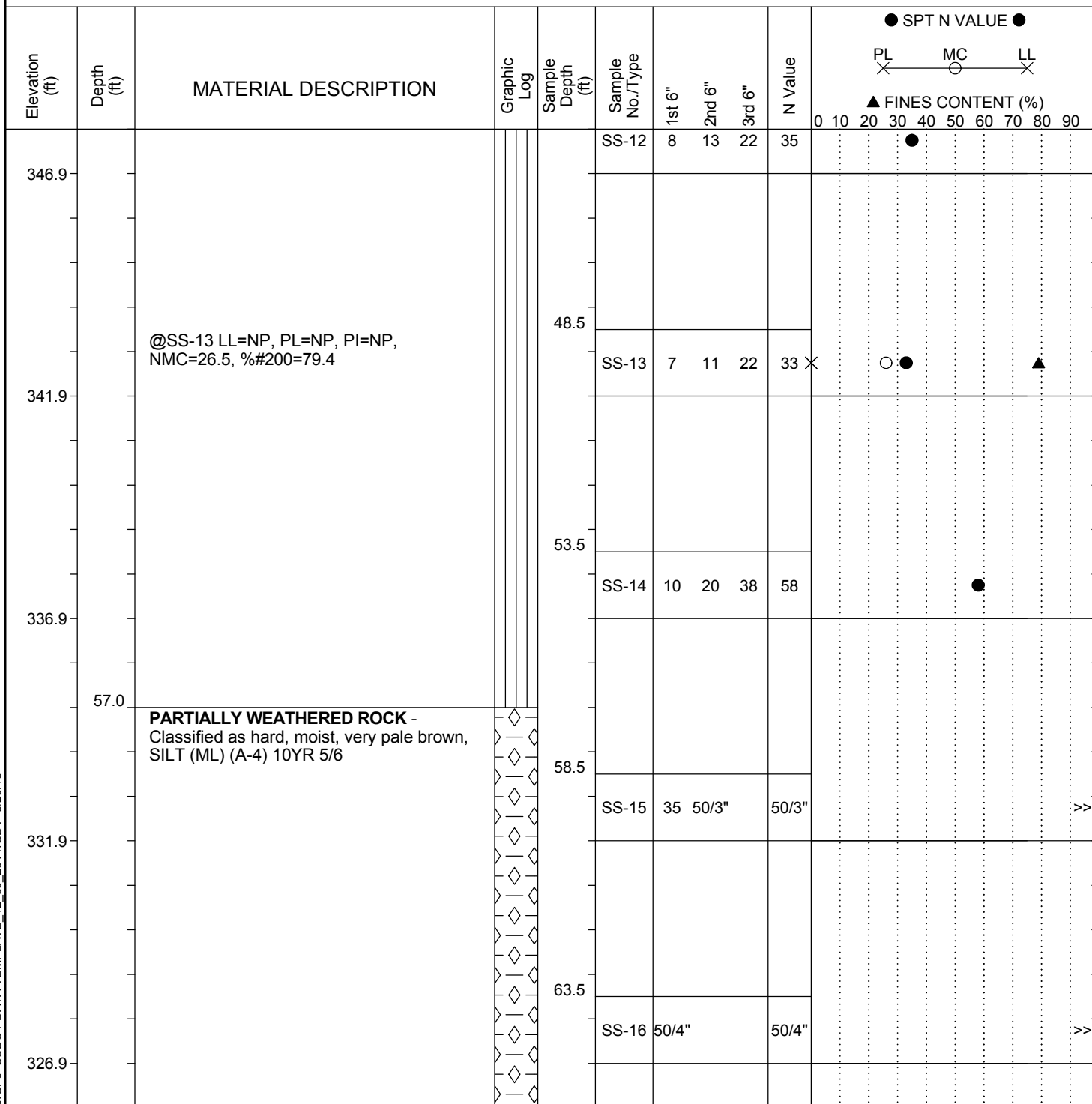
## LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-32	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: KZ		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	391.9 ft	Latitude:	34.17711363	Longitude:	-81.32257805	Date Started: 1/18/2016	
Total Depth: 98.5 ft		Soil Depth: 98.5 ft		Core Depth: 0 ft		Date Completed: 1/19/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: CF		Groundwater: TOB N.A.		24HR: 10 feet	



## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-32	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: KZ		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	391.9 ft	Latitude:	34.17711363	Longitude:	-81.32257805	Date Started: 1/18/2016	
Total Depth: 98.5 ft		Soil Depth: 98.5 ft		Core Depth: 0 ft		Date Completed: 1/19/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: CF		Groundwater: TOB N.A.		24HR: 10 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> 0 10 20 30 40 50 60 70 80 90 </div> </div>
321.9				68.5	SS-17	50/4"		50/4"		>>●
316.9				73.5	SS-18	23	40	50/5"	50/5"	>>●
311.9	77.0	<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, moist, very pale brown, Sandy SILT (ML) (A-4) 10YR 5/6 @SS-19 NMC=16.7, % #200=54.9		78.5	SS-19	50/5"		50/5"		○ ▲ >>●
306.9	82.0	<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, moist, grayish green, SILT with rock fragments (ML) (A-4) GLEY1 5/2		83.5	SS-20	50/1"		50/1"		>>●

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-32						
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48					
Eng./Geo.: KZ		Boring Location: -			Offset: -		Alignment: Existing					
Elev.:	391.9 ft	Latitude:	34.17711363	Longitude:	-81.32257805	Date Started:		1/18/2016				
Total Depth:		98.5 ft	Soil Depth:	98.5 ft	Core Depth:		0 ft	Date Completed:		1/19/2016		
Bore Hole Diameter (in):			2.94	Sampler Configuration		Liner Required:		Y (N)	Liner Used:		Y (N)	
Drill Machine:		CME-55	Drill Method:		RW	Hammer Type:		Automatic		Energy Ratio:		81.9%
Core Size:		N.A.	Driller:		CF	Groundwater:		TOB	N.A.		24HR	10 feet

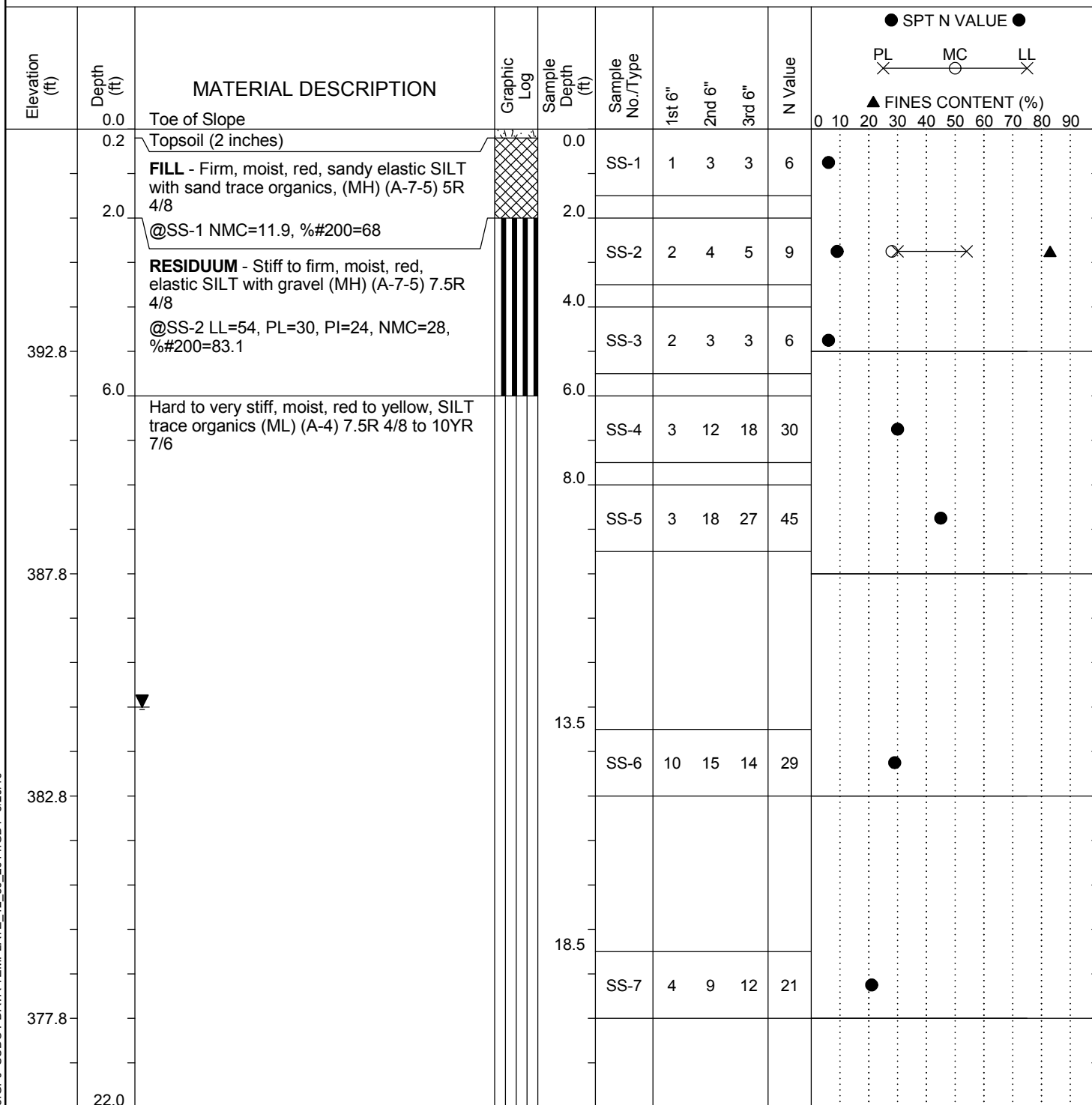
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> 0 10 20 30 40 50 60 70 80 90 </div> </div>
301.9				88.5	SS-21	50/3"		50/3"		
296.9				93.5	SS-22	50/1"		50/1"		
291.9	98.5	RW Bit Refusal at 98.5 feet								
286.9										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:		42383			County:		Lexington		Boring No.:		B-33							
Site Description:			Columbia Avenue (S-48) Roadway Improvements							Route:		S-48						
Eng./Geo.:			KZ		Boring Location:			-		Offset:		-		Alignment:		Existing		
Elev.:		397.8 ft		Latitude:		34.17770061		Longitude:		-81.32227634		Date Started:		1/11/2016				
Total Depth:		107.5 ft		Soil Depth:		107.5 ft		Core Depth:		0 ft		Date Completed:		1/12/2016				
Bore Hole Diameter (in):				2.94		Sampler Configuration			Liner Required:		Y (N)		Liner Used:		Y (N)			
Drill Machine:		CME-55			Drill Method:		RW		Hammer Type:		Automatic		Energy Ratio:		81.9%			
Core Size:		N.A.			Driller:		CF		Groundwater:		TOB		N.A.		24HR		13 feet	



## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-33	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: KZ		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	397.8 ft	Latitude:	34.17770061	Longitude:	-81.32227634	Date Started: 1/11/2016	
Total Depth: 107.5 ft		Soil Depth: 107.5 ft		Core Depth: 0 ft		Date Completed: 1/12/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: CF		Groundwater: TOB N.A.		24HR: 13 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
372.8		Firm to stiff, moist to wet, brownish yellow to dark brown, SILT (ML) (A-4) 10YR 6/8 to 10YR 3/3 @SS-8 LL=NP, PL=NP, PI=NP, NMC=51.5, %200=91.1		23.5	SS-8	2	2	5	7 X ●	<div> <div> ● </div> <div> ○ </div> <div> ▲ </div> </div>
367.8				28.5	SS-9	2	3	7	10 ●	
362.8		Hard, moist, olive gray, SILT (ML) (A-4) 5Y 5/2		33.5	SS-10	6	16	49	65	●
357.8				38.5	SS-11	32	34	39	73	●
42.0		<b>PARTIALLY WEATHERED ROCK-</b> Classified as hard, moist, strong brown, SILT (ML) (A-4) 7.5YR 4/6		43.5						

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

Project ID:		42383			County:		Lexington		Boring No.:		B-33							
Site Description:			Columbia Avenue (S-48) Roadway Improvements							Route:		S-48						
Eng./Geo.:			KZ		Boring Location:			-		Offset:		-		Alignment:		Existing		
Elev.:		397.8 ft		Latitude:		34.17770061		Longitude:		-81.32227634		Date Started:		1/11/2016				
Total Depth:		107.5 ft		Soil Depth:		107.5 ft		Core Depth:		0 ft		Date Completed:		1/12/2016				
Bore Hole Diameter (in):				2.94		Sampler Configuration			Liner Required:		Y (N)		Liner Used:		Y (N)			
Drill Machine:		CME-55			Drill Method:		RW		Hammer Type:		Automatic		Energy Ratio:		81.9%			
Core Size:		N.A.			Driller:		CF		Groundwater:		TOB		N.A.		24HR		13 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
352.8		To 10YR 7/6			SS-12	16	33	50/5"	50/5"	>>●
				48.5						
					SS-13	18	87	50/4"	50/4"	>>●
347.8		To 10YR 6/6								
				53.5						
					SS-14	30	36	50/4"	50/4"	>>●
342.8		To 4YR 3/3								
				58.5						
					SS-15	50/4"			50/4"	>>●
337.8		To 5YR 4/6								
				63.5						
					SS-16	50/4"			50/4"	>>●
332.8										

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-33	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: KZ		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	397.8 ft	Latitude:	34.17770061	Longitude:	-81.32227634	Date Started: 1/11/2016	
Total Depth: 107.5 ft		Soil Depth: 107.5 ft		Core Depth: 0 ft		Date Completed: 1/12/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: CF		Groundwater: TOB N.A.		24HR: 13 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
327.8		To 7.5YR 4/6		68.5	SS-17	22	50/4"	50/4"		>>●
322.8				73.5	SS-18	22	50/5"	50/5"		>>●
317.8		To 5YR 3/3		78.5	SS-19	25	50/5"	50/5"		>>●
82.0				83.5	SS-20	50/5"	50/5"		○ ▲	>>●
312.8		<b>PARTIALLY WEATHERED ROCK -</b> Classified as very dense, dry, brown, subrounded, Silty SAND (SM) (A-2-4) 7.5YR 4/6 @SS-20 NMC=18.9, % #200=41.5  To 7.5YR 2.5/2								

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:		42383			County:		Lexington		Boring No.:		B-33							
Site Description:			Columbia Avenue (S-48) Roadway Improvements							Route:		S-48						
Eng./Geo.:			KZ		Boring Location:			-		Offset:		-		Alignment:		Existing		
Elev.:		397.8 ft		Latitude:		34.17770061		Longitude:		-81.32227634		Date Started:		1/11/2016				
Total Depth:		107.5 ft		Soil Depth:		107.5 ft		Core Depth:		0 ft		Date Completed:		1/12/2016				
Bore Hole Diameter (in):				2.94		Sampler Configuration			Liner Required:		Y (N)		Liner Used:		Y (N)			
Drill Machine:		CME-55			Drill Method:		RW		Hammer Type:		Automatic		Energy Ratio:		81.9%			
Core Size:		N.A.			Driller:		CF		Groundwater:		TOB		N.A.		24HR		13 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> 0 10 20 30 40 50 60 70 80 90 </div> </div>
307.8		To 10YR 8/6		88.5	SS-21	50/4"		50/4"		>>●
				93.5	SS-22	50/2"		50/2"		>>●
302.8				98.5	SS-23	50/1"		50/1"		>>●
297.8				103.5	SS-24	50/1"		50/1"		>>●
292.8		To 5Y 8/4								
		RW Bit Refusal at 107.5 feet								
107.5										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-34		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	KZ		Boring Location:	-		Offset:	-		Alignment:	Existing	
Elev.:	396.2 ft		Latitude:	34.17730917		Longitude:	-81.32216508		Date Started:	1/7/2016	
Total Depth:	120 ft		Soil Depth:	120 ft		Core Depth:	0 ft		Date Completed:	1/8/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-55		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	81.9%	
Core Size:	N.A.		Driller:	AL		Groundwater:	TOB	N.A.		24HR	16 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL X</div> <div>MC ○</div> <div>LL X</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Toe of Slope								
	0.2	Topsoil (2 inches)		0.0	SS-1	2	3	7	10	●
	2.0	<b>FILL</b> - Stiff, moist, red, elastic silt (MH) (A-7-5) 7.5R 4/8 @SS-1 NMC=11.1		2.0						
	4.0	<b>RESIDUUM</b> - Very stiff, moist, red, SILT with clay seams (ML) (A-4) 7.5R 4/8 @SS-2 LL=NP, PL=NP, PI=NP, NMC=23.3, % <sub>#200</sub> =89.6		4.0	SS-2	6	8	10	18 X	● ○ ▲
391.2	6.0	Very stiff, moist, dark red, SILT (ML) (A-4) 7.5R 3/8		6.0	SS-3	4	9	19	28	●
	8.0	Firm to stiff, moist, red to strong brown, SILT (ML) (A-4) 7.5r 4/8 to 7.5R 4/6		8.0	SS-4	2	3	5	8	●
	10.0			10.0	SS-5	2	4	5	9	●
386.2	13.5			13.5	SS-6	2	3	6	9	●
381.2	17.0	Firm to stiff, moist, red to strong brown, SILT (ML) (A-4) 7.5r 4/8 to 7.5R 4/6		17.0						
	18.5			18.5	SS-7	2	2	5	7	●
376.2										

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-34		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	KZ		Boring Location:	-		Offset:	-		Alignment:	Existing	
Elev.:	396.2 ft		Latitude:	34.17730917		Longitude:	-81.32216508		Date Started:	1/7/2016	
Total Depth:	120 ft		Soil Depth:	120 ft		Core Depth:	0 ft		Date Completed:	1/8/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-55		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	81.9%	
Core Size:	N.A.		Driller:	AL		Groundwater:	TOB	N.A.		24HR	16 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
371.2		@SS-8 LL=NP, PL=NP, PI=NP, NMC=48.6, % <sub>#200</sub> =90.2		23.5	SS-8	2	3	5	8 X	<div> <div> ● </div> <div> ○ </div> <div> ▲ </div> </div>
366.2				28.5	SS-9	2	3	5	8	<div> <div> ● </div> </div>
361.2	32.0	Hard, moist, yellowish red and black, SILT (ML) (A-4) 5YR 4/6 and 5YR 2.5/1		33.5	SS-10	7	13	19	32	<div> <div> ● </div> </div>
356.2				38.5	SS-11	13	19	28	47	<div> <div> ● </div> </div>
				43.5						

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-34
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	KZ	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	396.2 ft	<b>Latitude:</b>	34.17730917	<b>Longitude:</b>	-81.32216508
<b>Date Started:</b>	1/7/2016				
<b>Total Depth:</b>	120 ft	<b>Soil Depth:</b>	120 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/8/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)	<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW
<b>Hammer Type:</b>	Automatic	<b>Energy Ratio:</b>	81.9%		
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	16 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
351.2					SS-12	13	17	14	31	
				48.5						
		@SS-13 NMC=23.5			SS-13	15	23	37	60	
346.2										
	52.0									
		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, moist, very dark gray to strong brown, SILT (ML) (A-4) 7.4YR 3/1 to 7.5YR 4/6		53.5						
					SS-14	16	43	50/4"	50/4"	>>
341.2										
		To 10YR 7/8								
		@SS-15 NMC=22.7		58.5						
					SS-15	10	17	50/4"	50/4"	>>
336.2										
		To 10YR 4/4								
				63.5						
					SS-16	19	50/4"	50/4"	50/4"	>>
331.2										

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-34
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	KZ	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	396.2 ft	<b>Latitude:</b>	34.17730917	<b>Longitude:</b>	-81.32216508
<b>Date Started:</b>	1/7/2016				
<b>Total Depth:</b>	120 ft	<b>Soil Depth:</b>	120 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/8/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	16 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL MC LL </div> <div> ▲ FINES CONTENT (%) </div> </div>
326.2		To 5Y 5/2		68.5	SS-17	43	50/1"	50/1"	50/1"	>>●
321.2		To 5Y 5/2		73.5	SS-18	50/3"		50/3"		>>●
316.2		To 10YR 8/4 to 10YR 3/3		78.5	SS-19	50/4"		50/4"		>>●
311.2		To 10YR 8/4 to 10YR 3/3		83.5	SS-20	38	50/4"	50/4"		>>●
		To 10YR 8/4								

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-34		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	KZ		Boring Location:	-		Offset:	-		Alignment:	Existing	
Elev.:	396.2 ft		Latitude:	34.17730917		Longitude:	-81.32216508		Date Started:	1/7/2016	
Total Depth:	120 ft		Soil Depth:	120 ft		Core Depth:	0 ft		Date Completed:	1/8/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-55		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	81.9%	
Core Size:	N.A.		Driller:	AL		Groundwater:	TOB	N.A.		24HR	16 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
306.2		To 7.5YR 3/3 to 7.5YR 8/1		88.5	SS-21	50/2"		50/2"		>>●
				93.5	SS-22	50/2"		50/2"		>>●
301.2		To 7.5YR 3/3 to 7.5YR 8/1		98.5	SS-23	50/3"		50/3"		>>●
296.2				103.5	SS-24	50/1"		50/1"		>>●
		To 7.5YR 5/6		108.5	SS-25	50/5"		50/5"		>>●
291.2										
		To 2.5YR 3/3								

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-34						
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48					
Eng./Geo.: KZ		Boring Location: -			Offset: -		Alignment: Existing					
Elev.:	396.2 ft	Latitude:	34.17730917	Longitude:	-81.32216508	Date Started:		1/7/2016				
Total Depth:		120 ft	Soil Depth:	120 ft	Core Depth:		0 ft	Date Completed:		1/8/2016		
Bore Hole Diameter (in):		2.94	Sampler Configuration		Liner Required:		Y	(N)	Liner Used:		Y	(N)
Drill Machine:		CME-55	Drill Method:	RW		Hammer Type:		Automatic		Energy Ratio:		81.9%
Core Size:		N.A.	Driller:	AL		Groundwater:		TOB	N.A.		24HR	16 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
281.2		To 5YR 7/1 to 7.5YR 3/3		113.5	SS-26	50/4"		50/4"		>>●
276.2	120.0	To 7.5YR 3/1		118.5	SS-27	50/3"		50/3"		>>●
271.2		<b>Boring Terminated at 120 feet</b>								
266.2										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-35		
Site Description:		Columbia Avenue (S-48) Roadway Improvements					Route: S-48	
Eng./Geo.: RS		Boring Location: -			Offset: -		Alignment: Existing	
Elev.:	377.7 ft	Latitude:	34.1784948	Longitude:	-81.32428267	Date Started:		1/6/2016
Total Depth:		30 ft	Soil Depth:	30 ft	Core Depth:	0 ft	Date Completed: 1/8/2016	
Bore Hole Diameter (in):		2.94	Sampler Configuration		Liner Required:	Y (N)	Liner Used:	Y (N)
Drill Machine:		CME-550X	Drill Method:		RW	Hammer Type:	Automatic	Energy Ratio: 74.2%
Core Size:		N.A.	Driller:		AL	Groundwater:	TOB N.A.	24HR 7 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
	0.0	Grassed Shoulder								
	0.1	Topsoil (1 inch)		0.0	SS-1	3	8	7	15	●
		<b>RESIDUUM</b> - Stiff, dry, red, Sandy SILT (ML) (A-4) 10R 5/8								
		@SS-1 NMC=20.6		2.0						
		@SS-2 LL=NP, PL=NP, PI=NP, NMC=27.8, %200=65.4			SS-2	5	5	4	9	●
	4.0	Very stiff, dry, light red, SILT (ML) (A-4) 10R 6/8		4.0						
372.7					SS-3	2	8	8	16	●
	6.0	Stiff to firm, dry, light red, fat CLAY with sand (CH) (A-7-5) 10R 7/8		6.0						
		@SS-4 LL=59, PL=30, PI=29, NMC=29.4, %200=94.9			SS-4	5	5	8	13	●
		@SS-5 NMC=30.9		8.0						
					SS-5	1	2	3	5	●
367.7										
	12.0	Stiff, dry, light red, SILT (ML) (A-4) 10R 6/8		13.5						
362.7					SS-6	4	5	6	11	●
	17.0	Very stiff to hard, dry, reddish yellow, SILT (ML) (A-4) 5YR 7/8		18.5						
					SS-7	5	10	12	22	●
357.7										

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-35		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	RS		Boring Location:	-		Offset:	-		Alignment:	Existing	
Elev.:	377.7 ft		Latitude:	34.1784948		Longitude:	-81.32428267		Date Started:	1/6/2016	
Total Depth:	30 ft		Soil Depth:	30 ft		Core Depth:	0 ft		Date Completed:	1/8/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-550X		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	74.2%	
Core Size:	N.A.		Driller:	AL		Groundwater:	TOB	N.A.		24HR	7 feet

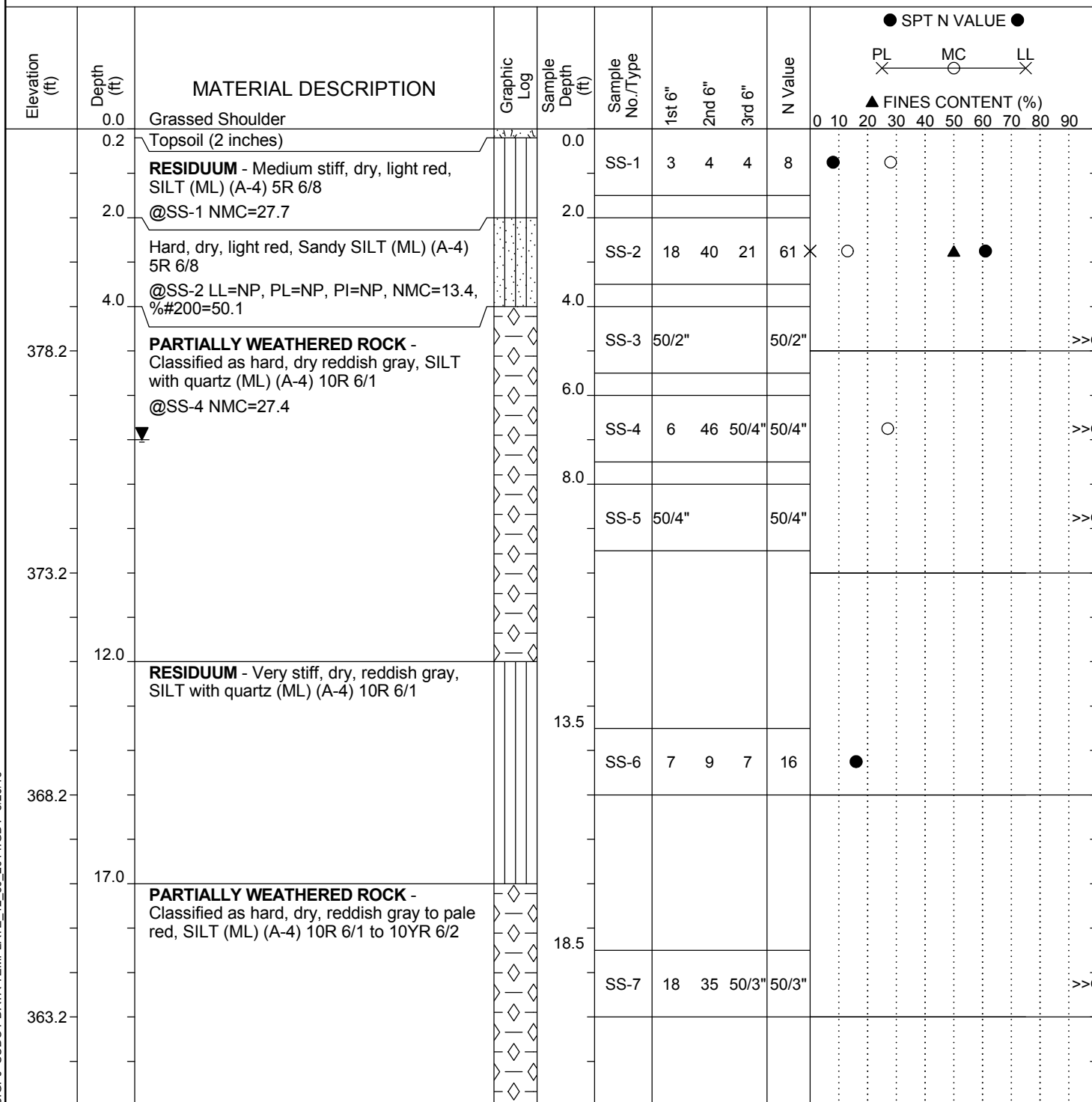
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
352.7				23.5	SS-8	6	10	16	26	●
347.7	30.0	Boring Terminated at 30 feet		28.5	SS-9	5	11	29	40	●
342.7										
337.7										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-36
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	RS	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	383.2 ft	<b>Latitude:</b>	34.17644057	<b>Longitude:</b>	-81.32058116
<b>Date Started:</b>	1/6/2016				
<b>Total Depth:</b>	30 ft	<b>Soil Depth:</b>	30 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/8/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	7 feet				



## LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS	- Split Spoon	HSA	- Hollow Stem Auger
UD	- Undisturbed Sample	CFA	- Continuous Flight Augers
AWG	- Rock Core, 1-1/8"	DC	- Driving Casing
NQ	- Rock Core, 1-7/8"	RW	- Rotary Wash
CU	- Cuttings	RC	- Rock Core
CT	- Continuous Tube		

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-36	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	383.2 ft	Latitude:	34.17644057	Longitude:	-81.32058116	Date Started: 1/6/2016	
Total Depth: 30 ft		Soil Depth: 30 ft		Core Depth: 0 ft		Date Completed: 1/8/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-55		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 81.9%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 7 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
358.2		@ SS-8: No Sample Recovered		23.5	SS-8	50/3"		50/3"		>>●
353.2	30.0	Boring Terminated at 30 feet		28.5	SS-9	50/4"		50/4"		>>●
348.2										
343.2										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-37	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	402.6 ft	Latitude:	34.17793384	Longitude:	-81.32171697	Date Started: 1/6/2016	
Total Depth: 50 ft		Soil Depth: 50 ft		Core Depth: 0 ft		Date Completed: 1/7/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 74.2%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 22 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
	0.0	Grassed Shoulder								
	0.2	Topsoil (2 inches)		0.0	SS-1	3	4	6	10	<div> ● 20 O 30 X 70 ▲ </div>
		<b>RESIDUUM</b> - Stiff to very stiff, dry, red, fat CLAY with sand (CH) (A-7-5) 10R 5/8 @SS-1 LL=65, PL=31, PI=34, NMC=24.5, % <sub>#200</sub> =70.4 @SS-2 NMC=22.2		2.0						
					SS-2	8	14	16	30	<div> O ● </div>
	4.0	Very stiff, dry, red, fat CLAY (CH) (A-7-5) 10R 4/8 @SS-3 NMC=24.3		4.0						
					SS-3	7	12	18	30	<div> O ● </div>
397.6	6.0	Very stiff, dry, light red, SILT (ML) (A-4) 10R 7/8		6.0						
					SS-4	4	8	12	20	<div> ● </div>
	8.0	Stiff to very stiff, dry, light red, SILT (ML) (A-4) 5R 6/8		8.0						
					SS-5	2	4	6	10	<div> ● </div>
392.6										
				13.5						
					SS-6	4	7	10	17	<div> ● </div>
387.6										
				18.5						
					SS-7	4	7	12	19	<div> ● </div>
382.6										
	22.0									

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-37	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	402.6 ft	Latitude:	34.17793384	Longitude:	-81.32171697	Date Started: 1/6/2016	
Total Depth: 50 ft		Soil Depth: 50 ft		Core Depth: 0 ft		Date Completed: 1/7/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 74.2%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 22 feet	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> </div>
377.6	27.0	Very stiff, dry, light red, SILT (ML) (A-4) 5R 7/8		23.5	SS-8	6	12	15	27	●
372.6		Hard to very stiff, dry, light red, SILT (ML) (A-4) 5R 7/8		28.5	SS-9	10	14	29	43	●
367.6		@SS-10 LL=NP, PL=NP, PI=NP, NMC=24.7, %200=85.9		33.5	SS-10	14	27	48	75 X	○ ● ▲
362.6				38.5	SS-11	6	9	16	25	●
	42.0	Hard, dry, light red, SILT (ML) (A-4) 5R 7/8		43.5						

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	



# SCDOT Soil Test Log

Project ID: 42383				County: Lexington		Boring No.: B-37	
Site Description: Columbia Avenue (S-48) Roadway Improvements			Route: S-48				
Eng./Geo.: RS		Boring Location: -		Offset: -		Alignment: Existing	
Elev.:	402.6 ft	Latitude:	34.17793384	Longitude:	-81.32171697	Date Started: 1/6/2016	
Total Depth: 50 ft		Soil Depth: 50 ft		Core Depth: 0 ft		Date Completed: 1/7/2016	
Bore Hole Diameter (in): 2.94		Sampler Configuration		Liner Required: Y (N)		Liner Used: Y (N)	
Drill Machine: CME-550X		Drill Method: RW		Hammer Type: Automatic		Energy Ratio: 74.2%	
Core Size: N.A.		Driller: AL		Groundwater: TOB N.A.		24HR: 22 feet	

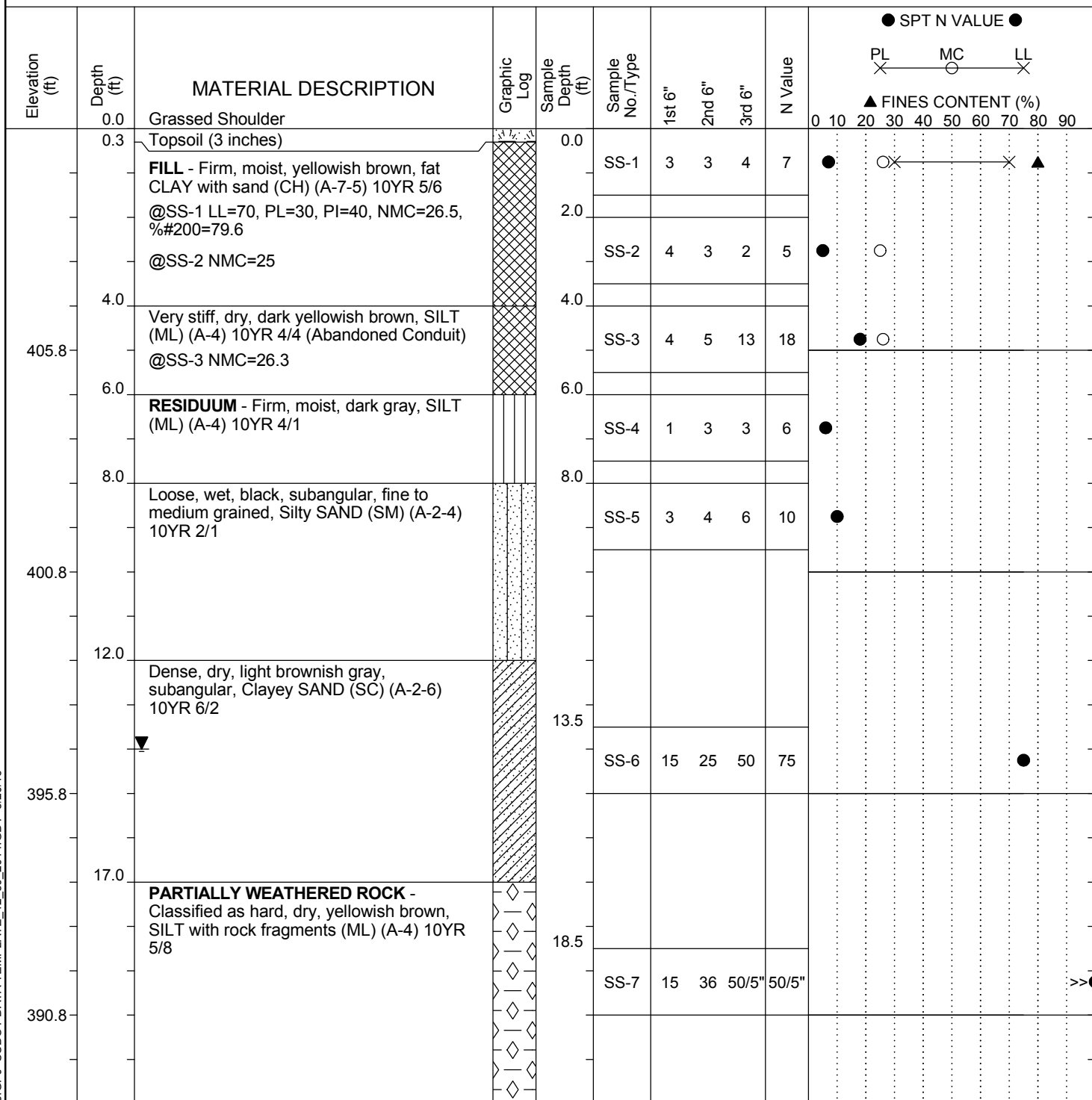
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
357.6					SS-12	21	40	33	73	<div> <div>0</div> <div>10</div> <div>20</div> <div>30</div> <div>40</div> <div>50</div> <div>60</div> <div>70</div> <div>80</div> <div>90</div> </div>
47.0		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, dry, light red, SILT (ML) (A-4) 5R 7/8		48.5						
352.6	50.0	<b>Boring Terminated at 50 feet</b>			SS-13	33	50/4"		50/4"	>>●
347.6										
342.6										
337.6										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-38
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	410.8 ft	<b>Latitude:</b>	34.17655625	<b>Longitude:</b>	-81.32363898
<b>Date Started:</b>	1/4/2016				
<b>Total Depth:</b>	50 ft	<b>Soil Depth:</b>	50 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/6/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	14 feet				



## LEGEND

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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

Project ID:	42383				County:	Lexington		Boring No.:	B-38		
Site Description:	Columbia Avenue (S-48) Roadway Improvements							Route:	S-48		
Eng./Geo.:	JF		Boring Location:	-		Offset:	-		Alignment:	Existing	
Elev.:	410.8 ft		Latitude:	34.17655625		Longitude:	-81.32363898		Date Started:	1/4/2016	
Total Depth:	50 ft		Soil Depth:	50 ft		Core Depth:	0 ft		Date Completed:	1/6/2016	
Bore Hole Diameter (in):	2.94		Sampler Configuration			Liner Required:	Y (N)		Liner Used:	Y (N)	
Drill Machine:	CME-55		Drill Method:	RW		Hammer Type:	Automatic		Energy Ratio:	81.9%	
Core Size:	N.A.		Driller:	AL		Groundwater:	TOB	N.A.		24HR	14 feet

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div> ● SPT N VALUE ● </div> <div> PL X MC O LL X </div> <div> ▲ FINES CONTENT (%) </div> <div> 0 10 20 30 40 50 60 70 80 90 </div> </div>
385.8				23.5	SS-8	15	24	50/5"	50/5"	>>●
380.8				28.5	SS-9	34	50/5"		50/5"	>>●
375.8		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, dry, brownish yellow, SILT with rock fragments (ML) (A-4) 10YR 6/8		33.5	SS-10	50/5"			50/5"	>>●
370.8		<b>PARTIALLY WEATHERED ROCK -</b> Classified as hard, dry, yellowish brown, SILT with rock fragments (ML) (A-4) 10YR 5/6		38.5	SS-11	50/5"			50/5"	>>●
				43.5						

## LEGEND

Continued Next Page

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

# SCDOT Soil Test Log

<b>Project ID:</b>	42383	<b>County:</b>	Lexington	<b>Boring No.:</b>	B-38
<b>Site Description:</b>	Columbia Avenue (S-48) Roadway Improvements			<b>Route:</b>	S-48
<b>Eng./Geo.:</b>	JF	<b>Boring Location:</b>	-	<b>Offset:</b>	-
<b>Elev.:</b>	410.8 ft	<b>Latitude:</b>	34.17655625	<b>Longitude:</b>	-81.32363898
<b>Date Started:</b>	1/4/2016				
<b>Total Depth:</b>	50 ft	<b>Soil Depth:</b>	50 ft	<b>Core Depth:</b>	0 ft
<b>Date Completed:</b>	1/6/2016				
<b>Bore Hole Diameter (in):</b>	2.94	<b>Sampler Configuration</b>		<b>Liner Required:</b>	Y (N)
<b>Liner Used:</b>	Y (N)				
<b>Drill Machine:</b>	CME-55	<b>Drill Method:</b>	RW	<b>Hammer Type:</b>	Automatic
<b>Energy Ratio:</b>	81.9%				
<b>Core Size:</b>	N.A.	<b>Driller:</b>	AL	<b>Groundwater:</b>	TOB N.A.
<b>24HR</b>	14 feet				

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	<div> <div>● SPT N VALUE ●</div> <div> <div>PL</div> <div>MC</div> <div>LL</div> </div> <div>▲ FINES CONTENT (%)</div> </div>
365.8					SS-12	50/4"			50/4"	
				48.5						
360.8	50.0	<b>Boring Terminated at 50 feet</b>			SS-13	28	50/3"		50/3"	
355.8										
350.8										
345.8										

## LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

**APPENDIX B**  
**LABORATORY TESTING**

**Exhibit B-1 – Laboratory Testing Description**  
**Exhibit B-2 – Summary of Laboratory Data**  
**Exhibit B-3 - Laboratory Data Sheets**

## Geotechnical Data Report

S-48 (Columbia Avenue) Corridor Improvements ■ Lexington County, SC

May 20, 2016 ■ Terracon Project No. 73155095



### LABORATORY TESTING DESCRIPTION

The samples collected during the field exploration were taken to our laboratory for additional testing. The laboratory testing program was developed by Terracon at the request of the SCDOT. Using the determined testing program, the laboratory tests were conducted on selected soil samples to determine lithological information. The test results are presented in this appendix

The laboratory test results were used to confirm the soil descriptions presented on the boring logs in Appendix A. Laboratory tests were performed in general accordance with the applicable ASTM, AASHTO, SCDOT or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

■ Sieve Analysis with Wash	AASHTO T88/(ASTM 422-63)
■ Sieve Analysis with Hydrometer	AASHTO T88/(ASTM 422-63)
■ Atterberg Limits	AASHTO T89/T90(ASTM D4318)
■ Moisture Content Determination	AASHTO T265/(ASTM D2216)
■ Standard Proctor	AASHTO T99/ (ASTM D698)
■ California Bearing Ratio	AASHTO T193/(ASTM D1883)
■ Tri-axial Testing	AASHTO T296/(ASTM D4767)
■ pH of Soils	AASHTO T289/(ASTM D4972)
■ Water Soluble Sulfate Content	AASHTO T290/(ASTM C1580)
■ Water-Soluble Chloride Content	AASHTO T291/(ASTM D1411)
■ Laboratory Soil Resistivity	AASHTO T288/(ASTM G187)
■ Loss on ignition	AASHTO T267/(ASTM D2974)

# SUMMARY OF LABORATORY RESULTS

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-LANDSCAPE 73155095 LAB TESTING.GPJ TERRACON2012.GDT 5/20/16

BORING ID	Depth	USCS Classification and Soil Description	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Organic Content (%)
B-01	0 - 1.5	LEAN CLAY(CL)	32	23	9	91.6	0.0	8.4	66.5	25.0	27.5	
B-01	2 - 3.5	SANDY FAT CLAY(CH)	59	29	30	53.9	0.8	45.4			26.7	
B-01	8 - 9.5	SANDY SILT(ML)	40	27	13	60.2	1.6	38.2			24.3	
B-02	0.5 - 2	ELASTIC SILT (MH)	50	27	23	88.5	1.4	10.0			22.6	
B-02	4 - 5.5	ELASTIC SILT (MH)	60	33	27						23.6	
B-02 BULK	0 - 5	SANDY SILTY CLAY with	25	18	7	56.0	17.0	27.0			16.0	4.8
		GRAVEL(CL-ML)										
B-03	0.5 - 2	LEAN CLAY with SAND(CL)	44	21	23	80.9	2.7	16.4			13.0	
B-03	2 - 3.5	LEAN CLAY(CL)	47	26	21	88.2	2.0	9.7			23.0	
B-03	6 - 7.5	SILT with SAND(ML)	NP	NP	NP	81.6	0.4	18.0			23.4	
B-04	0 - 1.5	LEAN CLAY(CL)	46	22	24	88.1	0.3	11.6			25.6	
B-04	2 - 3.5	LEAN CLAY(CL)	43	26	17	89.7	0.3	10.0			23.7	
B-04	6 - 7.5	FAT CLAY (CH)	54	23	31						23.2	
B-05	0 - 1.5	ELASTIC SILT(MH)	66	37	29	93.1	1.1	5.8			26.6	
B-05	2 - 3.5	ELASTIC SILT(MH)	72	39	33	94.9	0.0	5.1			25.3	
B-05 BULK	0 - 5	SILT(ML)	43	35	8	90.7	0.5	8.8			25.9	4.7
B-06	0 - 1.5	LEAN CLAY(CL)	37	21	16	85.8	1.4	12.8			22.5	
B-06	2 - 3.5	LEAN CLAY(CL)	41	22	19	91.5	0.2	8.3			25.6	
B-06	4 - 5.5	LEAN CLAY (CL)									27.0	
B-06	6 - 7.5	ELASTIC SILT with SAND(MH)	57	32	25	79.6	3.3	17.1	31.7	48.0	26.4	
B-07	0 - 1.5	SILTY CLAY(CL-ML)	28	21	7	86.8	1.4	11.8			23.8	
B-07	2 - 3.5	FAT CLAY(CH)	56	25	31	91.7	2.6	5.7			22.4	
B-07	8 - 9.5	SILT with SAND(ML)	NP	NP	NP	81.0	0.3	18.7			10.6	
B-08	0 - 1.5	LEAN CLAY(CL)	48	23	25	89.0	3.1	7.9	40.2	48.8	26.6	
B-08	2 - 3.5	FAT CLAY with SAND(CH)	61	29	32	71.7	6.2	22.1			21.3	

PROJECT: Columbia Avenue (S-48) Roadway Improvements

SITE: Columbia Avenue (S-48)  
Lexington County, South Carolina



PH. 803-741-9000

FAX. 803-741-9900

PROJECT NUMBER: 73155095

CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

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B-09	0 - 1.5	LEAN CLAY (CL)				73.0	12.1	14.9			20.1	
B-09	2 - 3.5	SILT with SAND(ML)	NP	NP	NP	82.9	0.0	17.1			23.8	
B-09	8 - 9.5	SILT with SAND (ML)				82.4	0.1	17.5			38.9	
B-10	0 - 1.5	LEAN CLAY with SAND(CL)	37	19	18	74.0	5.9	20.1			22.5	
B-10	2 - 3.5	LEAN CLAY with SAND(CL)	41	23	18	84.8	1.0	14.2			24.2	
B-10	8 - 9.5	ELASTIC SILT(MH)	71	42	29	95.7	0.0	4.3			39.2	
B-11	0 - 1.5	FAT CLAY(CH)	56	25	31	86.4	2.5	11.1			24.9	
B-11	2 - 3.5	FAT CLAY (CH)									27.7	
B-11	4 - 5.5	ELASTIC SILT(MH)	68	40	28	87.1	0.0	12.9			40.1	
B-12	0.5 - 2	LEAN CLAY with SAND(CL)	46	23	23	75.2	5.0	19.7			16.9	
B-12	2 - 3.5	FAT CLAY(CH)	72	34	38	90.1	0.0	9.9			24.7	
B-12	13.5 - 15	SILT with SAND(ML)	NP	NP	NP	82.8	0.2	17.0			44.1	
B-12 BULK	0 - 5	CLAYEY SAND with GRAVEL(SC)	28	18	10	31.0	19.1	49.9			13.9	5.6
B-13	0 - 1.5	LEAN CLAY with SAND(CL)	35	21	14	84.9	0.0	15.1			25.2	
B-13	2 - 3.5	FAT CLAY(CH)	52	24	28	87.7	0.2	12.2			24.7	
B-13	6 - 7.5	ELASTIC SILT(MH)	62	32	30	94.9	0.0	5.1	29.6	65.4	27.9	
B-14	0 - 1.5	FAT CLAY(CH)	63	26	37	92.4	0.0	7.6			25.8	
B-14	2 - 3.5	FAT CLAY(CH)	59	25	34	86.6	1.3	12.1	28.0	58.7	24.9	
B-14	8 - 9.5	ELASTIC SILT(MH)	69	40	29	87.5	0.6	12.0	30.7	56.8	31.0	
B-15	0 - 1.5	FAT CLAY (CH)				91.0	0.5	8.5			27.1	
B-15	2 - 3.5	FAT CLAY(CH)	59	27	32	89.3	0.0	10.7	40.1	49.1	27.1	
B-16	0.5 - 2	SILT (ML)				89.2	0.3	10.5			25.3	
B-16	2 - 3.5	ELASTIC SILT(MH)	51	31	20	88.8	0.6	10.6			25.7	
B-17	0 - 1.5	ELASTIC SILT with SAND(MH)	54	30	24	75.3	3.5	21.2			31.5	
B-17	2 - 3.5	LEAN CLAY with SAND (CL)				86.8	0.0	13.1	29.4	57.4	38.3	

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BORING ID	Depth	USCS Classification and Soil Description	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Organic Content (%)
B-17	4 - 5.5	LEAN CLAY with SAND (CL)	47	25	22						31.4	
B-18	0 - 1.5	LEAN CLAY with SAND (CL)									33.8	
B-18	2 - 3.5	LEAN CLAY with SAND(CL)	41	23	18	82.0	0.0	18.0			30.5	
B-19	0 - 1.5	FAT CLAY with SAND(CH)	50	24	26	83.9	6.0	10.1	53.5	30.4	24.0	
B-19	2 - 3.5	ELASTIC SILT(MH)	63	32	31	88.7	3.1	8.2	28.5	60.2	26.6	
B-20	0.5 - 2	ELASTIC SILT(MH)	64	34	30	96.6	0.0	3.4			22.0	
B-20	2 - 3.5	ELASTIC SILT with SAND(MH)	56	33	23	84.3	3.0	12.7			20.2	
B-20	8 - 9.5	SILT(ML)	NP	NP	NP	95.7	0.0	4.3			33.0	
B-20 BULK	0 - 5	SILT with SAND(ML)	46	28	18	76.6	6.8	16.6			21.6	4.8
B-21	0 - 1.5	SILT with SAND (ML)									25.0	
B-21	2 - 3.5	SILT with SAND(ML)	NP	NP	NP	74.9	1.0	24.1			18.4	
B-22	0 - 1.5	FAT CLAY(CH)	70	29	41	88.4	0.3	11.4			24.3	
B-22	2 - 3.5	FAT CLAY with SAND (CH)									35.9	
B-22	6 - 7.5	SILT with SAND(ML)	34	31	3	76.1	0.0	23.9			39.6	
B-23	0 - 1.5	ELASTIC SILT (MH)									28.2	
B-23	2 - 3.5	ELASTIC SILT(MH)	77	39	38	93.8	0.0	6.2	31.2	62.6	29.9	
B-24	0 - 1.5	LEAN CLAY(CL)	40	22	18	90.6	0.6	8.8			18.9	
B-24	2 - 3.5	FAT CLAY with SAND(CH)	59	23	36	82.8	1.0	16.2			23.2	
B-25	0 - 1.5	SANDY ELASTIC SILT (MH)									23.1	
B-25	2 - 3.5	SANDY ELASTIC SILT(MH)	52	32	20	66.6	0.3	33.1			28.1	
B-26	0.5 - 2	ELASTIC SILT(MH)	54	33	21	85.1	1.9	13.0			17.5	
B-26	2 - 3.5	ELASTIC SILT (MH)									16.9	
B-26	6 - 7.5	SILT (ML)									26.5	
B-26 BULK	0 - 5	SANDY SILT(ML)	36	25	11	67.1	8.7	24.2			18.9	4.4
B-27	0 - 1.5	ELASTIC SILT (MH)									26.1	

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BORING ID	Depth	USCS Classification and Soil Description	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Organic Content (%)
B-27	2 - 3.5	SILT(ML)	NP	NP	NP	93.4	0.0	6.6			30.6	
B-27	4 - 5.5	SILT (ML)									30.0	
B-28	0 - 1.5	SILT with SAND (ML)									26.6	
B-28	2 - 3.5	SILT with SAND(ML)	NP	NP	NP	73.1	1.0	25.9			33.7	
B-28	4 - 5.5	SILT with SAND (ML)									41.8	
B-28	6 - 7.5	SILT (ML)									30.6	
B-28	13.5 - 15	SILT with SAND (ML)									28.0	
B-29	0 - 1.5	SILT (ML)									32.2	
B-29	2 - 3.5	SILT(ML)	NP	NP	NP	90.7	0.1	9.2			30.4	
B-29	4 - 5.5	SILT (ML)									28.8	
B-29	6 - 7.5	SILT (ML)									25.9	
B-29	13.5 - 15	SILT with SAND (ML)									24.3	
B-29	53.5 - 55	SILT with SAND(ML)	NP	NP	NP	77.9	0.7	21.4			30.3	
B-29	88.5 - 90	SANDY SILT (ML)									12.7	
B-30	0 - 1.5	SILT with SAND (ML)									36.4	
B-30	2 - 3.5	ELASTIC SILT with SAND(MH)	53	43	10	70.2	0.0	29.8			11.2	
B-30	18.5 - 20	CLAYEY SAND(SC)	41	24	17	49.4	6.9	43.7			24.9	
B-30	88.5 - 90	SANDY SILT (ML)									22.6	
B-31	0 - 1.5	ELASTIC SILT (MH)									18.6	
B-31	2 - 3.5	ELASTIC SILT with SAND(MH)	56	38	18	79.4	0.0	20.6			35.7	
B-31	4 - 5.5	SILT with SAND (ML)									41.2	
B-31	33.5 - 35	SILT with SAND (ML)									25.7	
B-31	78.5 - 80	SILT (ML)									18.9	
B-32	0 - 1.5	ELASTIC SILT (MH)									12.3	
B-32	2 - 3.5	ELASTIC SILT with SAND (MH)									35.5	

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BORING ID	Depth	USCS Classification and Soil Description	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Organic Content (%)
B-32	13.5 - 15	SILT with SAND(ML)	NP	NP	NP	75.2	0.0	24.8			45.7	
B-32	48.5 - 50	SILT with SAND(ML)	NP	NP	NP	79.4	0.1	20.5			26.5	
B-32	78.5 - 80	SANDY SILT (ML)				54.9	3.4	41.8			16.7	
B-33	0 - 1.5	ELASTIC SILT with SAND (MH)				68.0	0.0	32.0	40.3	27.7	11.9	4.7
B-33	2 - 3.5	ELASTIC SILT with GRAVEL(MH)	54	30	24	83.1	10.8	6.0			28.0	
B-33	23.5 - 25	SILT(ML)	NP	NP	NP	91.1	0.0	8.9	58.9	32.1	51.5	
B-33	83.5 - 85	SILTY SAND (SM)				41.5	4.2	54.3			18.9	
B-34	0 - 1.5	ELASTIC SILT (MH)									11.1	
B-34	2 - 3.5	SILT(ML)	NP	NP	NP	89.6	0.2	10.2			23.3	
B-34	23.5 - 25	SILT(ML)	NP	NP	NP	90.2	0.0	9.8			48.6	
B-34	48.5 - 50	SILT (ML)									23.5	
B-34	58.5 - 60	SILT (ML)									22.7	
B-35	0 - 1.5	SANDY SILT (ML)									20.6	
B-35	2 - 3.5	SANDY SILT(ML)	NP	NP	NP	65.4	4.1	30.5			27.8	
B-35	6 - 7.5	FAT CLAY(CH)	59	30	29	94.9	0.3	4.8	43.7	51.1	29.4	
B-35	8 - 9.5	FAT CLAY with SAND (CH)									30.9	
B-36	0 - 1.5	SILT (ML)									27.7	
B-36	2 - 3.5	SANDY SILT(ML)	NP	NP	NP	50.1	14.0	35.9			13.4	
B-36	6 - 7.5	SILT (ML)									27.4	
B-37	0 - 1.5	FAT CLAY with SAND(CH)	65	31	34	70.4	11.8	17.8			24.5	
B-37	2 - 3.5	FAY CLAY with SAND (CH)									22.2	
B-37	4 - 5.5	FAY CLAY (CH)									24.3	
B-37	33.5 - 35	SILT(ML)	NP	NP	NP	85.9	0.0	14.1			24.7	
B-38	0 - 1.5	FAT CLAY with SAND(CH)	70	30	40	79.6	6.6	13.8			26.5	
B-38	2 - 3.5	FAT CLAY with SAND (CH)									25.0	

PROJECT: Columbia Avenue (S-48) Roadway Improvements

SITE: Columbia Avenue (S-48)  
Lexington County, South Carolina

**Terracon**  
521 Clemson Rd  
Columbia, SC

PH. 803-741-9000

FAX. 803-741-9900

PROJECT NUMBER: 73155095

CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

SUMMARY OF LABORATORY RESULTS

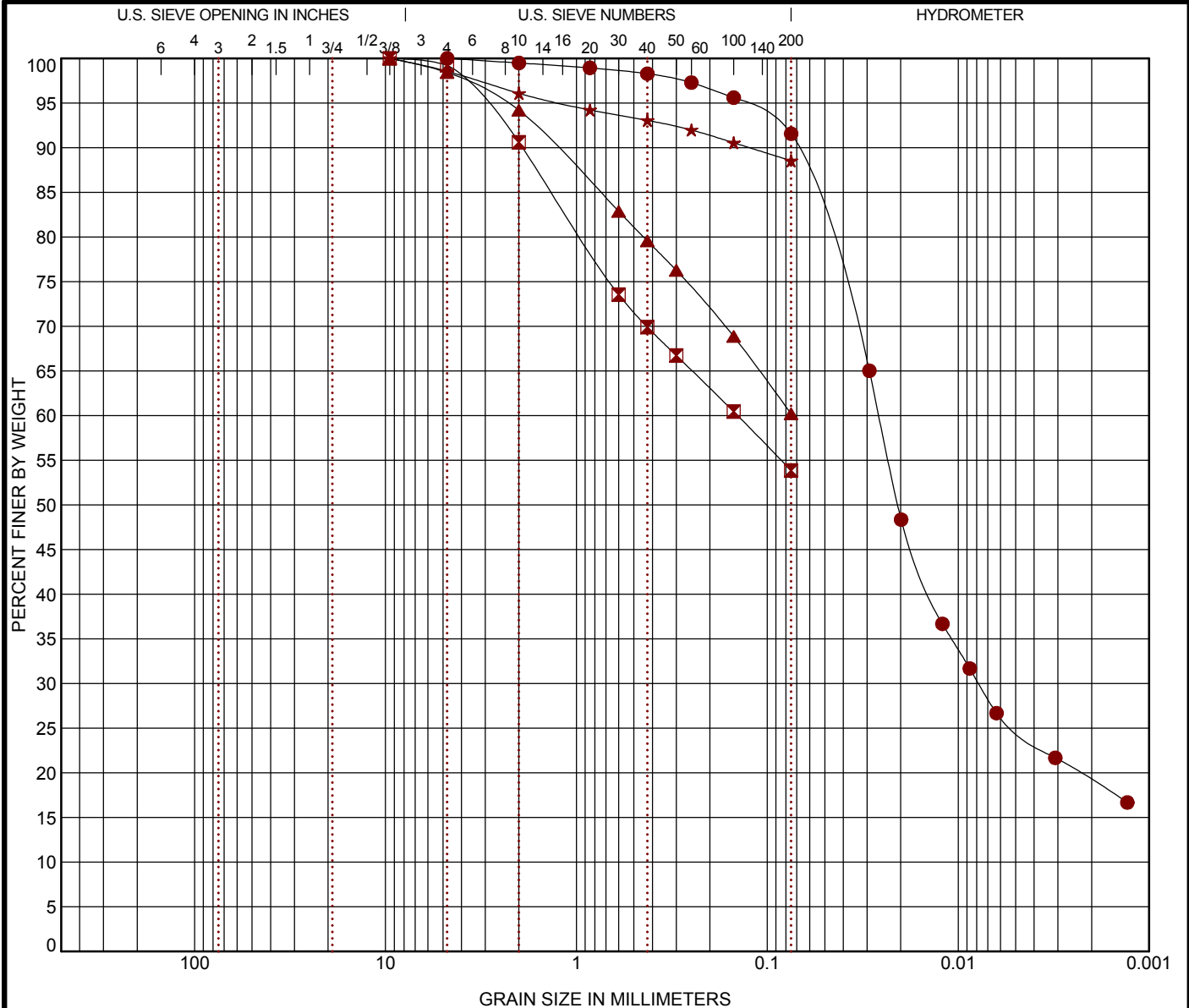
BORING ID	Depth	USCS Classification and Soil Description	Liquid Limit	Plastic Limit	Plasticity Index	% <#200 Sieve	% Gravel	% Sand	% Silt	% Clay	Water Content (%)	Organic Content (%)
B-38	4 - 5.5	SILT (ML)									26.3	
PROJECT: Columbia Avenue (S-48) Roadway Improvements			<div>Terracon</div> <div>521 Clemson Rd Columbia, SC</div>					PROJECT NUMBER: 73155095				
SITE: Columbia Avenue (S-48) Lexington County, South Carolina								CLIENT: Mead & Hunt, Inc. Lexington, South Carolina				
								PH. 803-741-9000      FAX. 803-741-9900				

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# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 73155095 LAB TESTING.GPJ TERRACON2012.GDT 5/20/16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification			AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-01	0 - 1.5	LEAN CLAY (CL)			A-4 (8)			32	23	9		
☒	B-01	2 - 3.5	SANDY FAT CLAY (CH)			A-7-6 (13)			59	29	30		
▲	B-01	8 - 9.5	SANDY SILT (ML)			A-6 (6)			40	27	13		
★	B-02	0.5 - 2	ELASTIC SILT (MH) (CH)			ELASTIC SILT (MH) (23)			50	27	23		
	Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay			
●	B-01	0 - 1.5	4.75	0.026	0.008		0.0	8.4	66.5 25.0				
☒	B-01	2 - 3.5	9.5	0.143			0.8	45.4	53.9				
▲	B-01	8 - 9.5	9.5				1.6	38.2	60.2				
★	B-02	0.5 - 2	9.5				1.4	10.0	88.5				

PROJECT: Columbia Avenue (S-48) Roadway Improvements

SITE: Columbia Avenue (S-48)  
Lexington County, South Carolina

**Terracon**  
521 Clemson Rd  
Columbia, SC

PROJECT NUMBER: 73155095

CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

**ASTM D422 / ASTM C136**

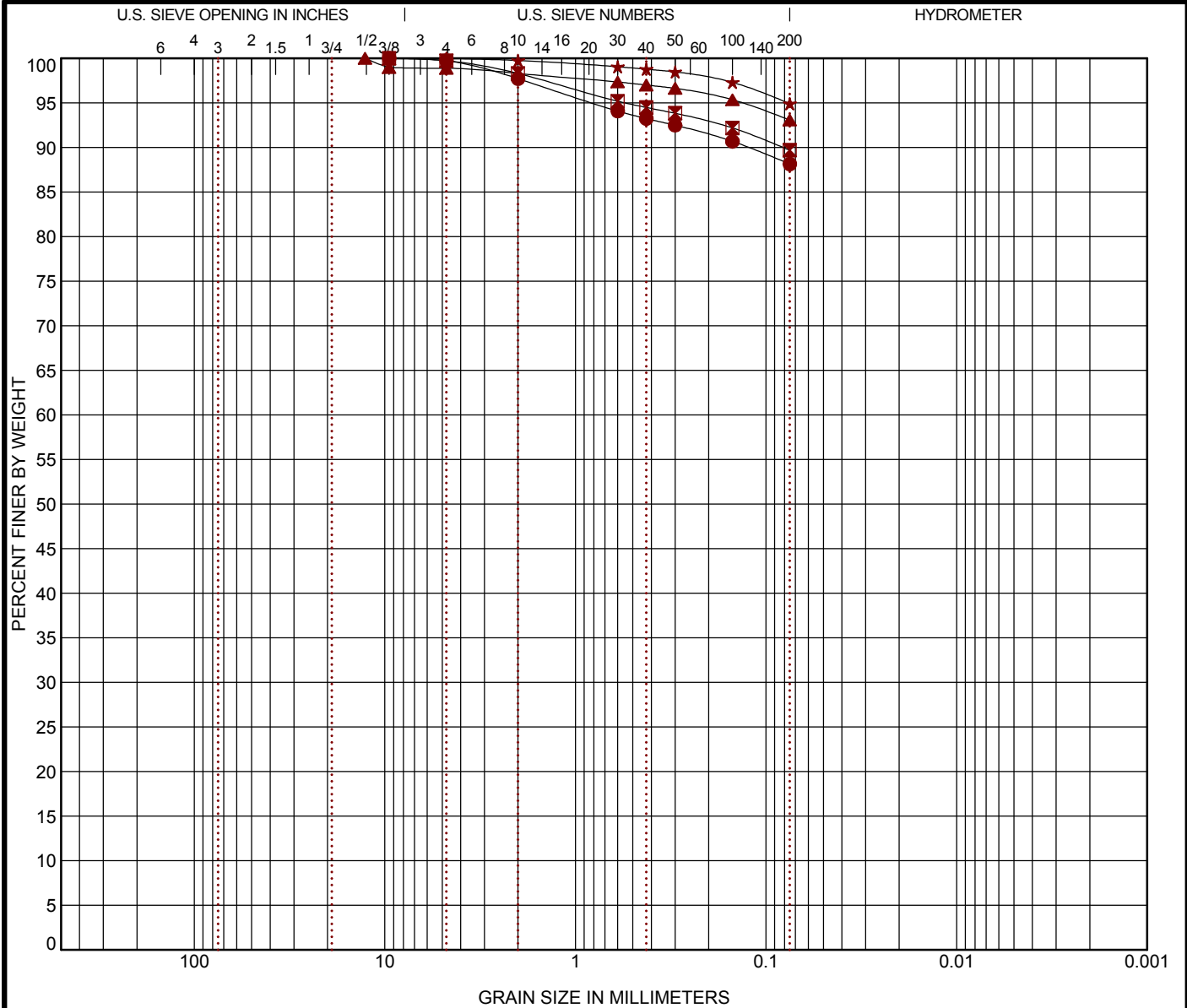
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# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 73155095 LAB TESTING.GPJ TERRACON2012.GDT 5/20/16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

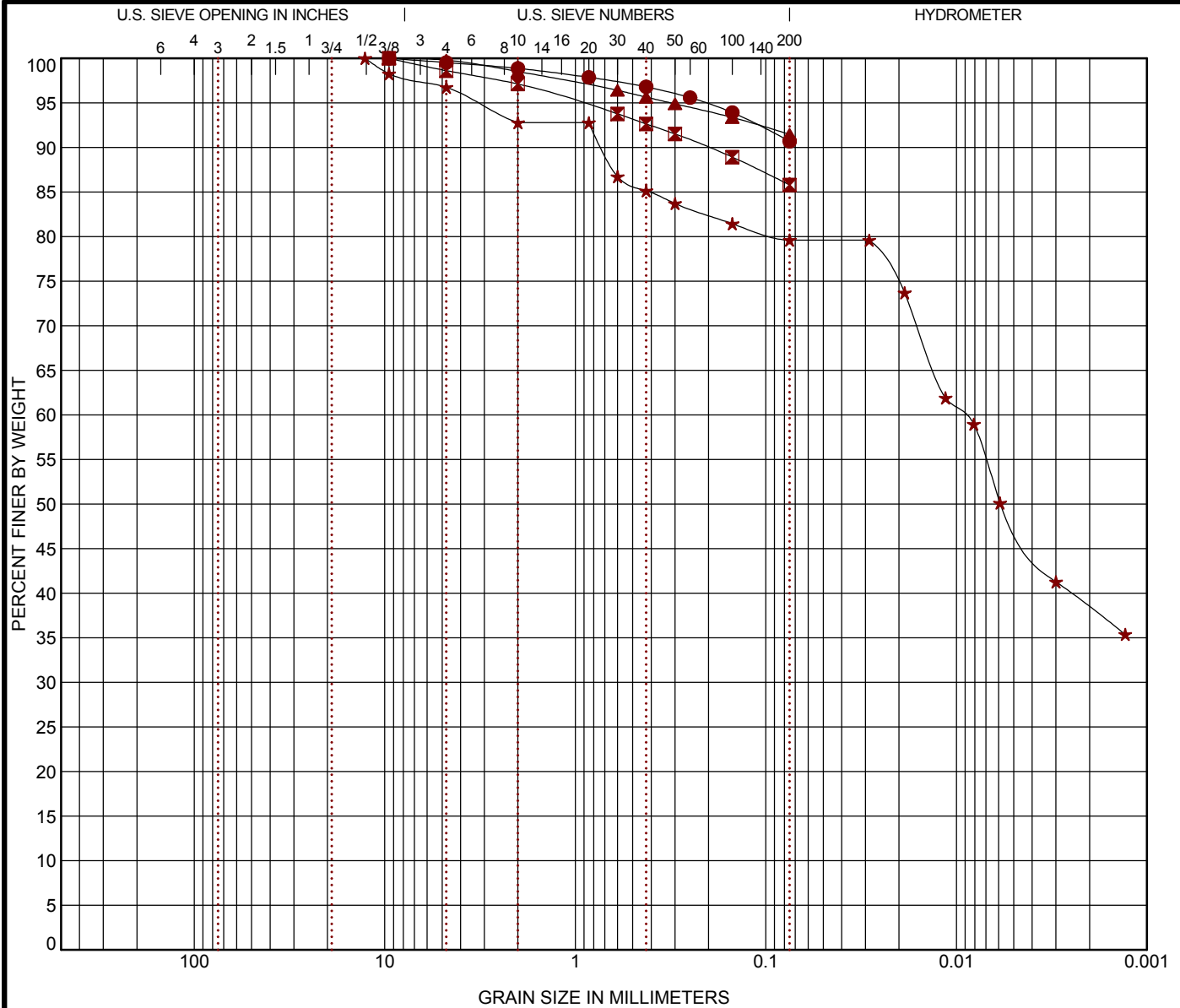
Boring ID	Depth	USCS Classification		AASHTO Classification		LL	PL	PI	Cc	Cu
● B-04	0 - 1.5	LEAN CLAY (CL)		A-7-6 (22)		46	22	24		
☒ B-04	2 - 3.5	LEAN CLAY (CL)		A-7-6 (17)		43	26	17		
▲ B-05	0 - 1.5	ELASTIC SILT (MH)		A-7-5 (34)		66	37	29		
★ B-05	2 - 3.5	ELASTIC SILT (MH)		A-7-5 (40)		72	39	33		
Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay	
● B-04	0 - 1.5	9.5				0.3	11.6	88.1		
☒ B-04	2 - 3.5	9.5				0.3	10.0	89.7		
▲ B-05	0 - 1.5	12.7				1.1	5.8	93.1		
★ B-05	2 - 3.5	4.75				0.0	5.1	94.9		

PROJECT: Columbia Avenue (S-48) Roadway Improvements				PROJECT NUMBER: 73155095			
SITE: Columbia Avenue (S-48) Lexington County, South Carolina				CLIENT: Mead & Hunt, Inc. Lexington, South Carolina			

**Terracon**  
521 Clemson Rd  
Columbia, SC

# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification		AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-05 BULK	0 - 5	SILT (ML)		A-5 (11)			43	35	8		
☒	B-06	0 - 1.5	LEAN CLAY (CL)		A-6 (14)			37	21	16		
▲	B-06	2 - 3.5	LEAN CLAY (CL)		A-7-6 (18)			41	22	19		
★	B-06	6 - 7.5	ELASTIC SILT with SAND (MH)		A-7-5 (23)			57	32	25		
Boring ID		Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay		
●	B-05 BULK	0 - 5	9.5				0.5	8.8	90.7			
☒	B-06	0 - 1.5	9.5				1.4	12.8	85.8			
▲	B-06	2 - 3.5	9.5				0.2	8.3	91.5			
★	B-06	6 - 7.5	12.7	0.009			3.3	17.1	31.7	48.0		

PROJECT: Columbia Avenue (S-48) Roadway Improvements

SITE: Columbia Avenue (S-48)  
Lexington County, South Carolina

**Terracon**

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PROJECT NUMBER: 73155095

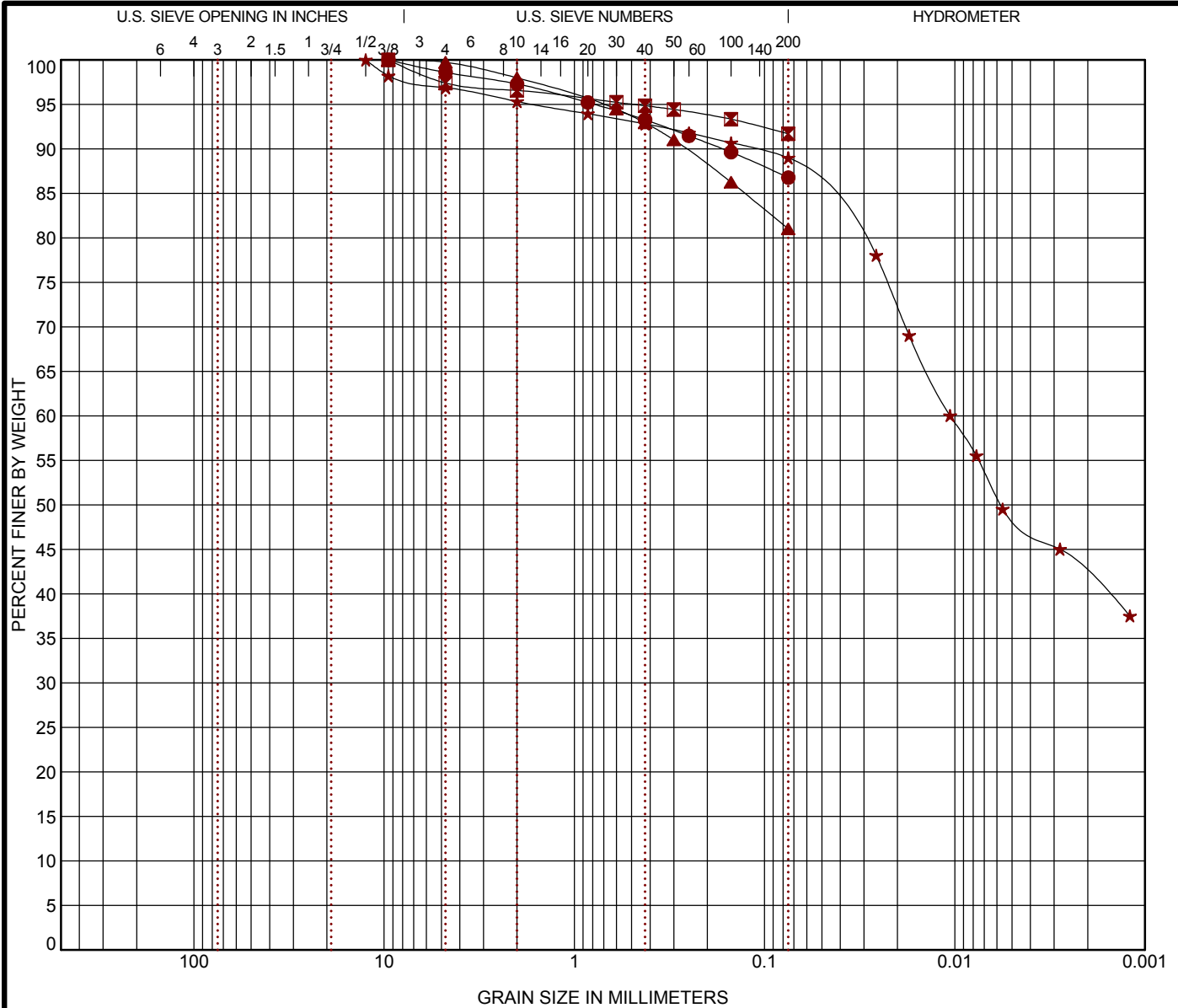
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification		AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-07	0 - 1.5	SILTY CLAY (CL-ML)		A-4 (5)			28	21	7		
⊠	B-07	2 - 3.5	FAT CLAY (CH)		A-7-6 (32)			56	25	31		
▲	B-07	8 - 9.5	SILT with SAND (ML)		A-4 (0)			NP	NP	NP		
★	B-08	0 - 1.5	LEAN CLAY (CL)		A-7-6 (24)			48	23	25		
Boring ID		Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt		%Clay	
●	B-07	0 - 1.5	9.5				1.4	11.8	86.8			
⊠	B-07	2 - 3.5	9.5				2.6	5.7	91.7			
▲	B-07	8 - 9.5	9.5				0.3	18.7	81.0			
★	B-08	0 - 1.5	12.5	0.011			3.1	7.9	40.2		48.8	

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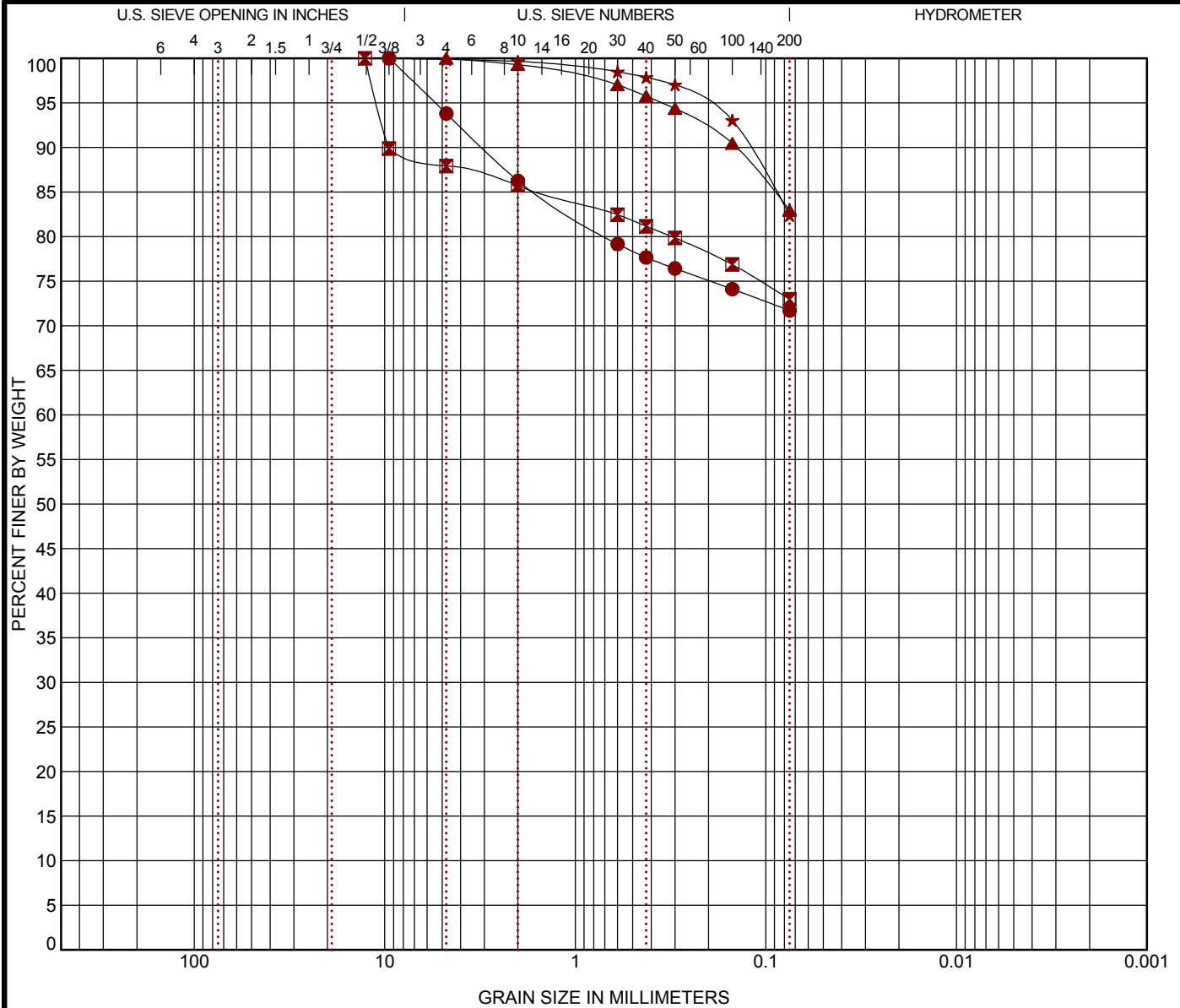
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification		AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-08	2 - 3.5	FAT CLAY with SAND (CH)		A-7-6 (24)			61	29	32		
☒	B-09	0 - 1.5	LEAN CLAY (CL)		LEAN CLAY (CL)							
▲	B-09	2 - 3.5	SILT with SAND (ML)		A-4 (0)			NP	NP	NP		
★	B-09	8 - 9.5	SILT with SAND (ML)		SILT with SAND (ML)							
Boring ID		Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay		
●	B-08	2 - 3.5	9.5				6.2	22.1	71.7			
☒	B-09	0 - 1.5	12.7				12.1	14.9	73.0			
▲	B-09	2 - 3.5	4.75				0.0	17.1	82.9			
★	B-09	8 - 9.5	9.5				0.1	17.5	82.4			

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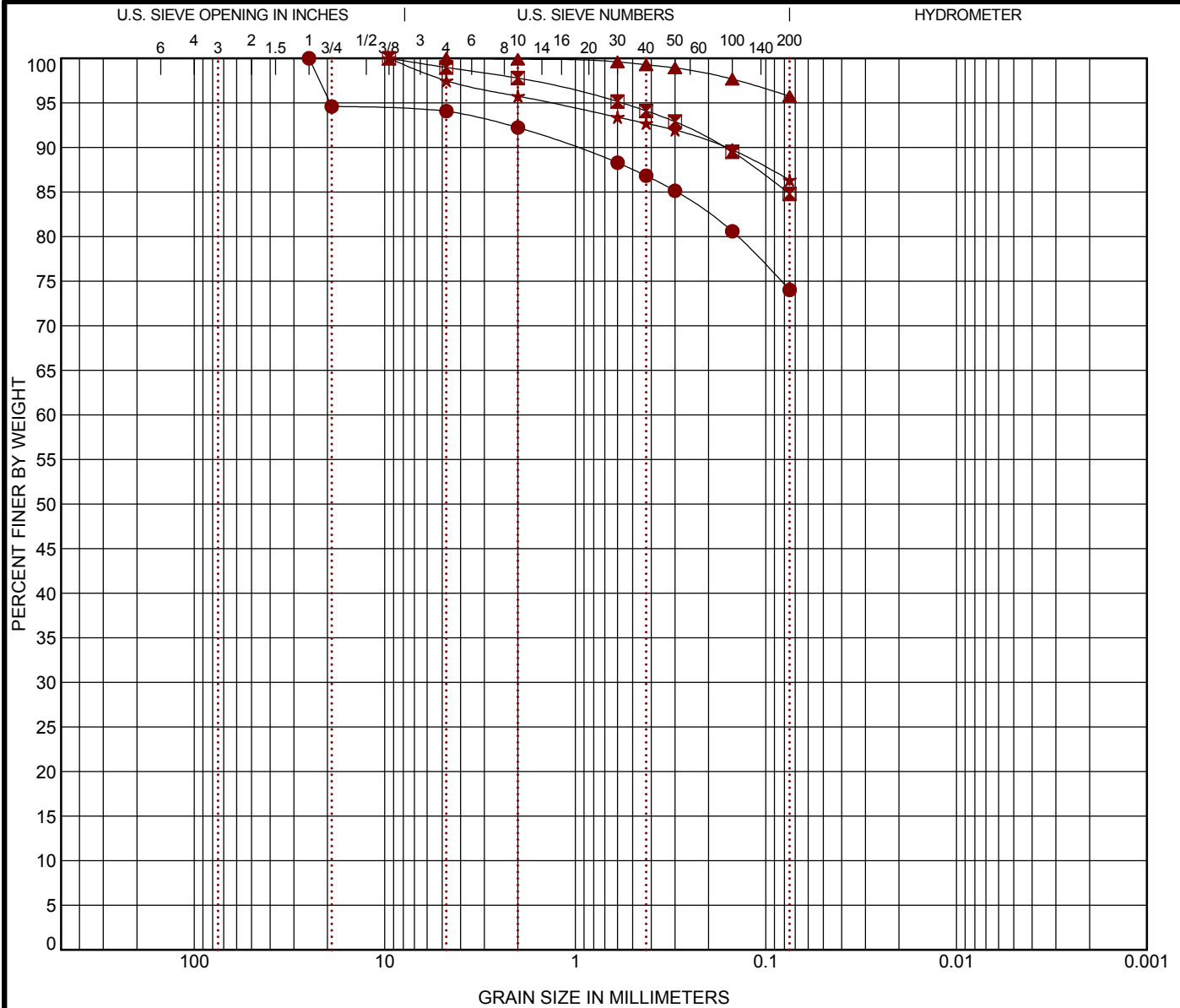
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification		AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-10	0 - 1.5	LEAN CLAY with SAND (CL)		A-6 (12)			37	19	18		
☒	B-10	2 - 3.5	LEAN CLAY with SAND (CL)		A-7-6 (16)			41	23	18		
▲	B-10	8 - 9.5	ELASTIC SILT (MH)		A-7-5 (37)			71	42	29		
★	B-11	0 - 1.5	FAT CLAY (CH)		A-7-6 (29)			56	25	31		
Boring ID		Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt		%Clay	
●	B-10	0 - 1.5	25				5.9	20.1	74.0			
☒	B-10	2 - 3.5	9.5				1.0	14.2	84.8			
▲	B-10	8 - 9.5	4.75				0.0	4.3	95.7			
★	B-11	0 - 1.5	9.5				2.5	11.1	86.4			

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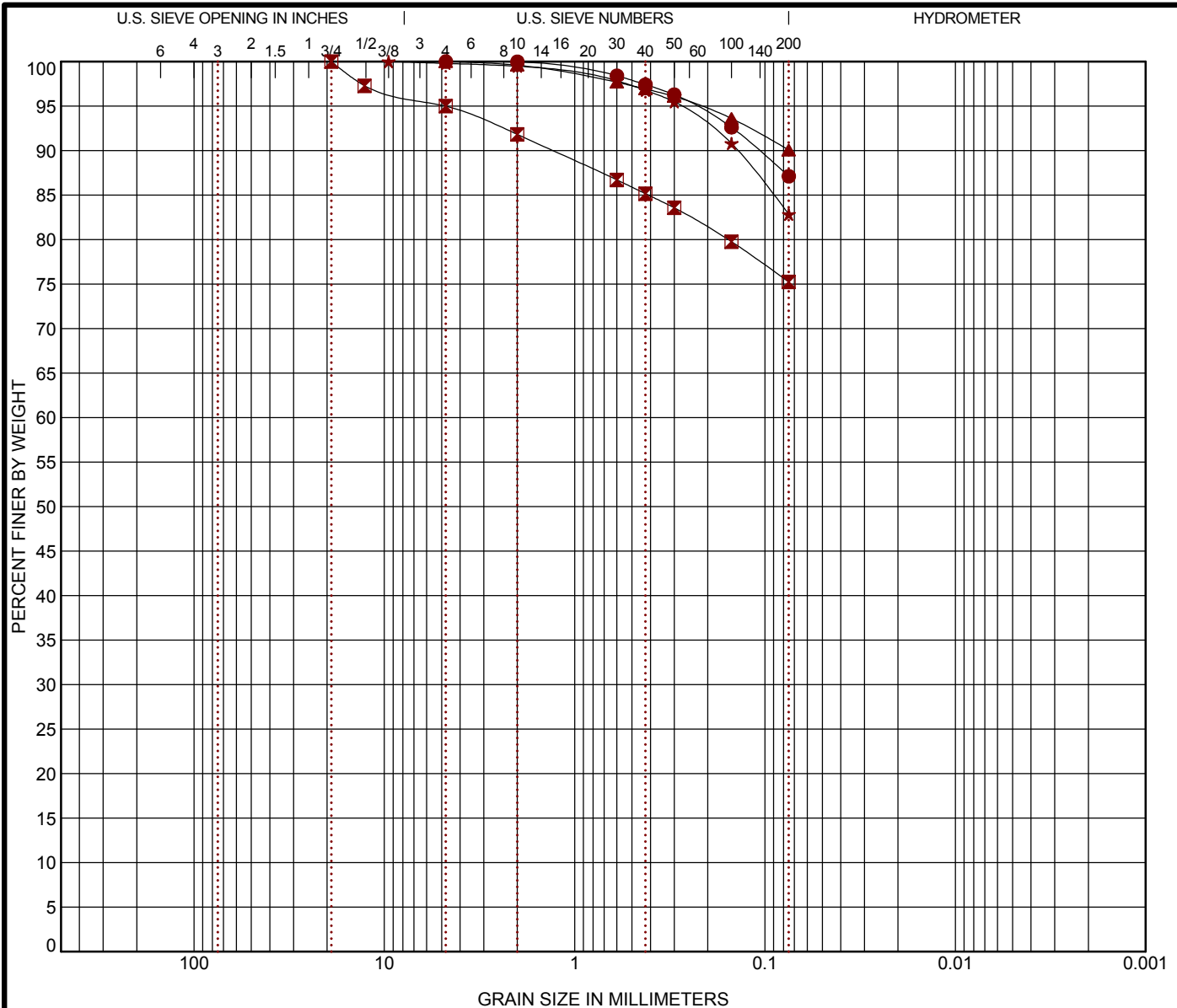
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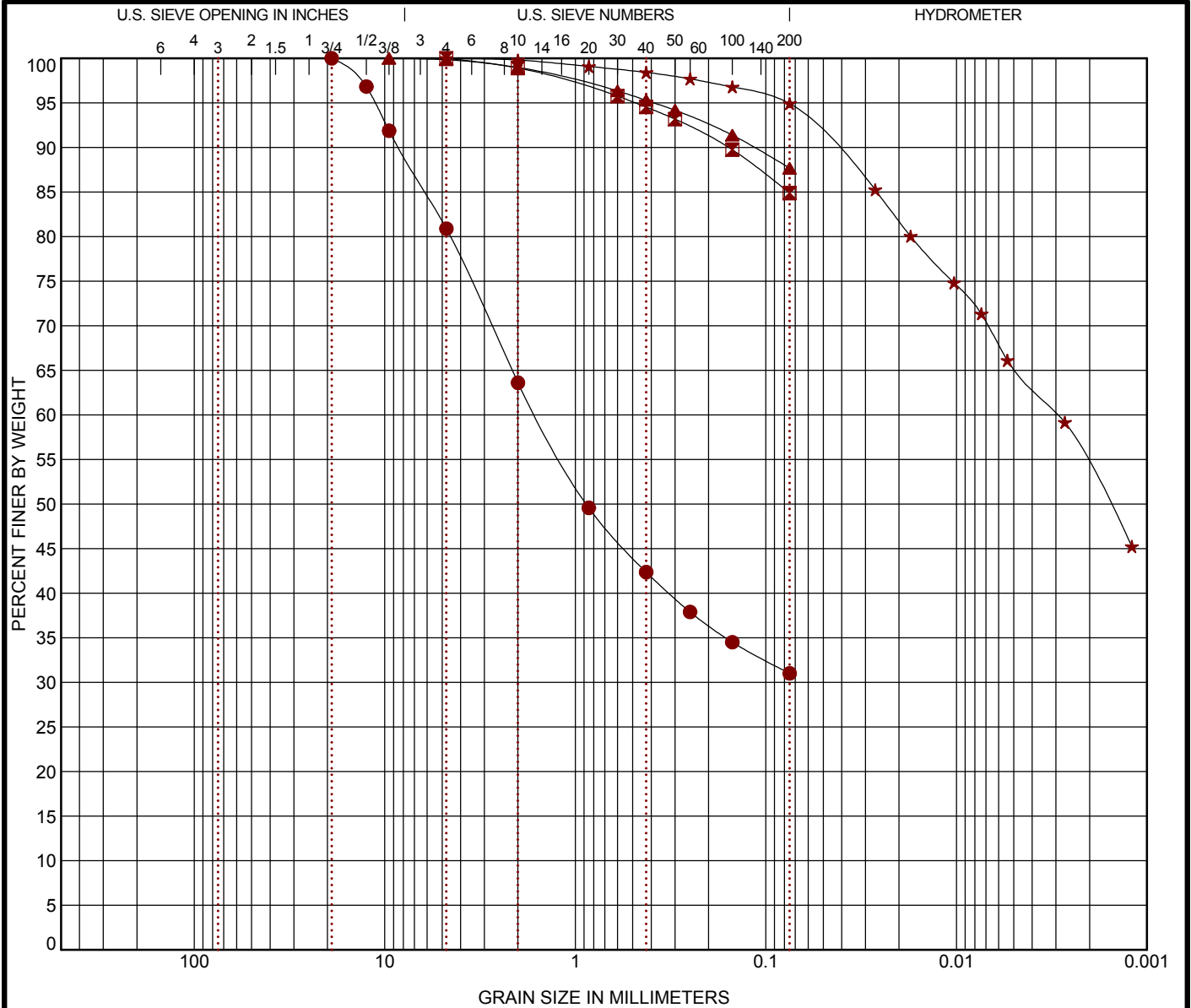
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification		AASHTO Classification		LL	PL	PI	Cc	Cu
● B-12 BULK	0 - 5	CLAYEY SAND with GRAVEL (SC)		A-2-4 (0)		28	18	10		
☒ B-13	0 - 1.5	LEAN CLAY with SAND (CL)		A-6 (12)		35	21	14		
▲ B-13	2 - 3.5	FAT CLAY (CH)		A-7-6 (27)		52	24	28		
★ B-13	6 - 7.5	ELASTIC SILT (MH)		A-7-5 (35)		62	32	30		
Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay	
● B-12 BULK	0 - 5	19	1.605			19.1	49.9	31.0		
☒ B-13	0 - 1.5	4.75				0.0	15.1	84.9		
▲ B-13	2 - 3.5	9.5				0.2	12.2	87.7		
★ B-13	6 - 7.5	4.75	0.003			0.0	5.1	29.6	65.4	

PROJECT: Columbia Avenue (S-48) Roadway Improvements

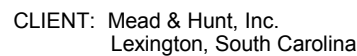
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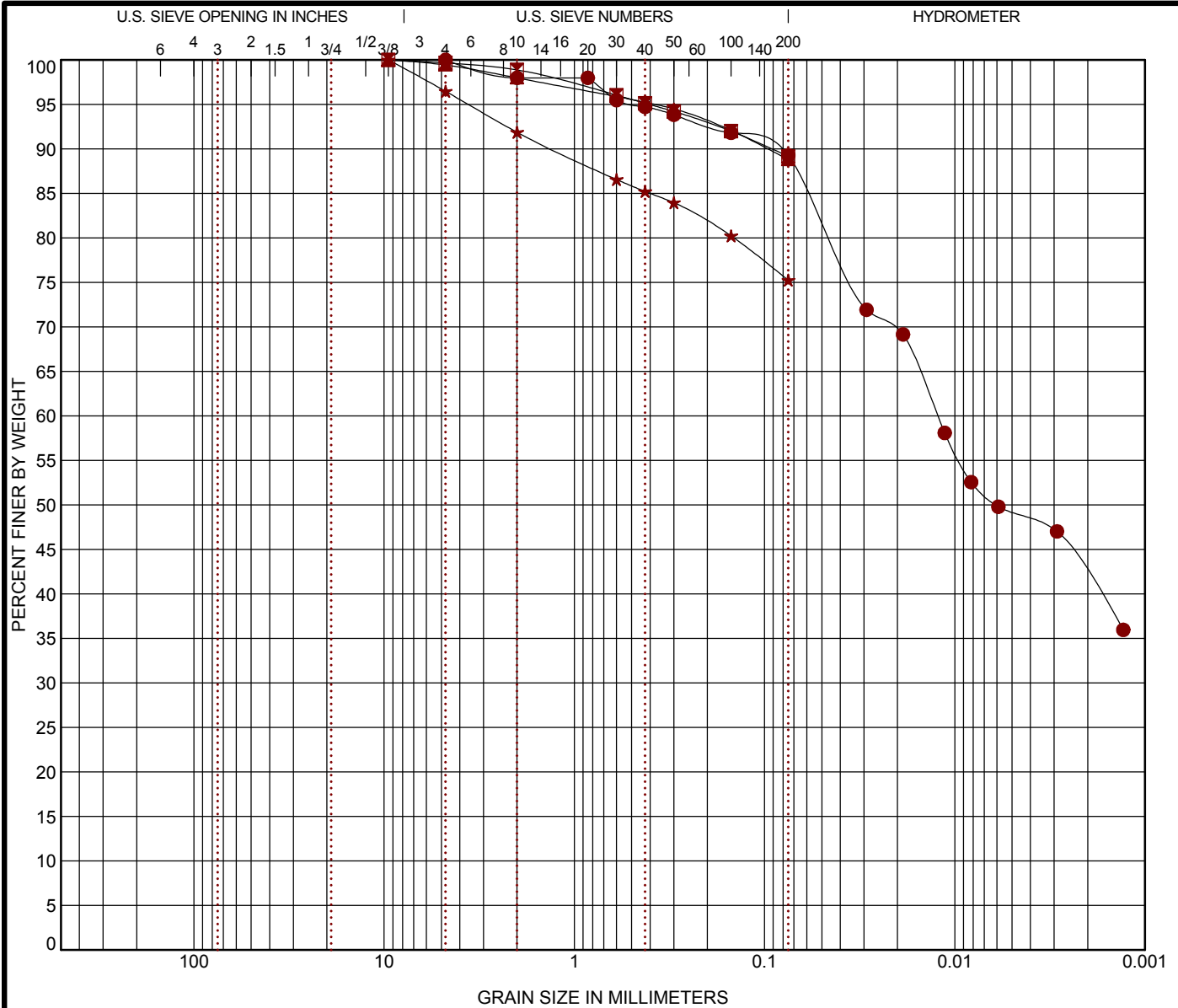
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification		AASHTO Classification		LL	PL	PI	Cc	Cu
● B-15	2 - 3.5	FAT CLAY (CH)		A-7-6 (32)		59	27	32		
☒ B-16	0.5 - 2	SILT (ML)		SILT (ML)						
▲ B-16	2 - 3.5	ELASTIC SILT (MH)		A-7-5 (21)		51	31	20		
★ B-17	0 - 1.5	ELASTIC SILT with SAND (MH)		A-7-5 (19)		54	30	24		
Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay	
● B-15	2 - 3.5	4.75	0.012			0.0	10.7	40.1	49.1	
☒ B-16	0.5 - 2	9.5				0.3	10.5	89.2		
▲ B-16	2 - 3.5	9.5				0.6	10.6	88.8		
★ B-17	0 - 1.5	9.5				3.5	21.2	75.3		

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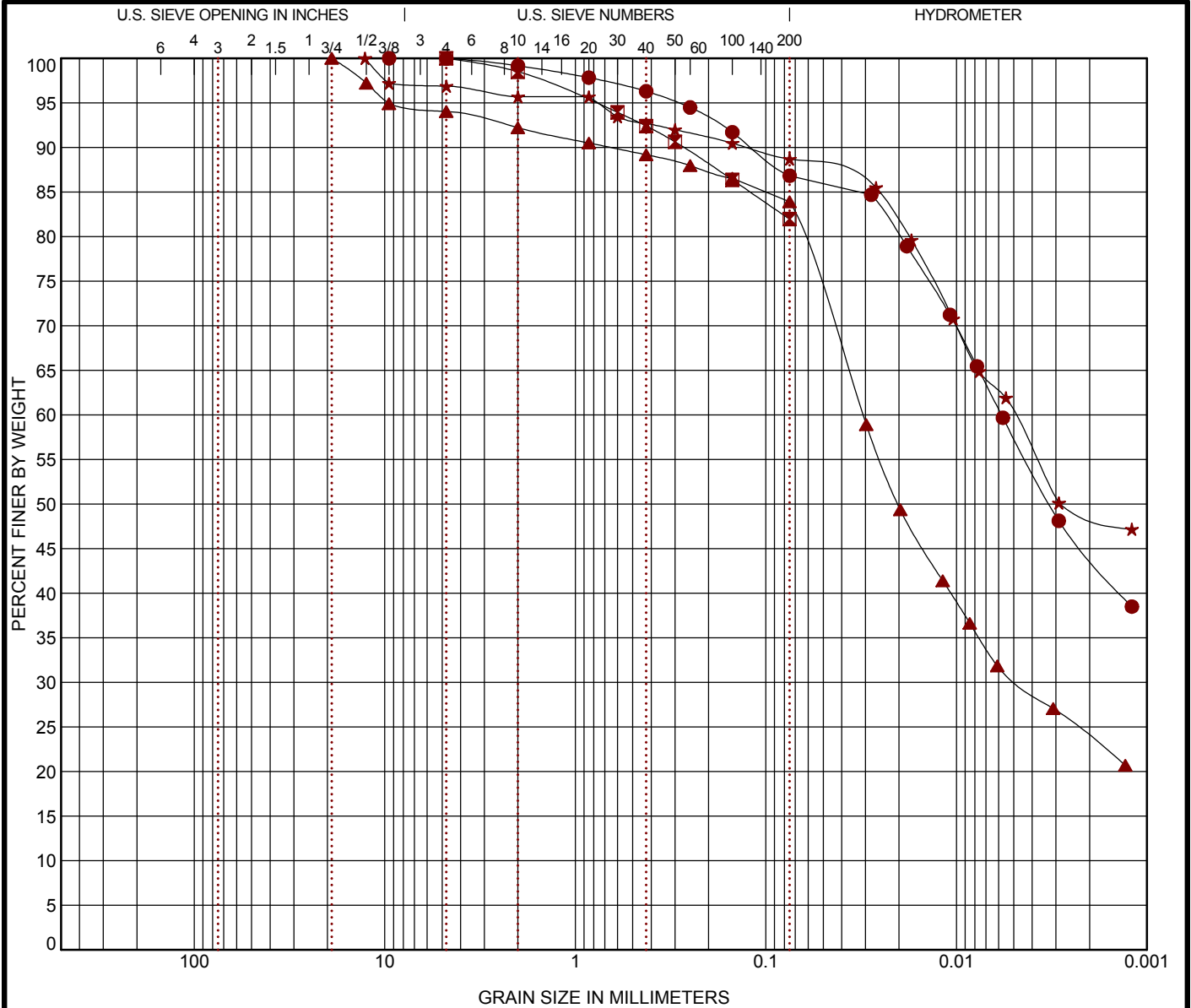
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification			AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-17	2 - 3.5	LEAN CLAY with SAND (CL)			LEAN CLAY with SAND (CL)							
☒	B-18	2 - 3.5	LEAN CLAY with SAND (CL)			A-7-6 (15)			41	23	18		
▲	B-19	0 - 1.5	FAT CLAY with SAND (CH)			A-7-6 (23)			50	24	26		
★	B-19	2 - 3.5	ELASTIC SILT (MH)			A-7-5 (33)			63	32	31		
Boring ID		Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt		%Clay		
●	B-17	2 - 3.5	9.5	0.006			0.0	13.1	29.4		57.4		
☒	B-18	2 - 3.5	4.75				0.0	18.0	82.0				
▲	B-19	0 - 1.5	19	0.031	0.005		6.0	10.1	53.5		30.4		
★	B-19	2 - 3.5	12.7	0.005			3.1	8.2	28.5		60.2		

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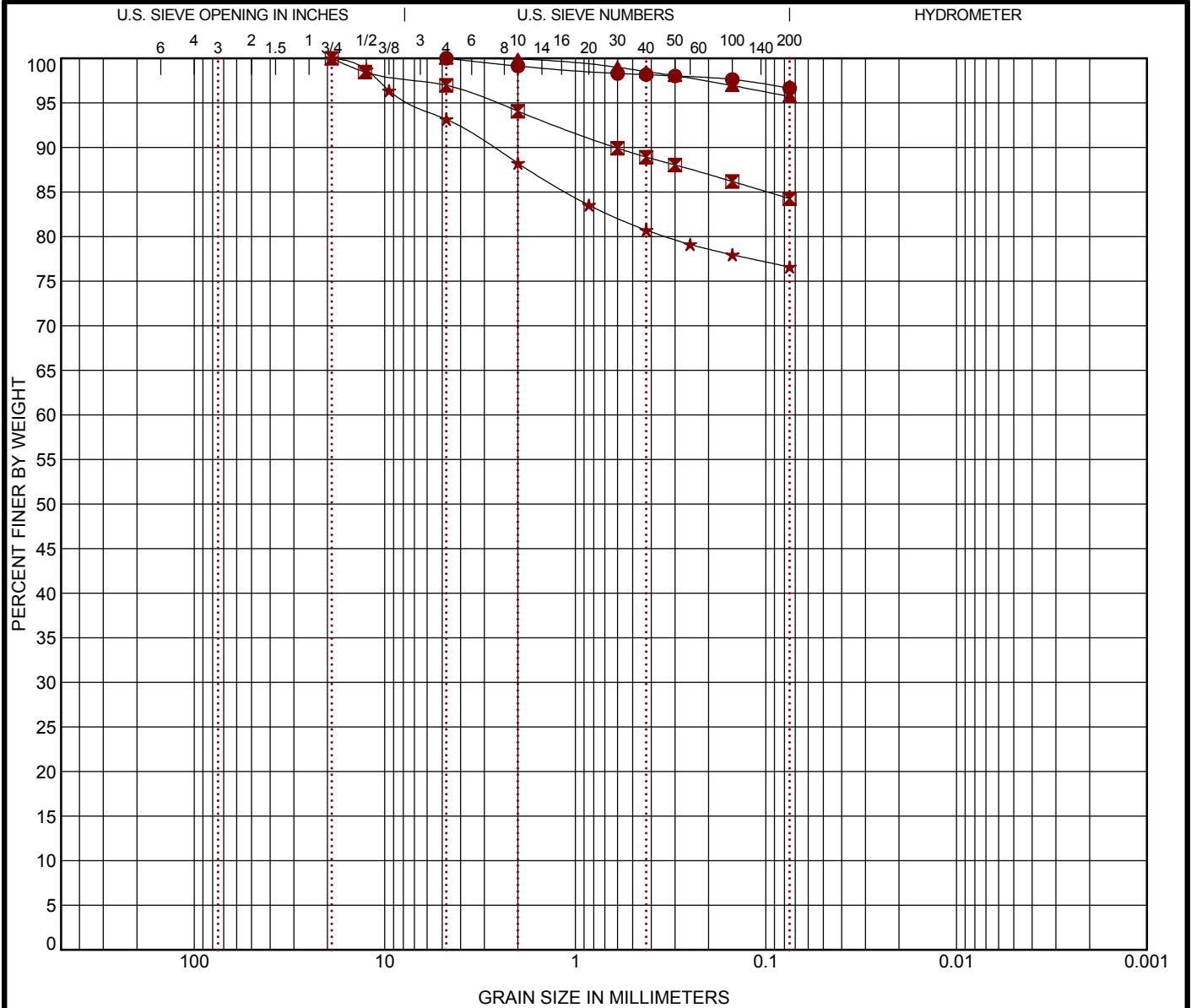
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	coarse	fine	coarse	medium	fine	

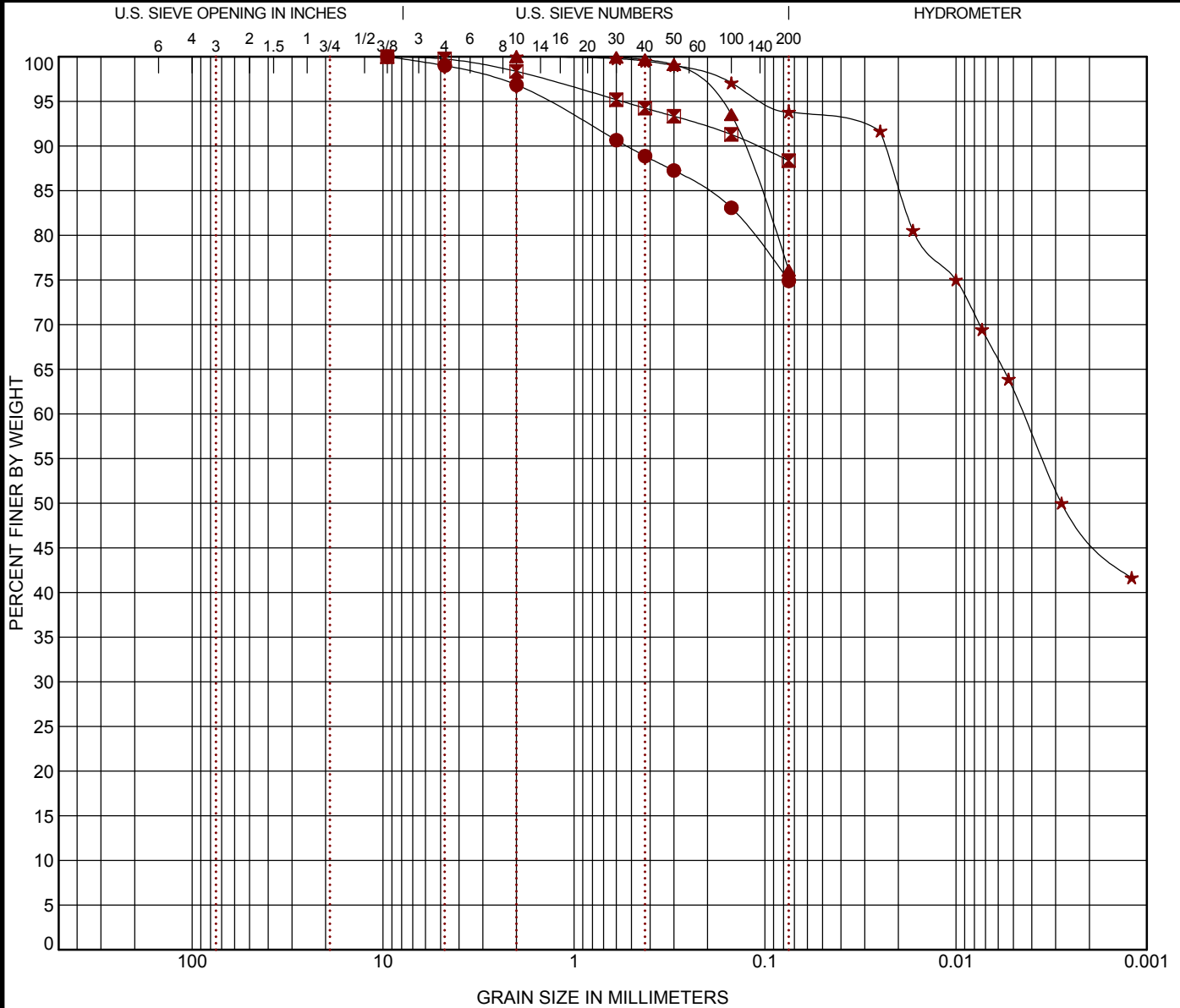
Boring ID	Depth	USCS Classification		AASHTO Classification		LL	PL	PI	Cc	Cu
● B-20	0.5 - 2	ELASTIC SILT (MH)		A-7-5 (36)		64	34	30		
☒ B-20	2 - 3.5	ELASTIC SILT with SAND (MH)		A-7-5 (23)		56	33	23		
▲ B-20	8 - 9.5	SILT (ML)		A-4 (0)		NP	NP	NP		
★ B-20 BULK	0 - 5	SILT with SAND (ML)		A-7-6 (15)		46	28	18		
Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay	
● B-20	0.5 - 2	4.75				0.0	3.4	96.6		
☒ B-20	2 - 3.5	19				3.0	12.7	84.3		
▲ B-20	8 - 9.5	4.75				0.0	4.3	95.7		
★ B-20 BULK	0 - 5	19				6.8	16.6	76.6		

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	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
● B-21	2 - 3.5	SILT with SAND (ML)	A-4 (0)	NP	NP	NP		
■ B-22	0 - 1.5	FAT CLAY (CH)	A-7-6 (41)	70	29	41		
▲ B-22	6 - 7.5	SILT with SAND (ML)	A-4 (3)	34	31	3		
★ B-23	2 - 3.5	ELASTIC SILT (MH)	A-7-5 (45)	77	39	38		

Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay
● B-21	2 - 3.5	9.5				1.0	24.1	74.9	
■ B-22	0 - 1.5	9.5				0.3	11.4	88.4	
▲ B-22	6 - 7.5	2				0.0	23.9	76.1	
★ B-23	2 - 3.5	2	0.004			0.0	6.2	31.2	62.6

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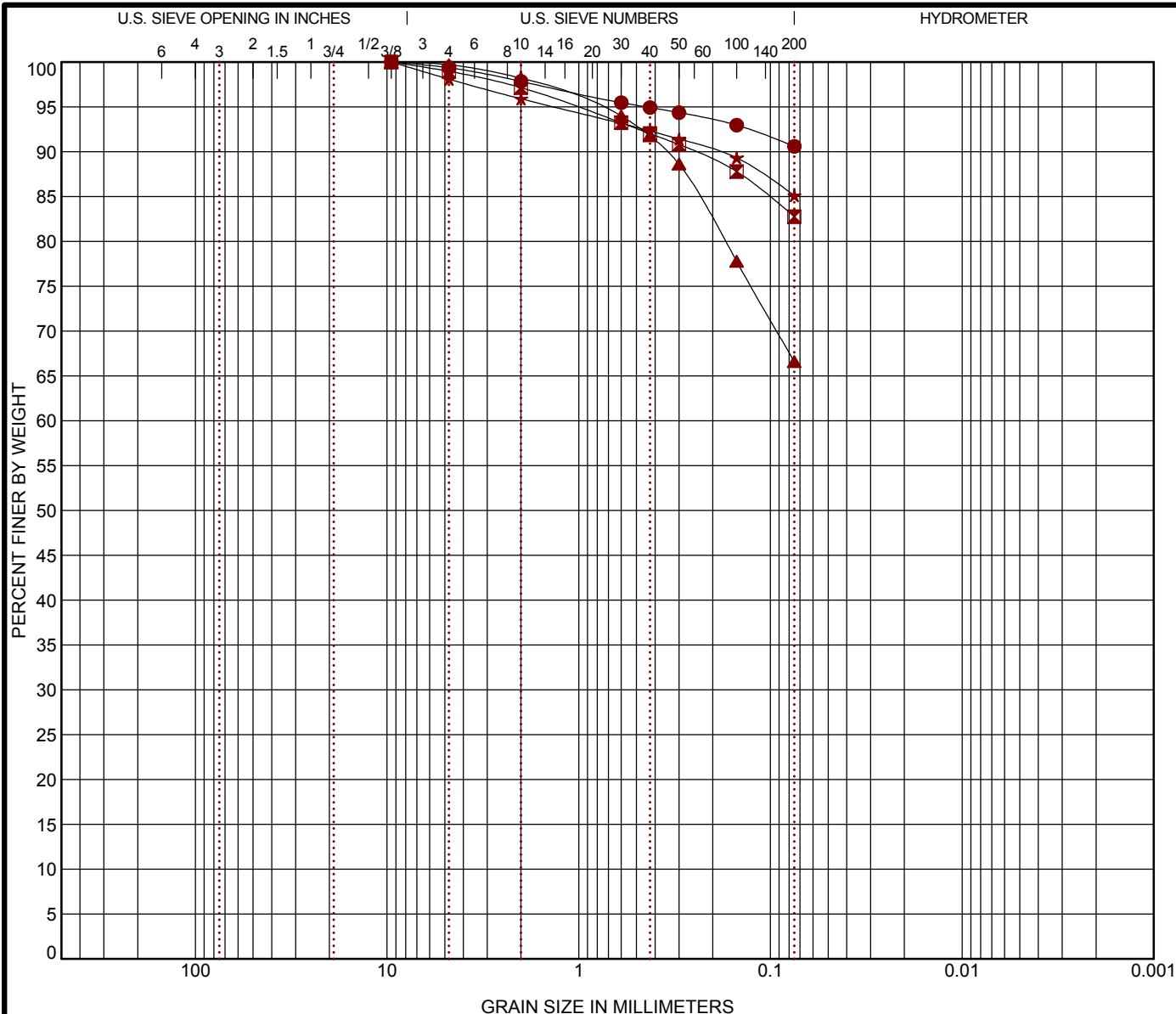
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification		AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-24	0 - 1.5	LEAN CLAY (CL)		A-6 (17)			40	22	18		
☒	B-24	2 - 3.5	FAT CLAY with SAND (CH)		A-7-6 (32)			59	23	36		
▲	B-25	2 - 3.5	SANDY ELASTIC SILT (MH)		A-7-5 (14)			52	32	20		
★	B-26	0.5 - 2	ELASTIC SILT (MH)		A-7-5 (21)			54	33	21		
Boring ID		Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt		%Clay	
●	B-24	0 - 1.5	9.5				0.6	8.8	90.6			
☒	B-24	2 - 3.5	9.5				1.0	16.2	82.8			
▲	B-25	2 - 3.5	9.5				0.3	33.1	66.6			
★	B-26	0.5 - 2	9.5				1.9	13.0	85.1			

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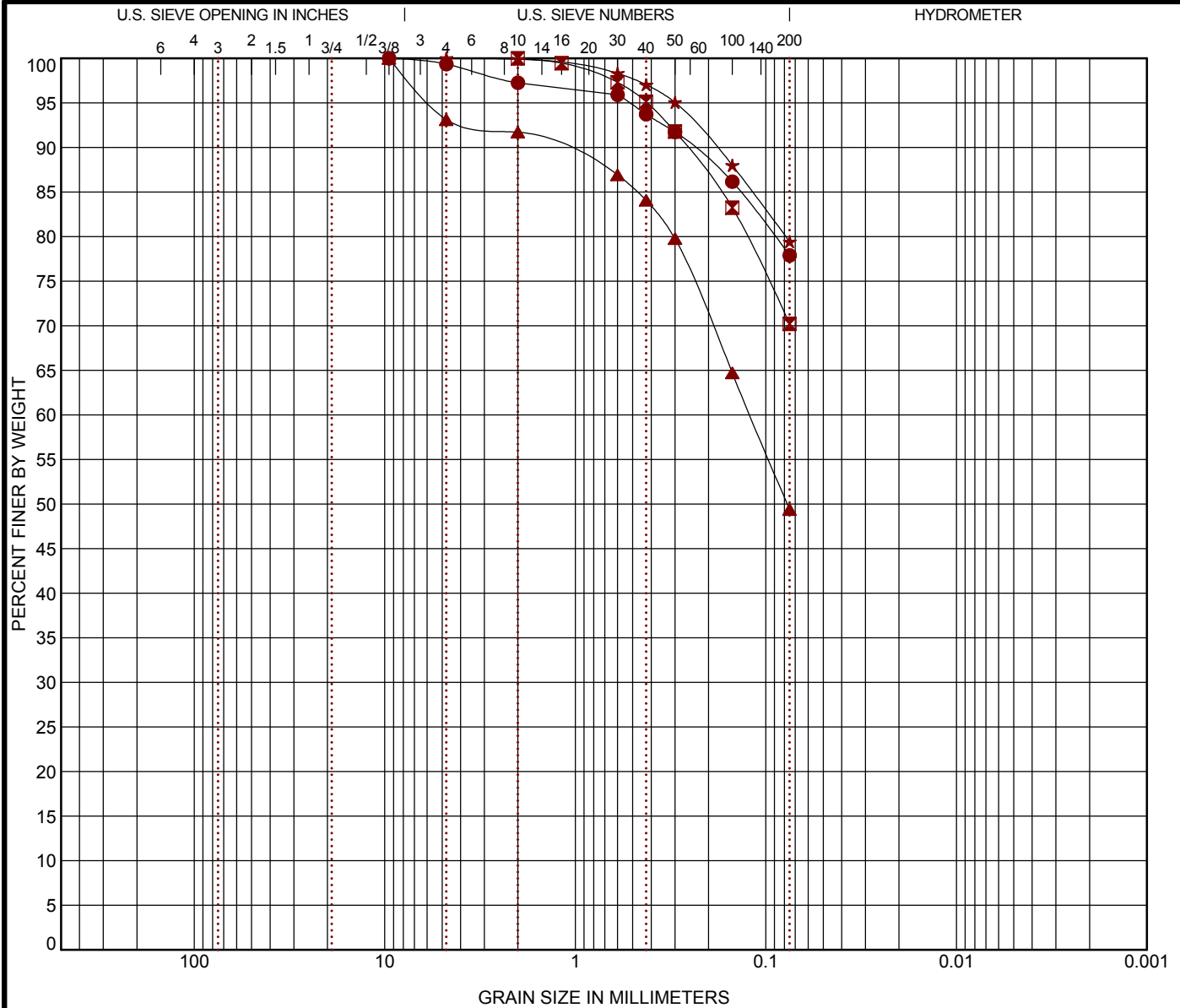
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification		AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-29	53.5 - 55	SILT with SAND (ML)		A-4 (0)			NP	NP	NP		
✘	B-30	2 - 3.5	ELASTIC SILT with SAND (MH)		A-5 (9)			53	43	10		
▲	B-30	18.5 - 20	CLAYEY SAND (SC)		A-7-6 (5)			41	24	17		
★	B-31	2 - 3.5	ELASTIC SILT with SAND (MH)		A-7-5 (17)			56	38	18		
Boring ID		Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay		
●	B-29	53.5 - 55	9.5				0.7	21.4	77.9			
✘	B-30	2 - 3.5	2				0.0	29.8	70.2			
▲	B-30	18.5 - 20	9.5	0.121			6.9	43.7	49.4			
★	B-31	2 - 3.5	4.75				0.0	20.6	79.4			

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SITE: Columbia Avenue (S-48)  
Lexington County, South Carolina

**Terracon**

521 Clemson Rd  
Columbia, SC

PROJECT NUMBER: 73155095

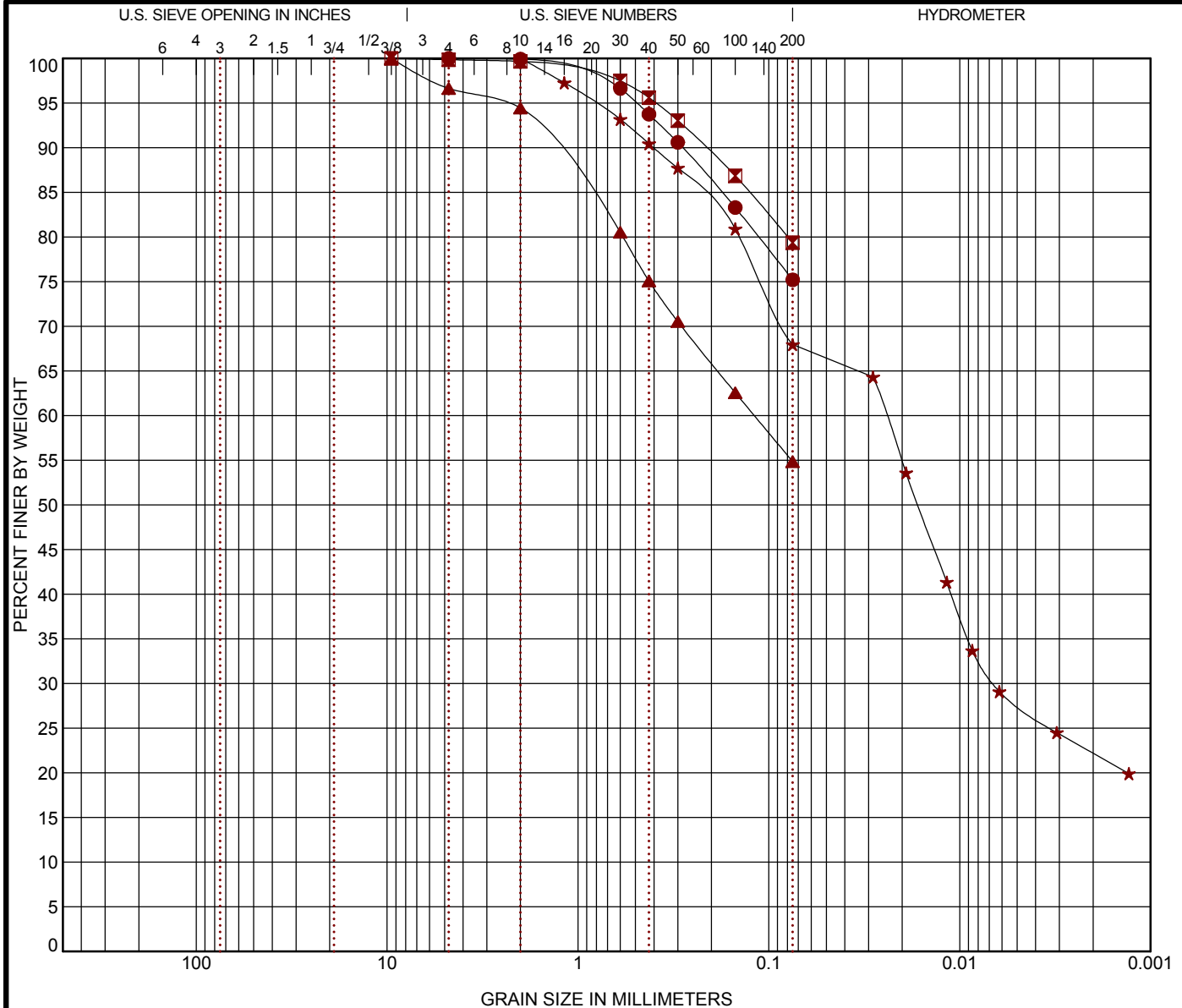
CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 73155095 LAB TESTING.GPJ TERRACON2012.GDT 5/20/16

# GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification		AASHTO Classification		LL	PL	PI	Cc	Cu
● B-32	13.5 - 15	SILT with SAND (ML)		A-4 (0)		NP	NP	NP		
▣ B-32	48.5 - 50	SILT with SAND (ML)		A-4 (0)		NP	NP	NP		
▲ B-32	78.5 - 80	SANDY SILT (ML)		SANDY SILT (ML)						
★ B-33	0 - 1.5	ELASTIC SILT with SAND (MH)		ELASTIC SILT with SAND (MH)						
Boring ID	Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay	
● B-32	13.5 - 15	4.75				0.0	24.8	75.2		
▣ B-32	48.5 - 50	9.5				0.1	20.5	79.4		
▲ B-32	78.5 - 80	9.5	0.119			3.4	41.8	54.9		
★ B-33	0 - 1.5	2	0.024	0.007		0.0	32.0	40.3	27.7	

PROJECT: Columbia Avenue (S-48) Roadway Improvements

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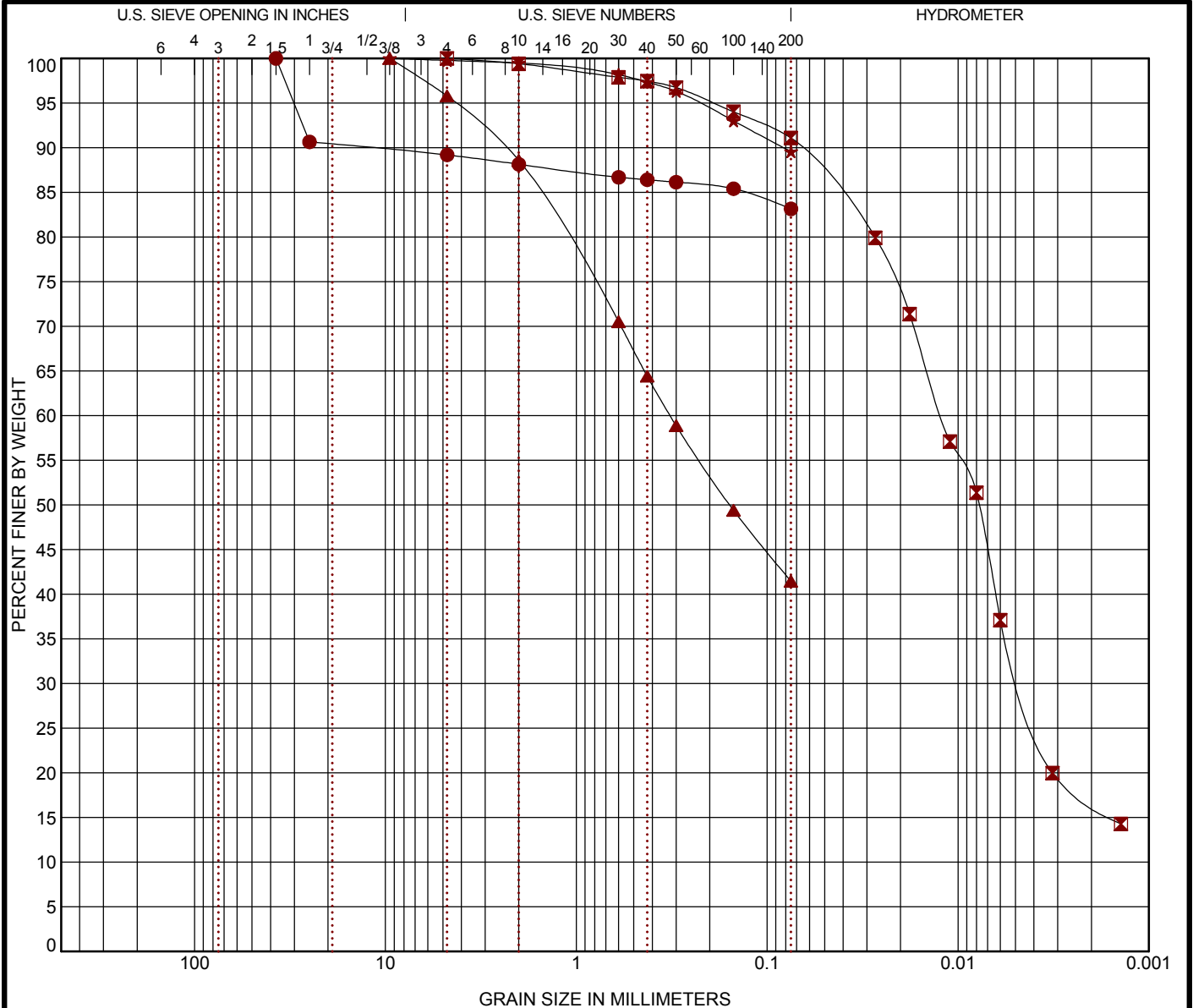
PROJECT NUMBER: 73155095

CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

# GRAIN SIZE DISTRIBUTION

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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

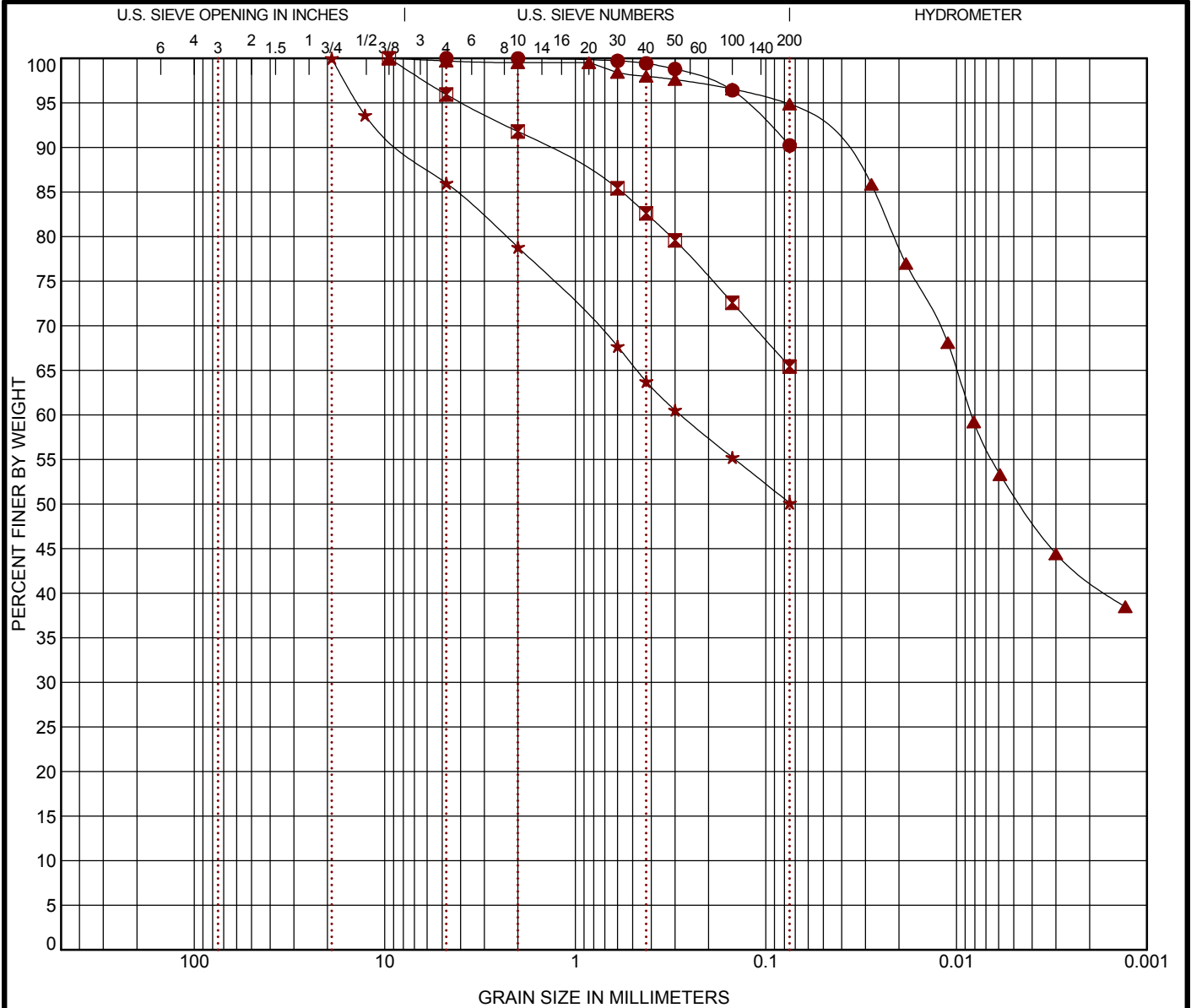
Boring ID		Depth	USCS Classification		AASHTO Classification			LL	PL	PI	Cc	Cu
●	B-33	2 - 3.5	ELASTIC SILT with GRAVEL (MH)		A-7-5 (22)			54	30	24		
☒	B-33	23.5 - 25	SILT (ML)		A-4 (0)			NP	NP	NP		
▲	B-33	83.5 - 85	SILTY SAND (SM)		SILTY SAND (SM)							
★	B-34	2 - 3.5	SILT (ML)		A-4 (0)			NP	NP	NP		
Boring ID		Depth	D <sub>100</sub>	D <sub>60</sub>	D <sub>30</sub>	D <sub>10</sub>	%Gravel	%Sand	%Silt	%Clay		
●	B-33	2 - 3.5	37.5				10.8	6.0	83.1			
☒	B-33	23.5 - 25	4.75	0.012	0.005		0.0	8.9	58.9	32.1		
▲	B-33	83.5 - 85	9.5	0.322			4.2	54.3	41.5			
★	B-34	2 - 3.5	9.5				0.2	10.2	89.6			

PROJECT: Columbia Avenue (S-48) Roadway Improvements	 521 Clemson Rd Columbia, SC	PROJECT NUMBER: 73155095
SITE: Columbia Avenue (S-48) Lexington County, South Carolina		CLIENT: Mead & Hunt, Inc. Lexington, South Carolina

# GRAIN SIZE DISTRIBUTION

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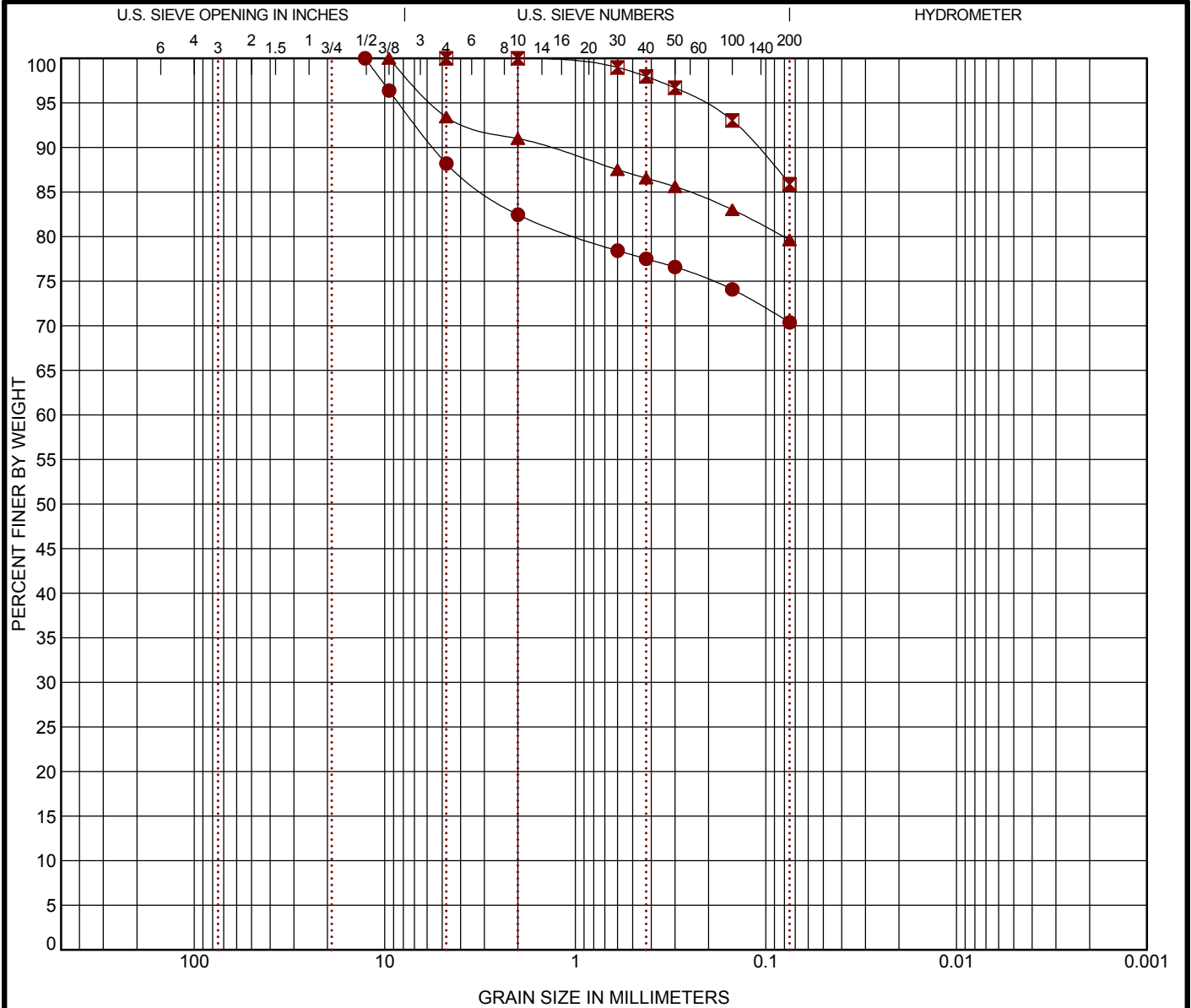




# GRAIN SIZE DISTRIBUTION

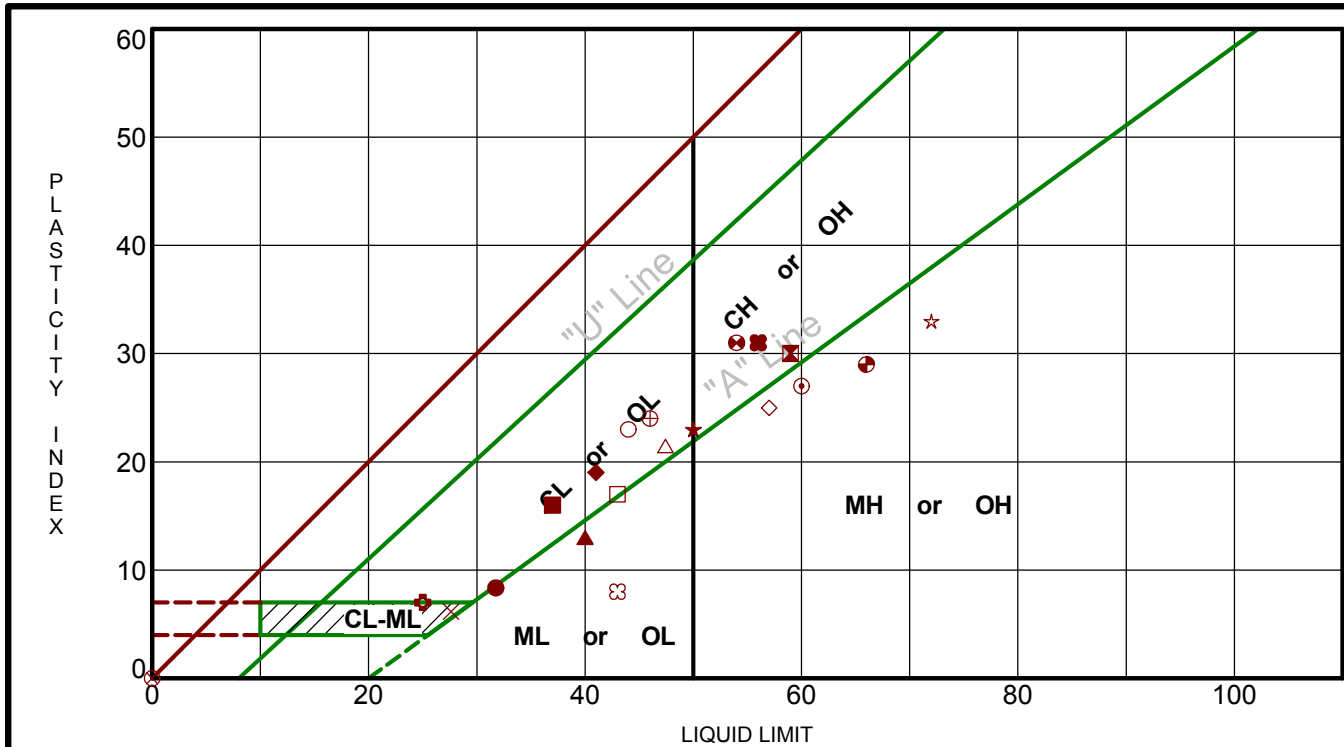
ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 73155095 LAB TESTING.GPJ TERRACON2012.GDT 5/20/16



# ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● B-01	0 - 1.5	32	23	9	92	CL	LEAN CLAY
⊠ B-01	2 - 3.5	59	29	30	54	CH	SANDY FAT CLAY
▲ B-01	8 - 9.5	40	27	13	60	ML	SANDY SILT
★ B-02	0.5 - 2	50	27	23	89	CH	ELASTIC SILT (MH)
⊙ B-02	4 - 5.5	60	33	27			ELASTIC SILT (MH)
⊕ B-02 BULK	0 - 5	25	18	7	56	CL-ML	SANDY SILTY CLAY with GRAVEL
○ B-03	0.5 - 2	44	21	23	81	CL	LEAN CLAY with SAND
△ B-03	2 - 3.5	47	26	21	88	CL	LEAN CLAY
⊗ B-03	6 - 7.5	NP	NP	NP	82	ML	SILT with SAND
⊕ B-04	0 - 1.5	46	22	24	88	CL	LEAN CLAY
□ B-04	2 - 3.5	43	26	17	90	CL	LEAN CLAY
⊕ B-04	6 - 7.5	54	23	31			FAT CLAY (CH)
⊕ B-05	0 - 1.5	66	37	29	93	MH	ELASTIC SILT
★ B-05	2 - 3.5	72	39	33	95	MH	ELASTIC SILT
⊗ B-05 BULK	0 - 5	43	35	8	91	ML	SILT
■ B-06	0 - 1.5	37	21	16	86	CL	LEAN CLAY
◆ B-06	2 - 3.5	41	22	19	91	CL	LEAN CLAY
◇ B-06	6 - 7.5	57	32	25	80	MH	ELASTIC SILT with SAND
× B-07	0 - 1.5	28	21	7	87	CL-ML	SILTY CLAY
⊕ B-07	2 - 3.5	56	25	31	92	CH	FAT CLAY

PROJECT: Columbia Avenue (S-48) Roadway Improvements

SITE: Columbia Avenue (S-48)  
Lexington County, South Carolina

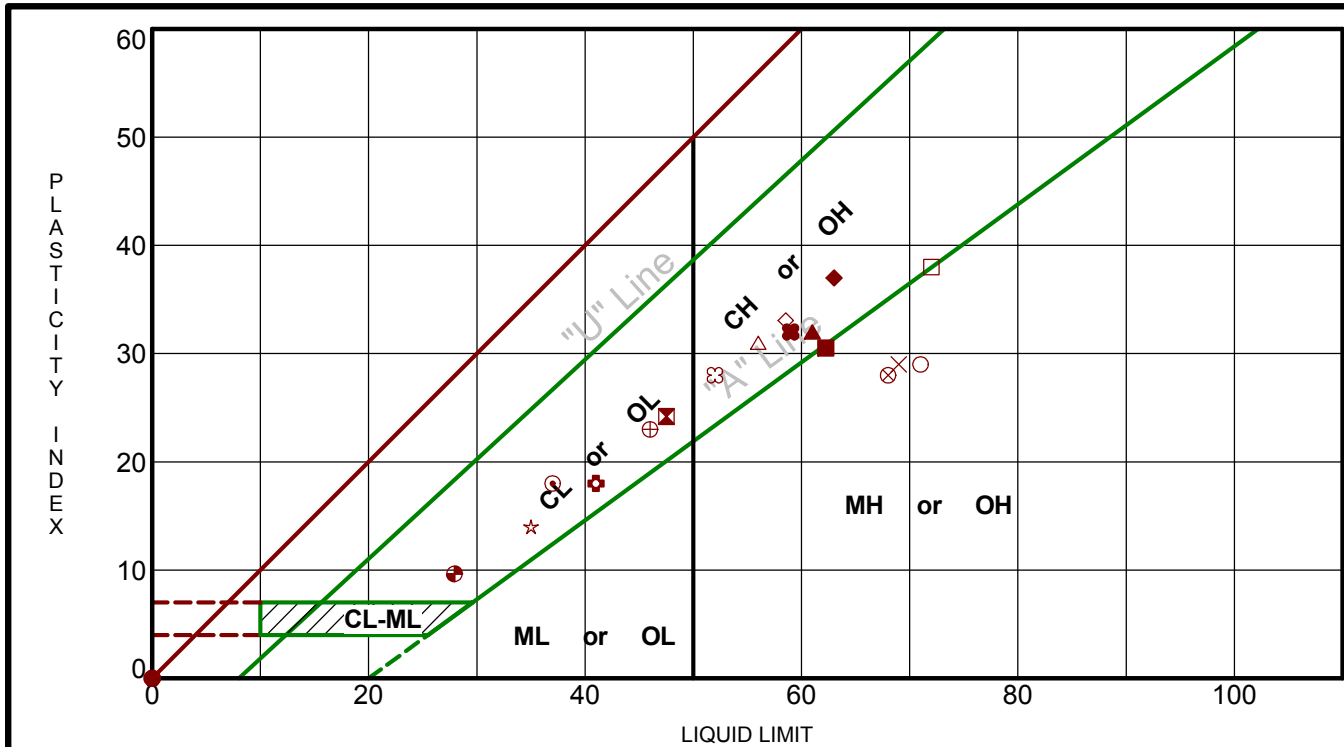
**Terracon**  
521 Clemson Rd  
Columbia, SC

PROJECT NUMBER: 73155095

CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

# ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● B-07	8 - 9.5	NP	NP	NP	81	ML	SILT with SAND
⊠ B-08	0 - 1.5	48	23	25	89	CL	LEAN CLAY
▲ B-08	2 - 3.5	61	29	32	72	CH	FAT CLAY with SAND
★ B-09	2 - 3.5	NP	NP	NP	83	ML	SILT with SAND
⊙ B-10	0 - 1.5	37	19	18	74	CL	LEAN CLAY with SAND
⊕ B-10	2 - 3.5	41	23	18	85	CL	LEAN CLAY with SAND
○ B-10	8 - 9.5	71	42	29	96	MH	ELASTIC SILT
△ B-11	0 - 1.5	56	25	31	86	CH	FAT CLAY
⊗ B-11	4 - 5.5	68	40	28	87	MH	ELASTIC SILT
⊕ B-12	0.5 - 2	46	23	23	75	CL	LEAN CLAY with SAND
□ B-12	2 - 3.5	72	34	38	90	CH	FAT CLAY
⊕ B-12	13.5 - 15	NP	NP	NP	83	ML	SILT with SAND
⊕ B-12 BULK	0 - 5	28	18	10	31	SC	CLAYEY SAND with GRAVEL
★ B-13	0 - 1.5	35	21	14	85	CL	LEAN CLAY with SAND
⊗ B-13	2 - 3.5	52	24	28	88	CH	FAT CLAY
■ B-13	6 - 7.5	62	32	30	95	MH	ELASTIC SILT
◆ B-14	0 - 1.5	63	26	37	92	CH	FAT CLAY
◇ B-14	2 - 3.5	59	25	34	87	CH	FAT CLAY
× B-14	8 - 9.5	69	40	29	87	MH	ELASTIC SILT
■ B-15	2 - 3.5	59	27	32	89	CH	FAT CLAY

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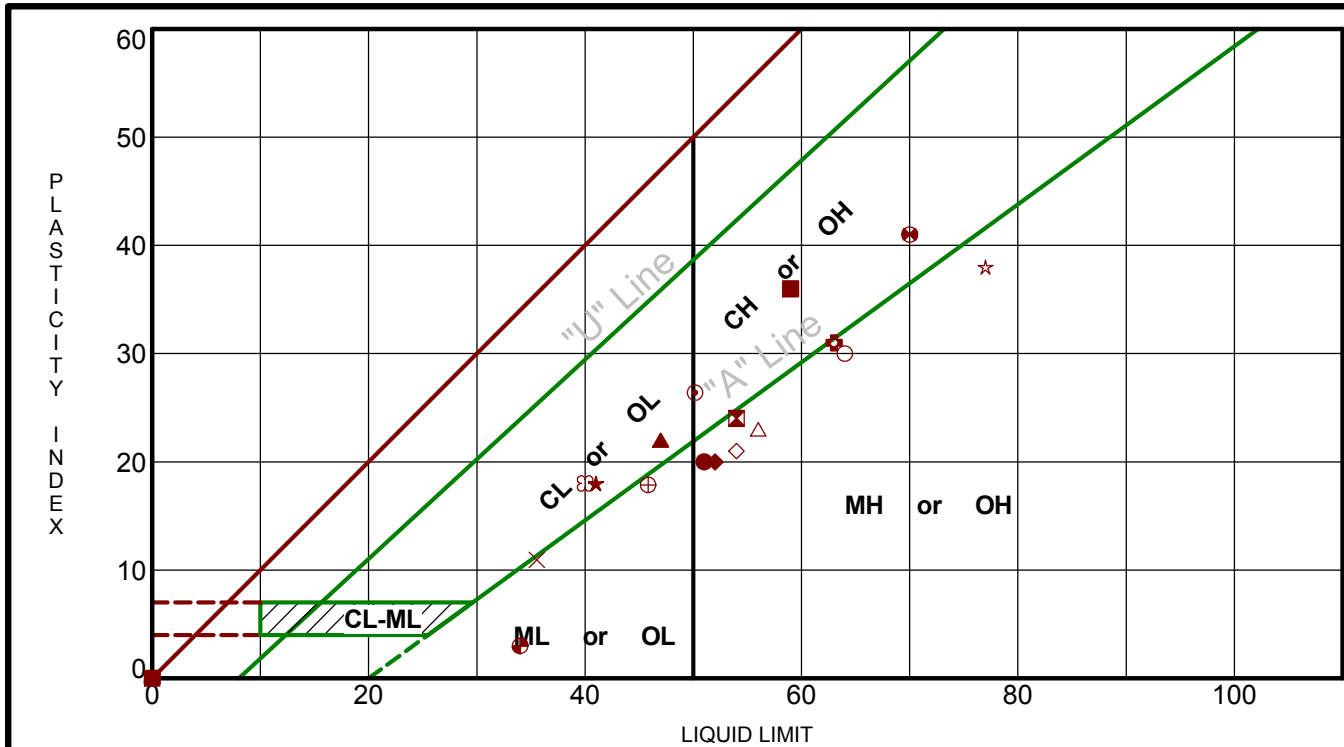
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# ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● B-16	2 - 3.5	51	31	20	89	MH	ELASTIC SILT
⊠ B-17	0 - 1.5	54	30	24	75	MH	ELASTIC SILT with SAND
▲ B-17	4 - 5.5	47	25	22			LEAN CLAY with SAND (CL)
★ B-18	2 - 3.5	41	23	18	82	CL	LEAN CLAY with SAND
⊙ B-19	0 - 1.5	50	24	26	84	CH	FAT CLAY with SAND
⊕ B-19	2 - 3.5	63	32	31	89	MH	ELASTIC SILT
○ B-20	0.5 - 2	64	34	30	97	MH	ELASTIC SILT
△ B-20	2 - 3.5	56	33	23	84	MH	ELASTIC SILT with SAND
⊗ B-20	8 - 9.5	NP	NP	NP	96	ML	SILT
⊕ B-20 BULK	0 - 5	46	28	18	77	ML	SILT with SAND
□ B-21	2 - 3.5	NP	NP	NP	75	ML	SILT with SAND
⊕ B-22	0 - 1.5	70	29	41	88	CH	FAT CLAY
⊕ B-22	6 - 7.5	34	31	3	76	ML	SILT with SAND
★ B-23	2 - 3.5	77	39	38	94	MH	ELASTIC SILT
⊗ B-24	0 - 1.5	40	22	18	91	CL	LEAN CLAY
■ B-24	2 - 3.5	59	23	36	83	CH	FAT CLAY with SAND
◆ B-25	2 - 3.5	52	32	20	67	MH	SANDY ELASTIC SILT
◇ B-26	0.5 - 2	54	33	21	85	MH	ELASTIC SILT
× B-26 BULK	0 - 5	36	25	11	67	ML	SANDY SILT
■ B-27	2 - 3.5	NP	NP	NP	93	ML	SILT

PROJECT: Columbia Avenue (S-48) Roadway Improvements

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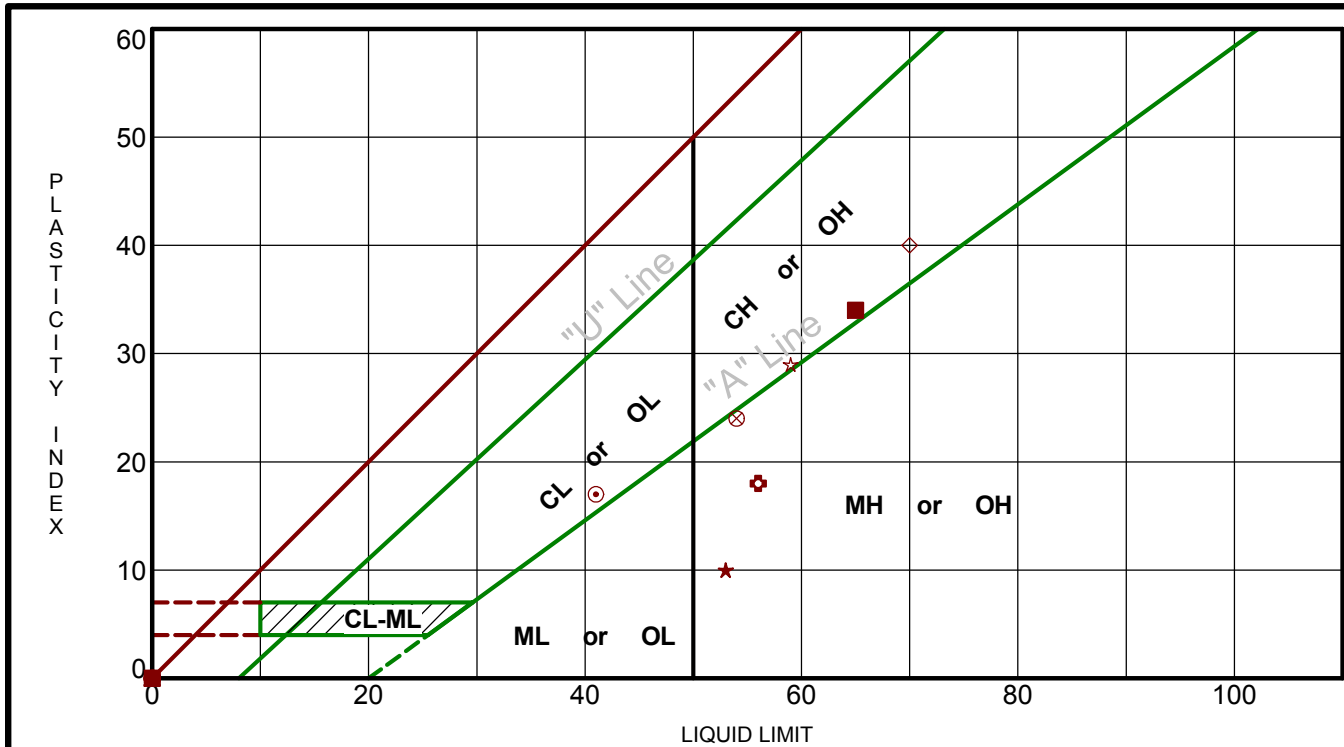
**Terracon**  
521 Clemson Rd  
Columbia, SC

PROJECT NUMBER: 73155095

CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

# ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● B-28	2 - 3.5	NP	NP	NP	73	ML	SILT with SAND
⊗ B-29	2 - 3.5	NP	NP	NP	91	ML	SILT
▲ B-29	53.5 - 55	NP	NP	NP	78	ML	SILT with SAND
★ B-30	2 - 3.5	53	43	10	70	MH	ELASTIC SILT with SAND
⊙ B-30	18.5 - 20	41	24	17	49	SC	CLAYEY SAND
⊕ B-31	2 - 3.5	56	38	18	79	MH	ELASTIC SILT with SAND
○ B-32	13.5 - 15	NP	NP	NP	75	ML	SILT with SAND
△ B-32	48.5 - 50	NP	NP	NP	79	ML	SILT with SAND
⊗ B-33	2 - 3.5	54	30	24	83	MH	ELASTIC SILT with GRAVEL
⊕ B-33	23.5 - 25	NP	NP	NP	91	ML	SILT
□ B-34	2 - 3.5	NP	NP	NP	90	ML	SILT
⊕ B-34	23.5 - 25	NP	NP	NP	90	ML	SILT
⊕ B-35	2 - 3.5	NP	NP	NP	65	ML	SANDY SILT
★ B-35	6 - 7.5	59	30	29	95	CH	FAT CLAY
⊗ B-36	2 - 3.5	NP	NP	NP	50	ML	SANDY SILT
■ B-37	0 - 1.5	65	31	34	70	CH	FAT CLAY with SAND
◆ B-37	33.5 - 35	NP	NP	NP	86	ML	SILT
◇ B-38	0 - 1.5	70	30	40	80	CH	FAT CLAY with SAND

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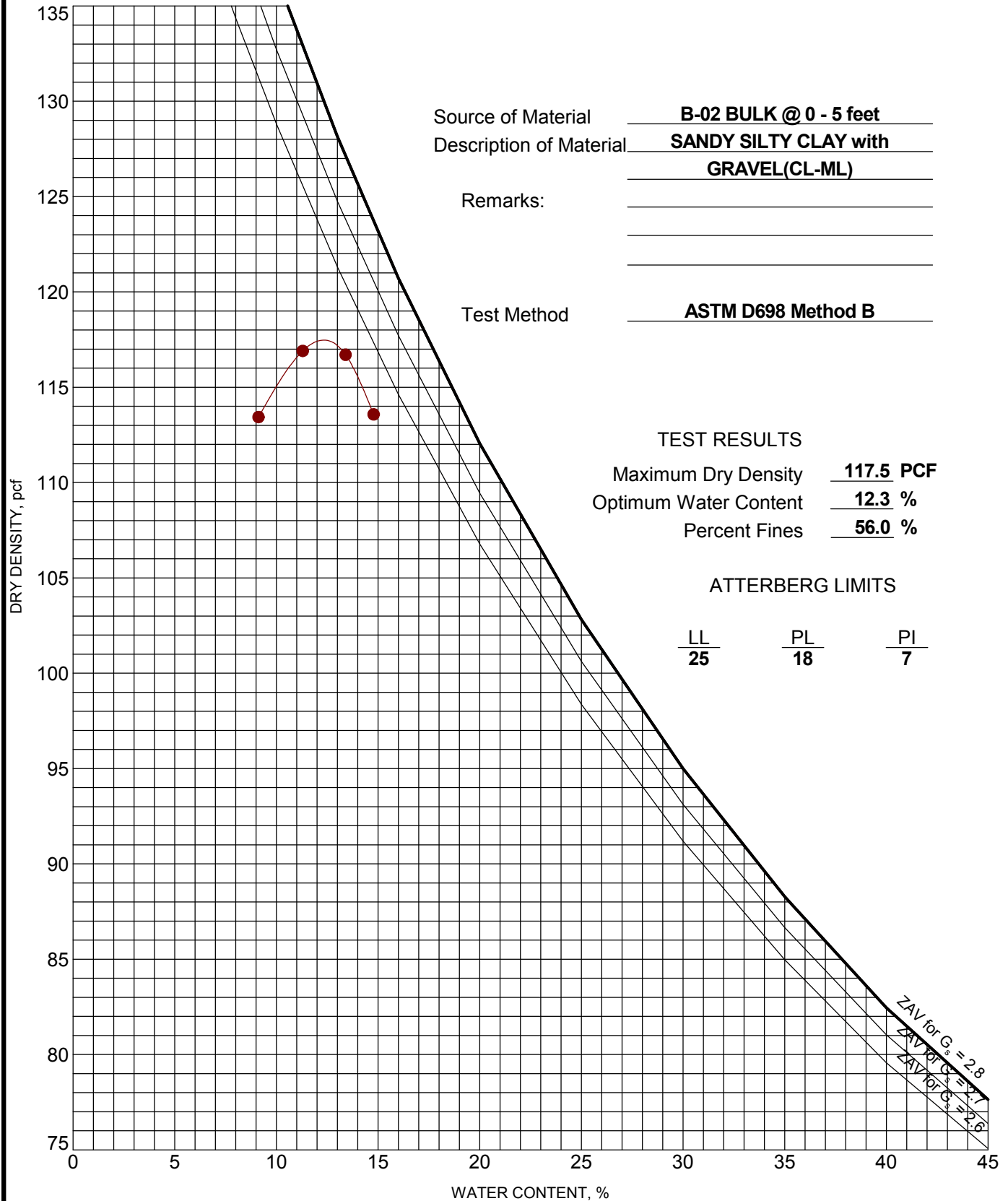
PROJECT NUMBER: 73155095

CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

# MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V2 73155095 LAB TESTING.GPJ TERRACON2012.GDT 5/20/16



Source of Material B-02 BULK @ 0 - 5 feet  
 Description of Material SANDY SILTY CLAY with GRAVEL(CL-ML)  
 Remarks: \_\_\_\_\_  
 Test Method ASTM D698 Method B

## TEST RESULTS

Maximum Dry Density 117.5 PCF  
 Optimum Water Content 12.3 %  
 Percent Fines 56.0 %

## ATTERBERG LIMITS

LL PL PI  
25 18 7

PROJECT: Columbia Avenue (S-48) Roadway Improvements

SITE: Columbia Avenue (S-48)  
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**Terracon**  
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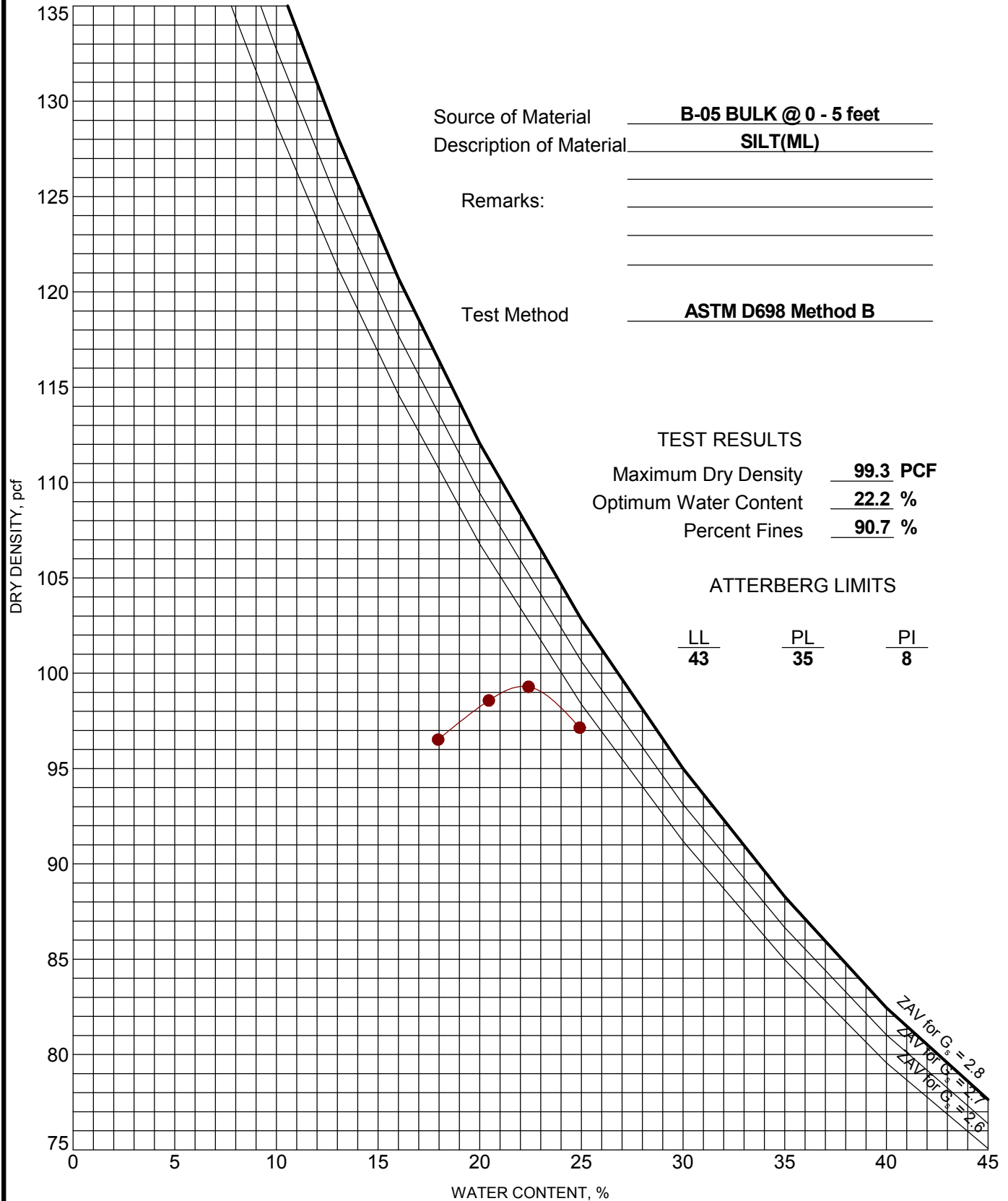
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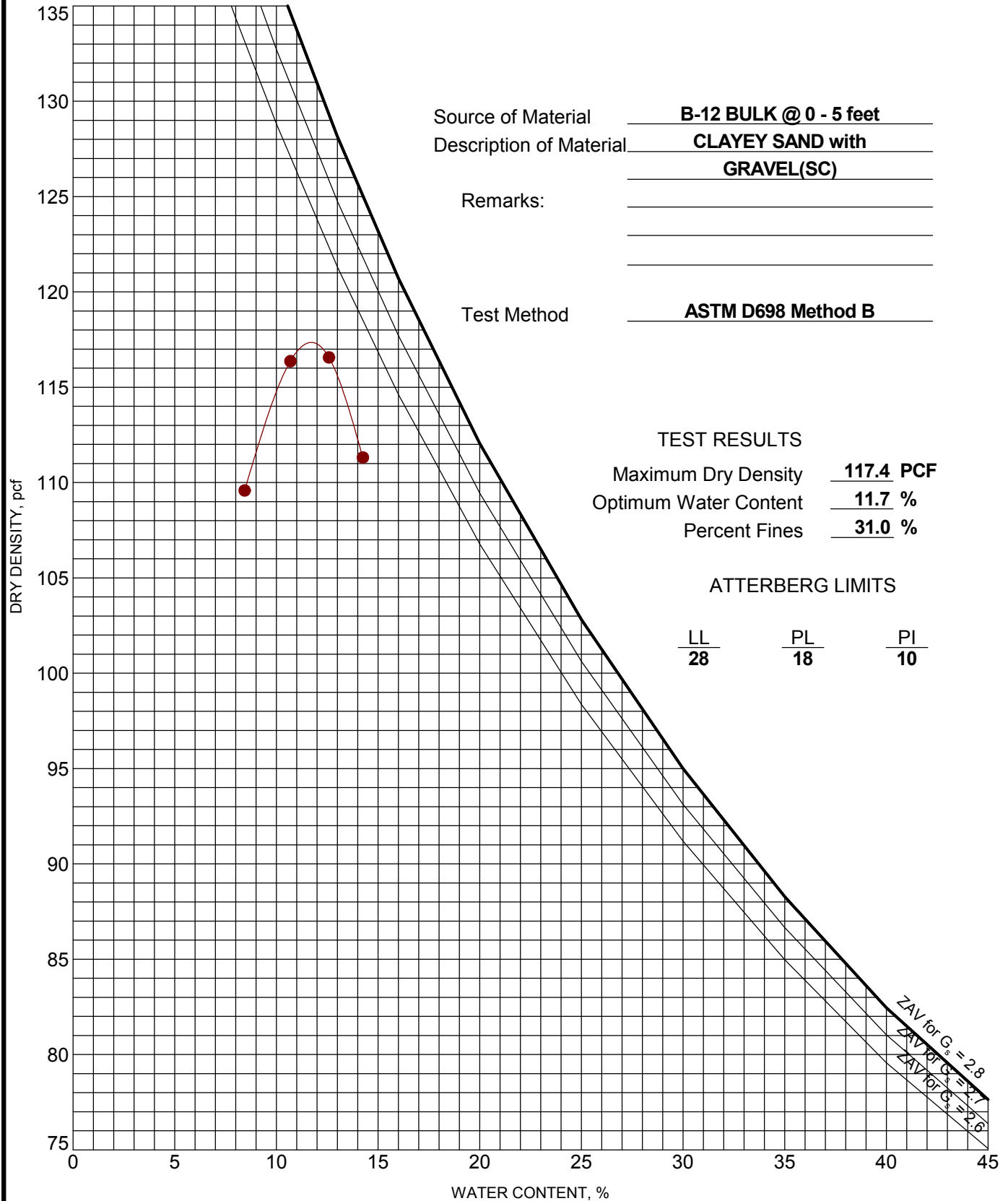
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# MOISTURE-DENSITY RELATIONSHIP

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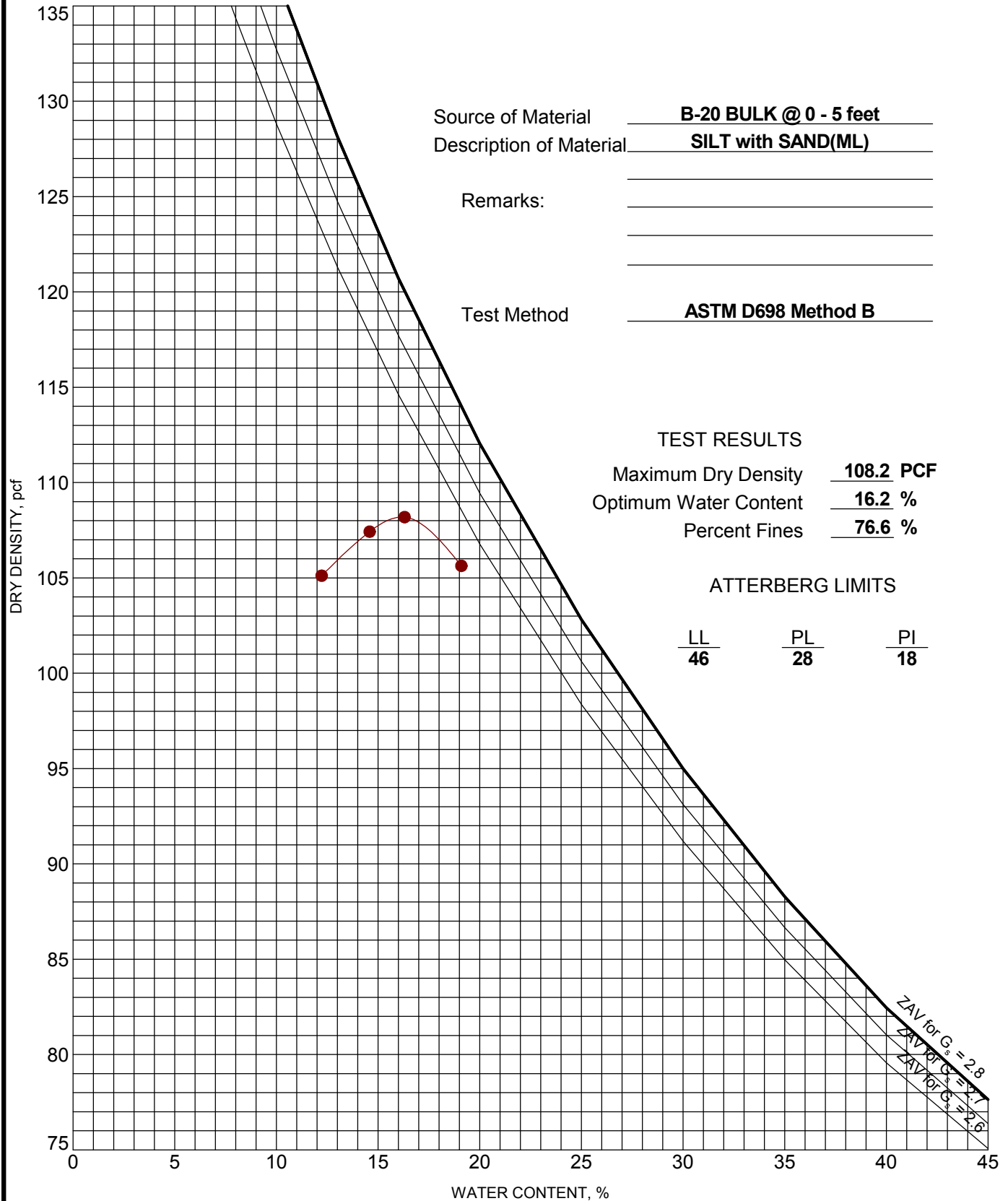
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# MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

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Source of Material B-20 BULK @ 0 - 5 feet  
 Description of Material SILT with SAND(ML)

Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Test Method ASTM D698 Method B

## TEST RESULTS

Maximum Dry Density 108.2 PCF  
 Optimum Water Content 16.2 %  
 Percent Fines 76.6 %

## ATTERBERG LIMITS

<u>LL</u>	<u>PL</u>	<u>PI</u>
<b>46</b>	<b>28</b>	<b>18</b>

PROJECT: Columbia Avenue (S-48) Roadway Improvements

SITE: Columbia Avenue (S-48)  
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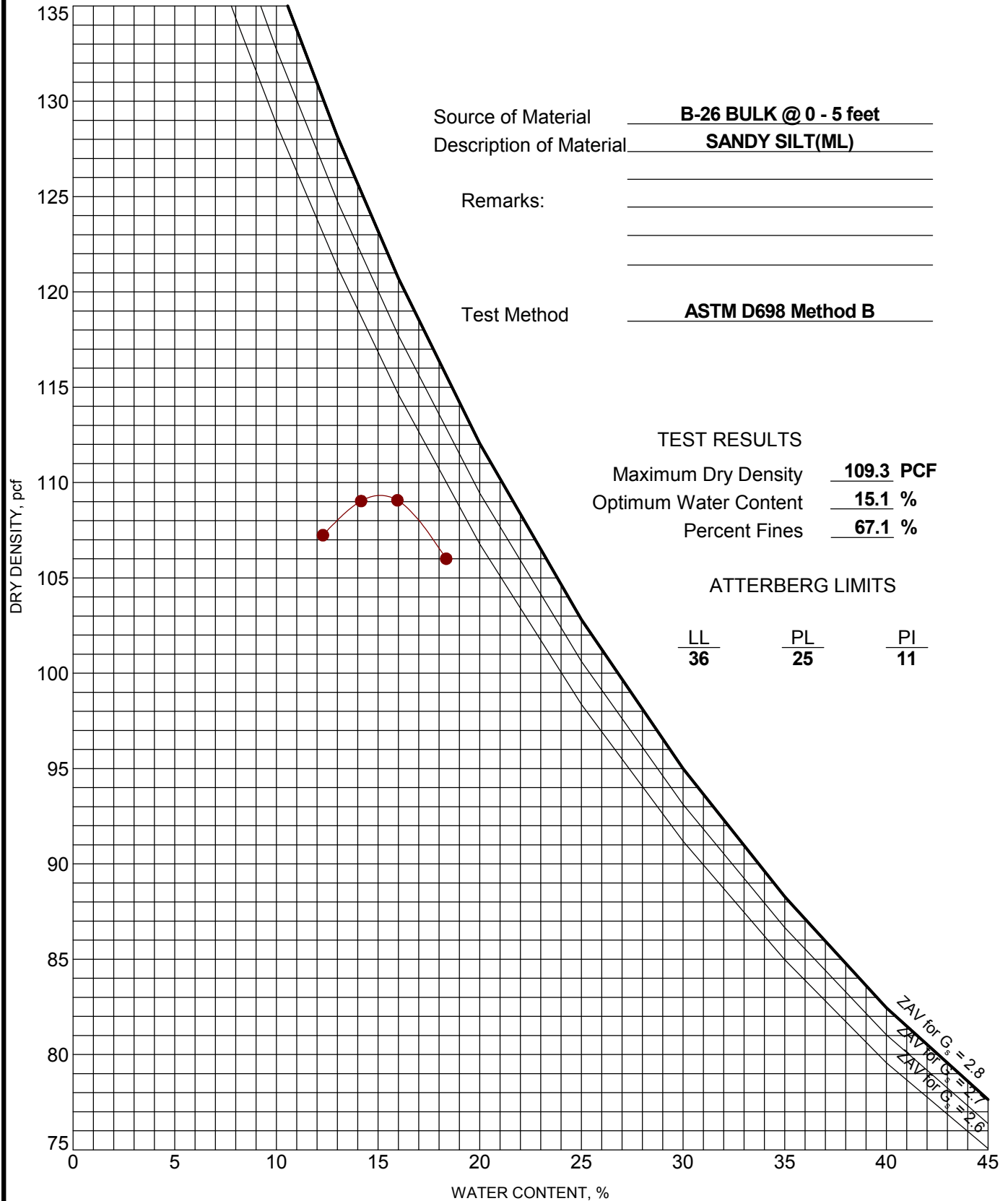
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PROJECT: Columbia Avenue (S-48) Roadway Improvements

SITE: Columbia Avenue (S-48)  
Lexington County, South Carolina

**Terracon**  
521 Clemson Rd  
Columbia, SC

PROJECT NUMBER: 73155095

CLIENT: Mead & Hunt, Inc.  
Lexington, South Carolina

# CHEMICAL LABORATORY TEST REPORT

**Project Number:** 73155095

**Service Date:** 04/14/16

**Report Date:** 04/15/16

**Task:**

**Terracon**

750 Pilot Road, Suite F  
Las Vegas, Nevada 89119  
(702) 597-9393

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## **Client**

Mead & Hunt, Inc.  
Lexington, South Carolina

## **Project**

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, SC

**Sample Submitted By:** Terracon (73)

**Date Received:** 4/13/2016

**Lab No.:** 16-0217

## ***Results of Resistivity Analysis***

<i>Sample Number</i>	Bulk
<i>Sample Location</i>	B-2
<i>Sample Depth (ft.)</i>	0.0-5.0
pH Analysis, AWWA 4500 H	7.87
Water Soluble Sulfate (SO <sub>4</sub> ), ASTM D 516, (mg/kg)	47
Chlorides, ASTM D 512, (mg/kg)	100
Resistivity, ASTM G-57, (ohm-cm)	4608
Organic Content by Loss on Ignition, ASTM D 2974 (percent, %)	4.8

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**Analyzed By:**



Kurt D. Ergun  
Chemist

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# CHEMICAL LABORATORY TEST REPORT

**Project Number:** 73155095

**Service Date:** 03/10/16

**Report Date:** 03/11/16

**Task:**

# Terracon

750 Pilot Road, Suite F  
Las Vegas, Nevada 89119  
(702) 597-9393

## Client

Mead & Hunt, Inc.  
Lexington, South Carolina

## Project

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, SC

**Sample Submitted By:** Terracon (73)

**Date Received:** 3/4/2016

**Lab No.:** 16-0207

## *Results of Resistivity Analysis*

	<i>Sample Number</i>	SS-2	SS-1	SS-1	SS-1
	<i>Sample Location</i>	B-30	B-32	B-33	B-34
	<i>Sample Depth (ft.)</i>	2.0-4.0	0.0-2.0	0.0-2.0	0.0-2.0
pH Analysis, AWWA 4500 H		7.55	5.97	6.29	5.87
Water Soluble Sulfate (SO <sub>4</sub> ), ASTM D 516, (mg/kg)		11	41	25	28
Chlorides, ASTM D 512, (mg/kg)		12	25	12	12
Resistivity, ASTM G-57, (ohm-cm)		16102	7760	22310	22213
Organic Content by Loss on Ignition, ASTM D 2974 (percent, %)				4.7	
Moisture Content, ASTM D 2216 (percent, %)		11.2	12.3	11.9	11.1

**Analyzed By:**



Kurt D. Ergun  
Chemist

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# CHEMICAL LABORATORY TEST REPORT

**Project Number:** 73155095  
**Service Date:** 03/14/16  
**Report Date:** 03/15/16  
**Task:**

**Terracon**

750 Pilot Road, Suite F  
Las Vegas, Nevada 89119  
(702) 597-9393

## Client

Mead & Hunt, Inc.  
Lexington, South Carolina

## Project

Columbia Avenue (S-48) Roadway Improvements  
Lexington County, SC

**Sample Submitted By:** Terracon (73)

**Date Received:** 3/4/2016

**Lab No.:** 16-0217

## Results of Resistivity Analysis

	<i>Sample Number</i>	Bulk	Bulk	Bulk	Bulk
	<i>Sample Location</i>	B-5	B-12	B-20	B-26
	<i>Sample Depth (ft.)</i>	0.0-5.0	0.0-5.0	0.0-5.0	0.0-5.0
pH Analysis, AWWA 4500 H		7.48	6.70	7.61	6.50
Water Soluble Sulfate (SO <sub>4</sub> ), ASTM D 516, (mg/kg)		25	116	25	105
Chlorides, ASTM D 512, (mg/kg)		12	45	12	38
Resistivity, ASTM G-57, (ohm-cm)		22504	2037	23280	2377
Organic Content by Loss on Ignition, ASTM D 2974 (percent, %)		4.7	5.6	4.8	4.4

**Analyzed By:**

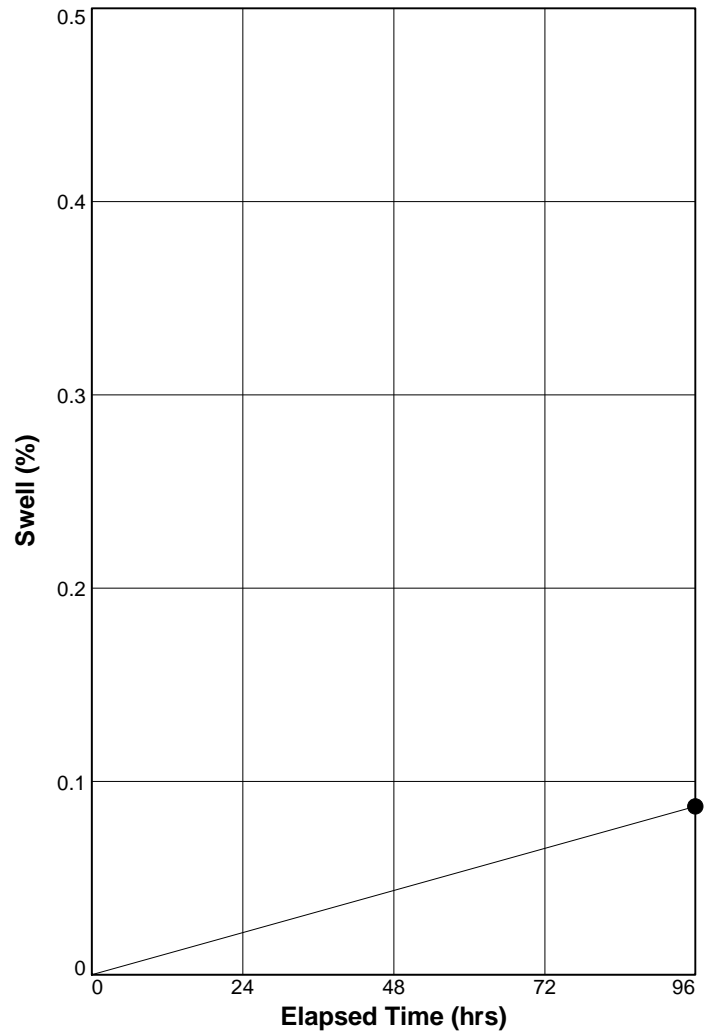
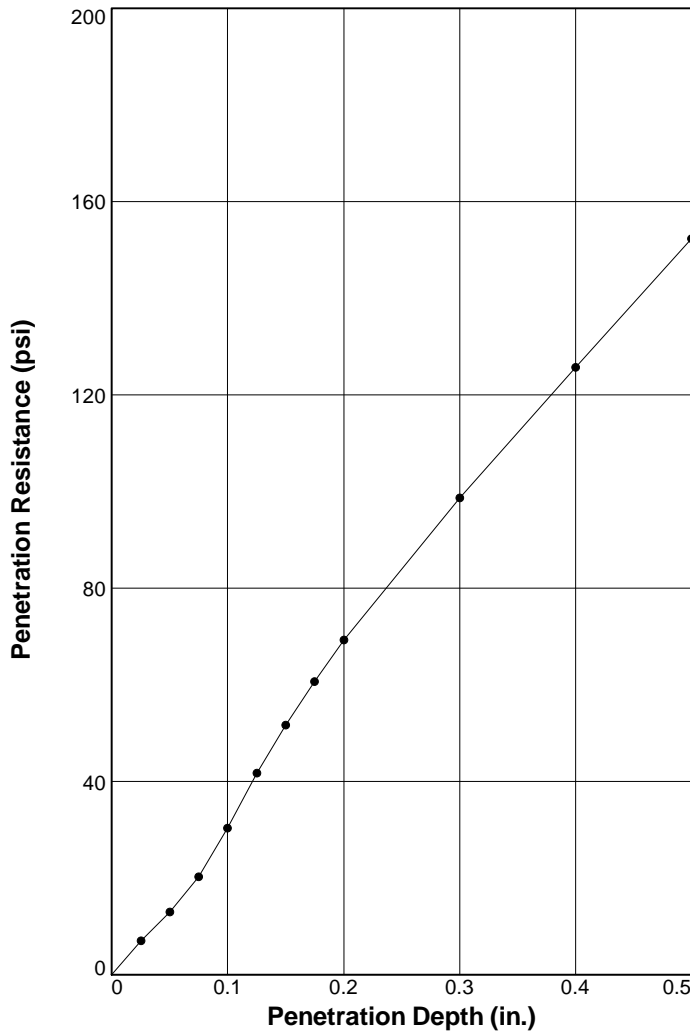


Kurt D. Ergun  
Chemist

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

# BEARING RATIO TEST REPORT

## ASTM D 1883-07



	Molded			Soaked			CBR (%)		Linearity	Surcharge	Max.
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.	Correction (in.)	(lbs.)	Swell (%)
1 ○	111.6	95	12.3	111.5	94.9	14.3	4.1	5.1	0.024	10	0.1
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Sandy Silty Clay with Gravel							CL-ML	117.5	12.3	25	7

**Project No:** 73155095  
**Project:** S-48 (Columbia Avenue) Corridor Improvements  
**Source of Sample:** B-2 Bulk      **Depth:** 0.0-5.0 ft  
**Sample Number:** 1  
**Date:** 3/17/16

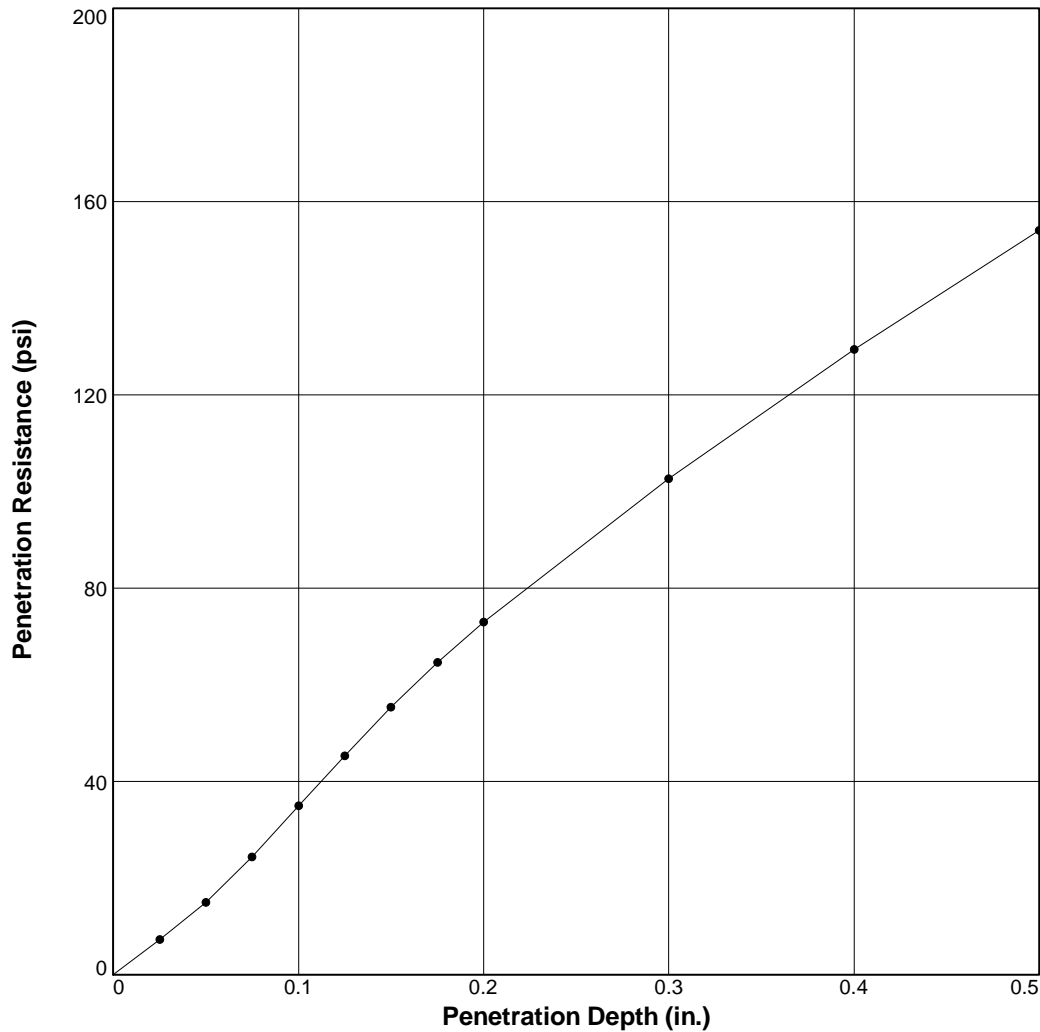
### Test Description/Remarks:

Compaction based on D698 effort.

BEARING RATIO TEST REPORT  
**Terracon Consultants, Inc.**

# BEARING RATIO TEST REPORT

## ASTM D 1883-07



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	94.3	95	22.2	94.3	95	27.7	4.1	5.1	0.014	10	0
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Silt							ML	99.3	22.2	43	8

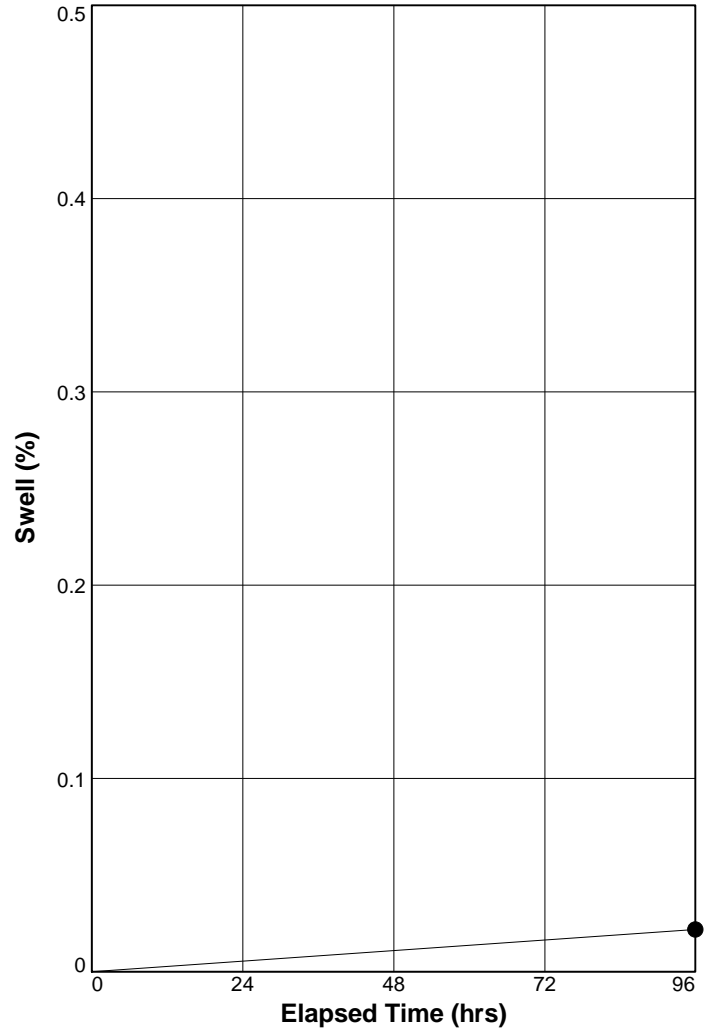
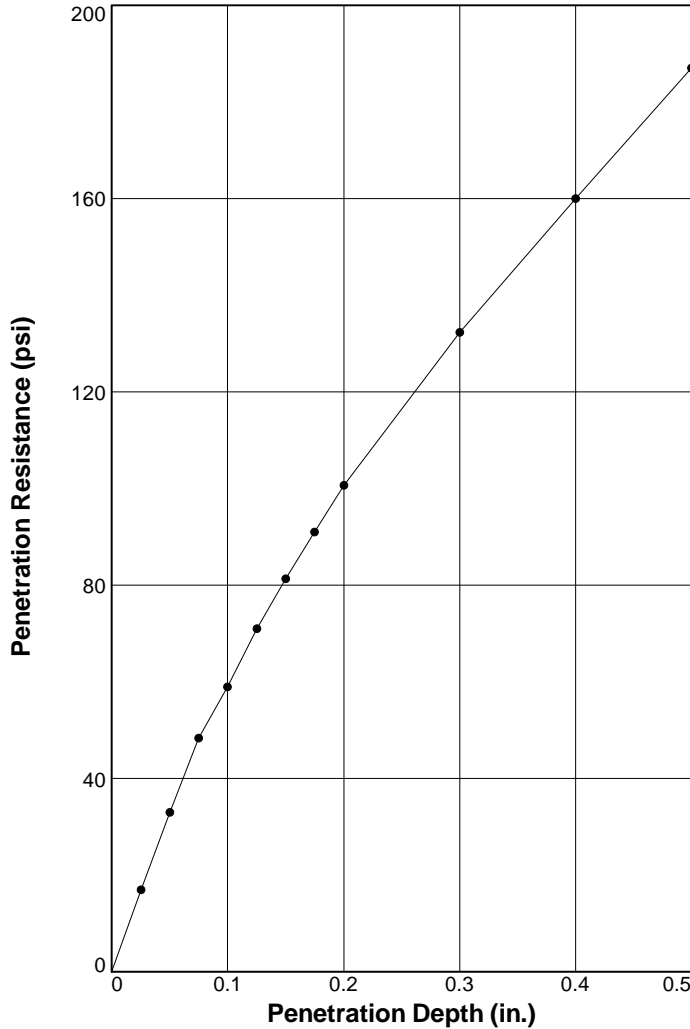
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**Project:** S-48 (Columbia Avenue) Corridor Improvements  
**Source of Sample:** B-5 Bulk      **Depth:** 0.0-5.0 ft  
**Sample Number:** 1  
**Date:** 3/17/16

**Test Description/Remarks:**  
  
 Compaction based on D698 effort.

BEARING RATIO TEST REPORT  
**Terracon Consultants, Inc.**

# BEARING RATIO TEST REPORT

## ASTM D 1883-07



	Molded			Soaked			CBR (%)		Linearity	Surcharge	Max.
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.	Correction (in.)	(lbs.)	Swell (%)
1 ○	111.5	95	11.7	111.5	95	13.4	5.9	6.7	0.000	10	0
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Clayey Sand with Gravel							SC	117.4	11.7	28	10

**Project No:** 73155095  
**Project:** S-48 (Columbia Avenue) Corridor Improvements  
**Source of Sample:** B-12 Bulk      **Depth:** 0.0-5.0 ft  
**Sample Number:** 1  
**Date:** 3/17/16

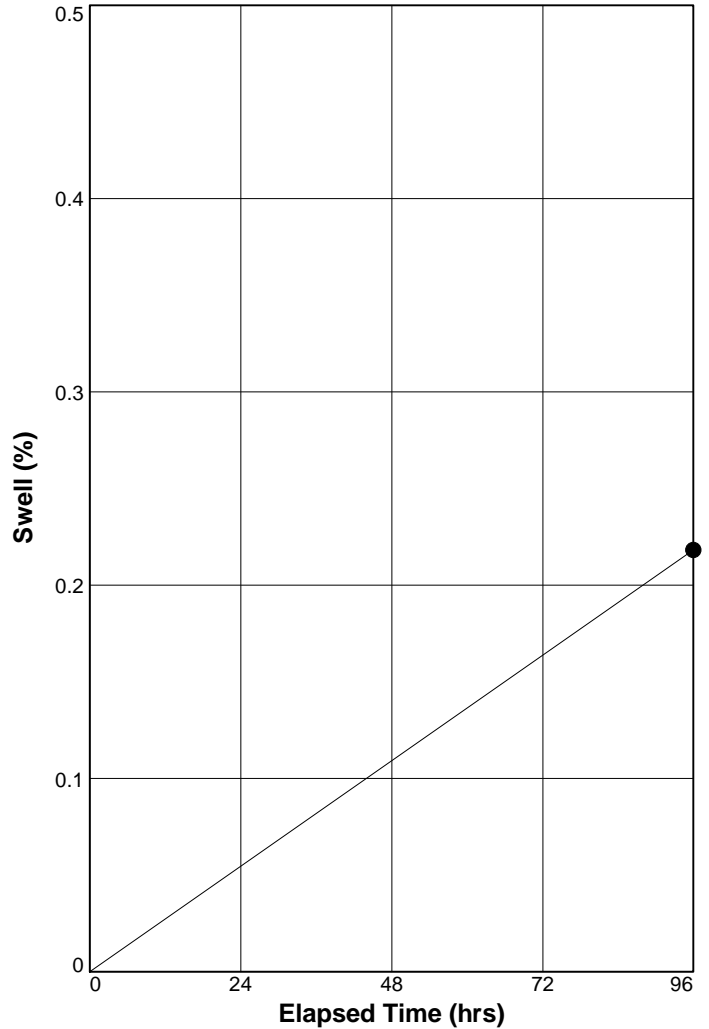
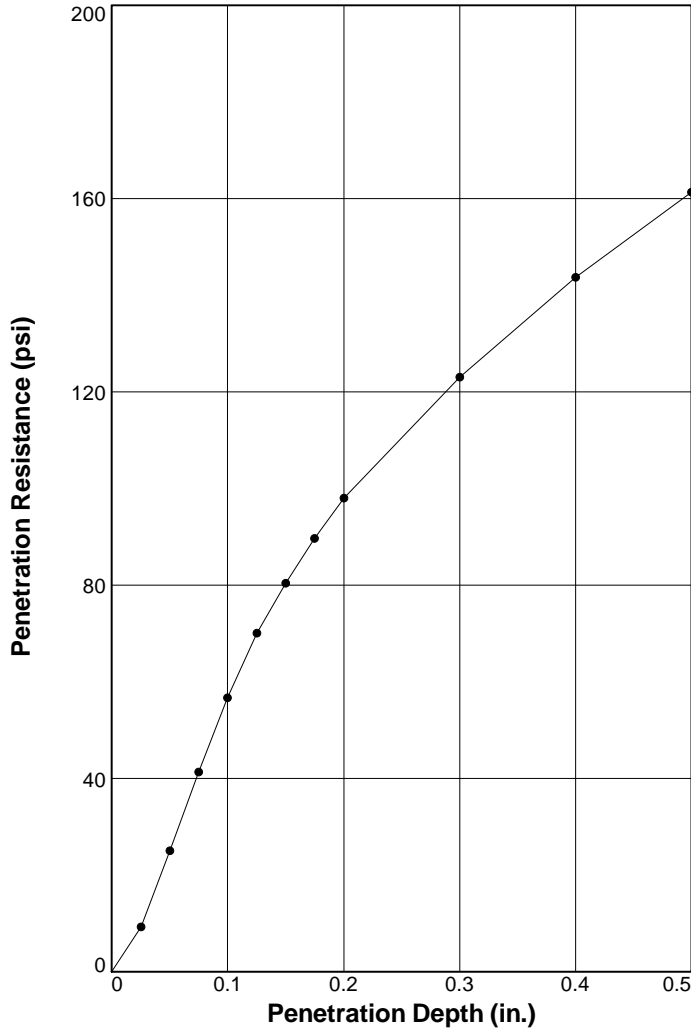
**Test Description/Remarks:**  
  
 Compaction based on D698 effort.

BEARING RATIO TEST REPORT  
**Terracon Consultants, Inc.**



# BEARING RATIO TEST REPORT

## ASTM D 1883-07



	Molded			Soaked			CBR (%)		Linearity	Surcharge	Max.
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.	Correction (in.)	(lbs.)	Swell (%)
1 ○	102.8	95	16.2	102.6	94.8	21.7	6.2	6.7	0.010	10	0.2
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Silt with Sand							ML	108.2	16.2	46	18

**Project No:** 73155095

**Project:** S-48 (Columbia Avenue) Corridor Improvements

**Source of Sample:** B-20 Bulk      **Depth:** 0.0-5.0 ft

**Sample Number:** 1

**Date:** 3/17/16

**Test Description/Remarks:**

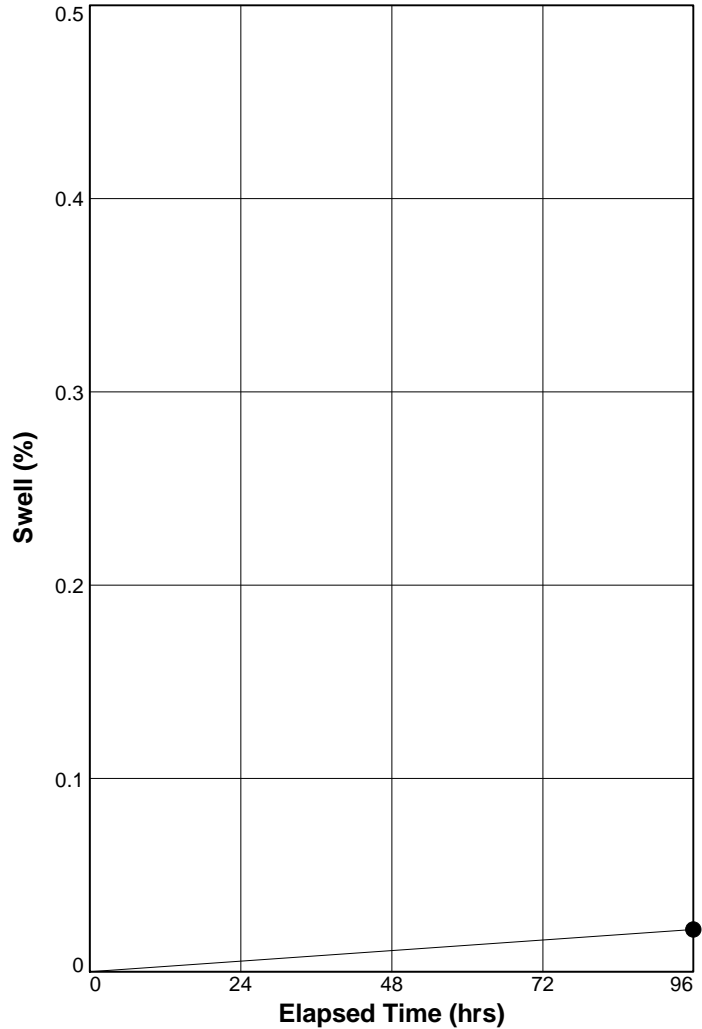
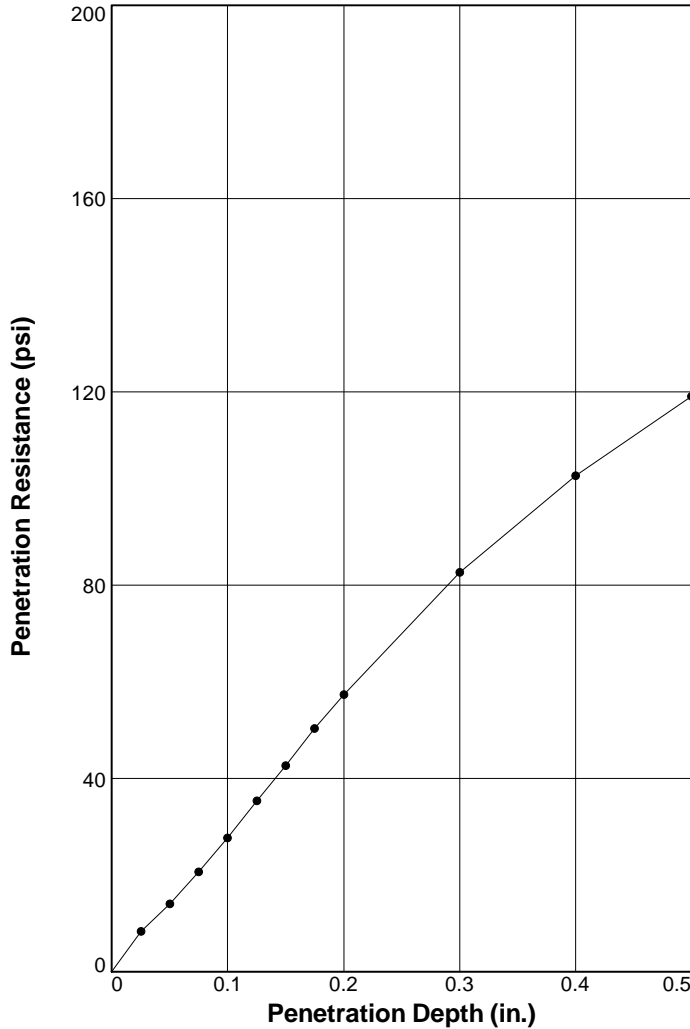
Compaction based on D698 effort.

BEARING RATIO TEST REPORT

**Terracon Consultants, Inc.**

# BEARING RATIO TEST REPORT

## ASTM D 1883-07



	Molded			Soaked			CBR (%)		Linearity	Surcharge	Max.
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.	Correction (in.)	(lbs.)	Swell (%)
1 ○	103.8	95	15.1	103.8	95	21.5	3.0	4.0	0.008	10	0
2 △											
3 □											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Sandy Silt							ML	109.3	15.1	36	11

**Project No:** 73155095  
**Project:** S-48 (Columbia Avenue) Corridor Improvements  
**Source of Sample:** B-26 Bulk      **Depth:** 0.0-5.0 ft  
**Sample Number:** 1  
**Date:** 3/17/16

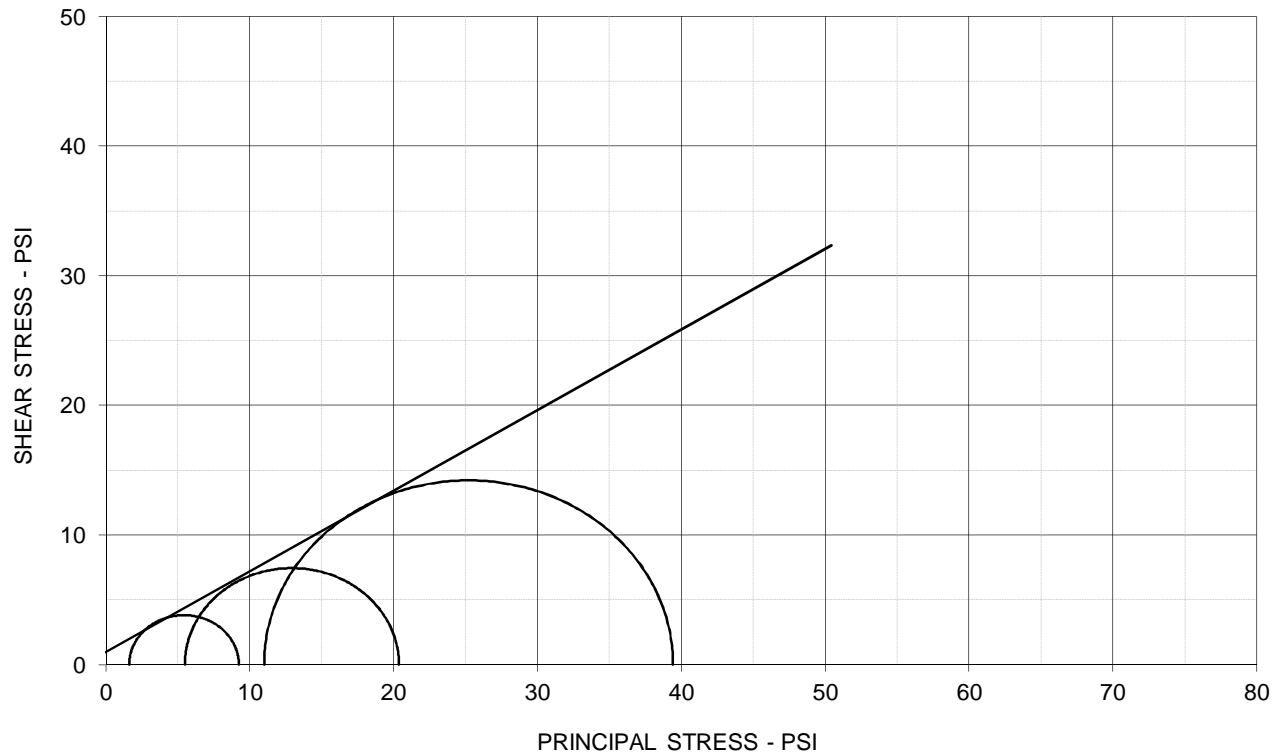
**Test Description/Remarks:**  
  
 Compaction based on D698 effort.

BEARING RATIO TEST REPORT  
**Terracon Consultants, Inc.**

# TRIAXIAL SHEAR TEST REPORT



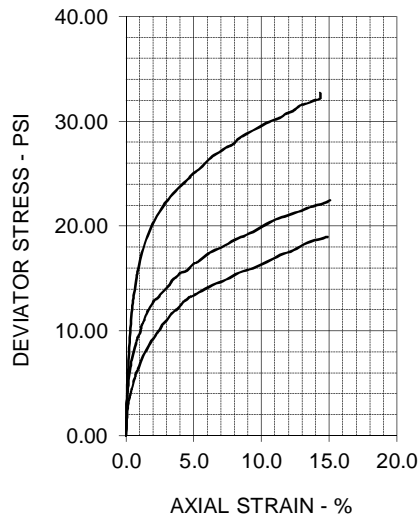
P.O. Box 5010, 51 Lost Mound Drive, Suite 135 Chattanooga, TN 37406



## EFFECTIVE STRESS PARAMETERS

$\phi' = 31.9 \text{ deg}$

$c' = 1.0 \text{ psi}$



### SPECIMEN NO.

1 2 3 4

#### INITIAL

Moisture Content - %	16.2	16.2	16.2
Dry Density - pcf	102.8	102.8	102.8
Diameter - inches	2.80	2.80	2.80
Height - inches	5.60	5.60	5.60

#### AT TEST

Final Moisture - %	23.3	23.1	23.0
Dry Density - pcf	102.9	103.4	103.6
Calculated Diameter (in.)	2.81	2.80	2.79
Height - inches	5.64	5.59	5.58
Effect. Cell Pressure - psi	3.5	6.9	13.9
Failure Stress - psi	7.62	14.88	28.42
Total Pore Pressure - psi	51.9	51.4	52.9
Strain Rate - inches/min.	0.00060	0.00060	0.00060
Failure Strain - %	1.3	3.5	8.4
$S_1'$ Failure - psi	9.25	20.38	39.43
$S_3'$ Failure - psi	1.63	5.50	11.01

## TEST DESCRIPTION

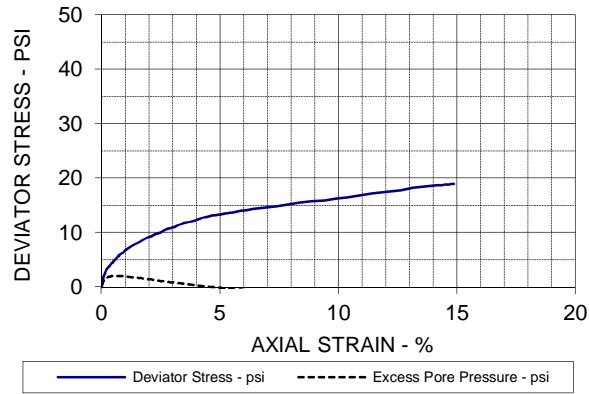
TYPE OF TEST & NO: CU with Pore Pressure  
 SAMPLE TYPE: Remolded  
 DESCRIPTION: Silt with Sand (ML)  
 SAMPLE LOCATION: B-20 Bulk, 0.0-5.0 ft  
 ASSUMED SPECIFIC GRAVITY: 2.75  
 LL: 46 PL: 28 PI: 18 Percent -200: 77  
 REMARKS: Specimens remolded to 95% at optimum.

## PROJECT INFORMATION

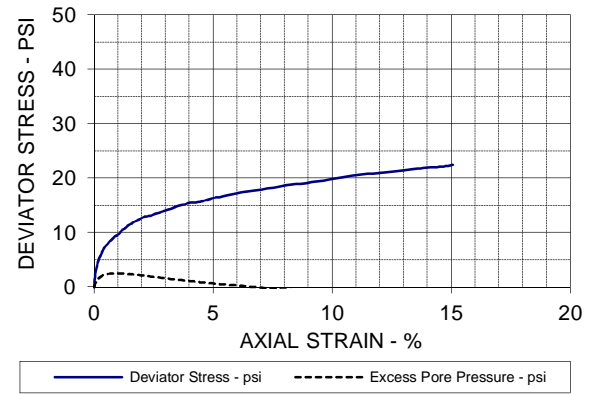
PROJECT: S-48 (Columbia Avenue) Corridor Improvements  
 LOCATION: Lexington County, SC  
 PROJECT NO: 73155095  
 CLIENT: Mead & Hunt  
 DATE: 3/17/16

**TERRACON**

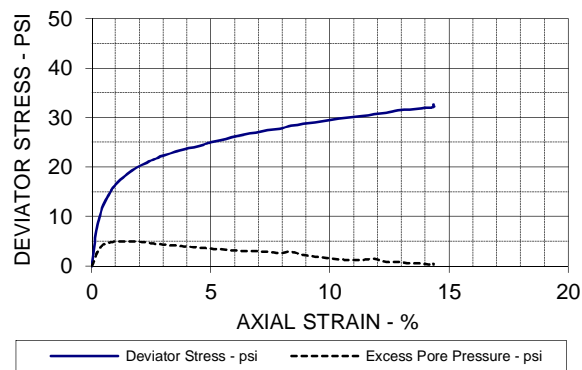
SPECIMEN NO. 1



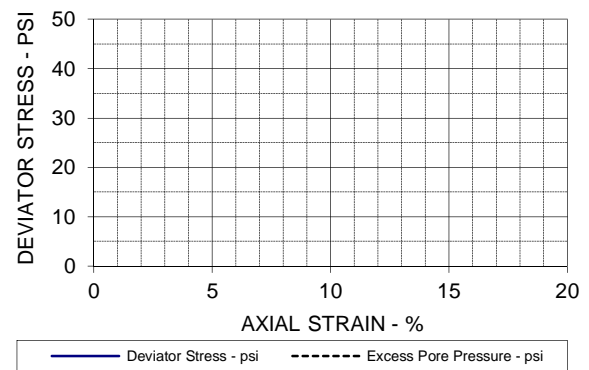
SPECIMEN NO. 2



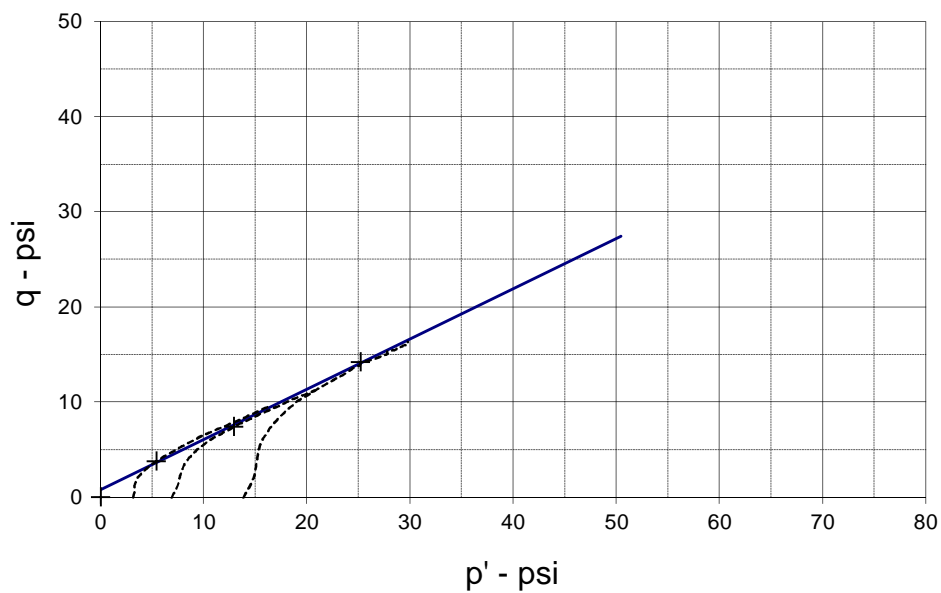
SPECIMEN NO. 3



SPECIMEN NO. 4

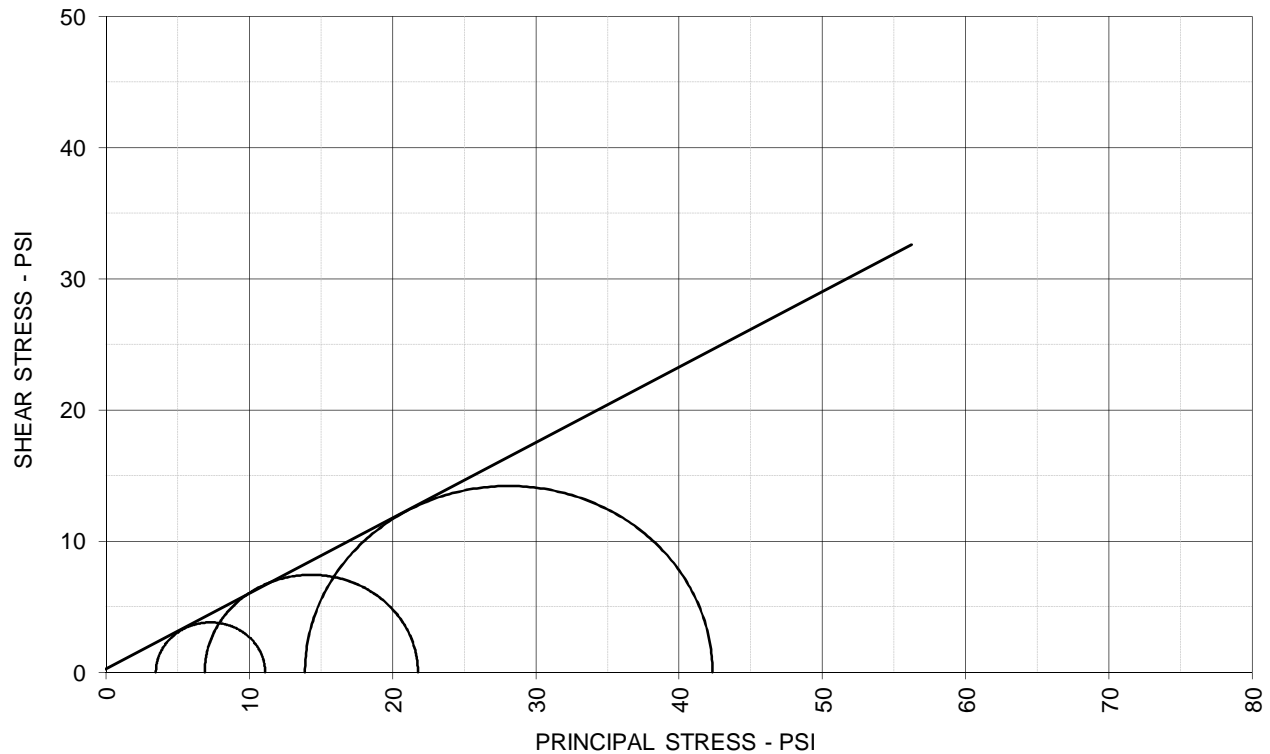


p - q DIAGRAM



EFFECTIVE STRESS PARAMETERS	$R^2 = 1.00$	a (deg) = 27.8	a (psi) = 0.8
PROJECT: S-48 (Columbia Avenue) Corridor Improvements	TYPE OF TEST & NO: CU with Pore Pressure		
PROJECT NO: 73155095	<b>TERRACON</b>		
DESCRIPTION: Silt with Sand (ML)			

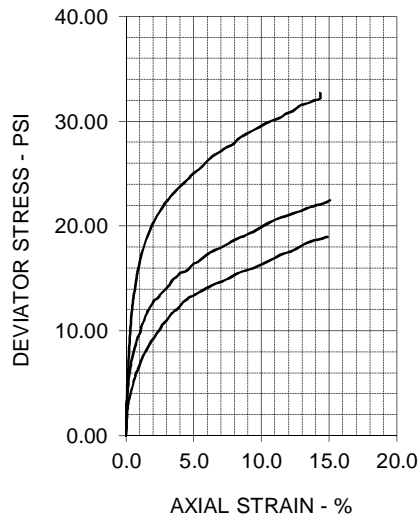
# TRIAXIAL SHEAR TEST REPORT



## TOTAL STRESS PARAMETERS

$\phi = 29.9 \text{ deg}$

$c = 0.2 \text{ psi}$



### SPECIMEN NO.

1 2 3 4

#### INITIAL

Moisture Content - %	16.2	16.2	16.2
Dry Density - pcf	102.8	102.8	102.8
Diameter - inches	2.80	2.80	2.80
Height - inches	5.60	5.60	5.60

#### AT TEST

Final Moisture - %	23.3	23.1	23.0
Dry Density - pcf	102.9	103.4	103.6
Calculated Diameter (in.)	2.81	2.80	2.79
Height - inches	5.64	5.59	5.58
Effect. Cell Pressure - psi	3.5	6.9	13.9
Failure Stress - psi	7.62	14.88	28.42
Total Pore Pressure - psi	51.9	51.4	52.9
Strain Rate - inches/min.	0.00060	0.00060	0.00060
Failure Strain - %	1.3	3.5	8.4
$S_1$ Failure - psi	11.12	21.78	42.32
$S_3$ Failure - psi	3.50	6.90	13.90

## TEST DESCRIPTION

TYPE OF TEST & NO: CU with Pore Pressure  
 SAMPLE TYPE: Remolded  
 DESCRIPTION: Silt with Sand (ML)  
 SAMPLE LOCATION: B-20 Bulk, 0.0-5.0 ft  
 ASSUMED SPECIFIC GRAVITY: 2.75  
 LL: 46 PL: 28 PI: 18 Percent -200: 77  
 REMARKS: Specimens remolded to 95% at optimum.

## PROJECT INFORMATION

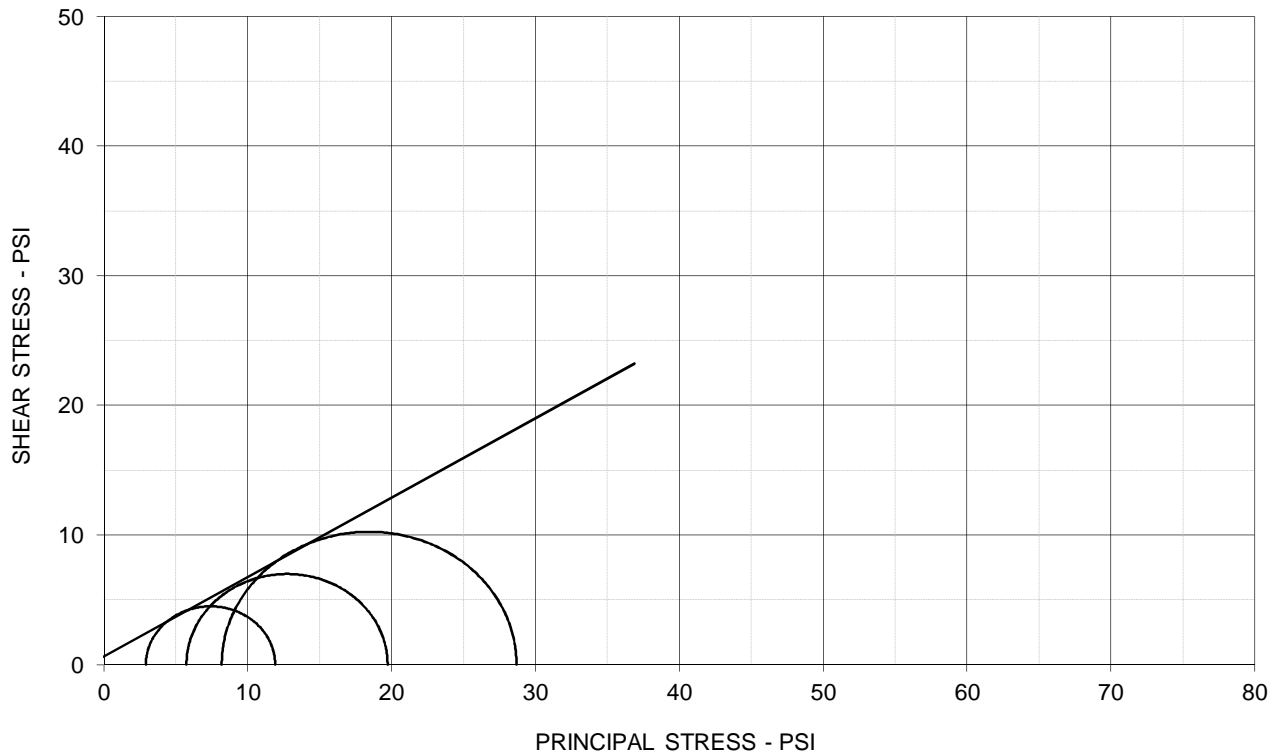
PROJECT: S-48 (Columbia Avenue) Corridor Improvements  
 LOCATION: Lexington County, SC  
 PROJECT NO: 73155095  
 CLIENT: Mead & Hunt  
 DATE: 3/17/16

**TERRACON**

# TRIAXIAL SHEAR TEST REPORT



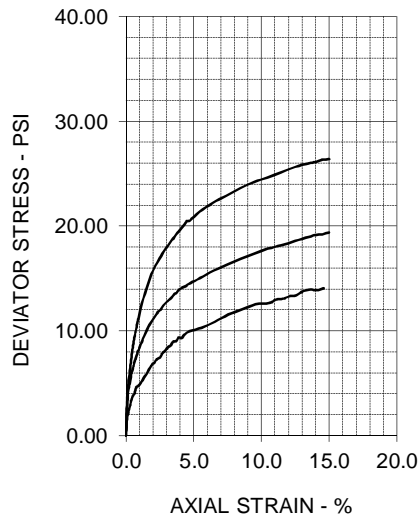
P.O. Box 5010, 51 Lost Mound Drive, Suite 135 Chattanooga, TN 37406



## EFFECTIVE STRESS PARAMETERS

$\phi' = 31.5 \text{ deg}$

$c' = 0.6 \text{ psi}$



### SPECIMEN NO.

1 2 3 4

#### INITIAL

Moisture Content - %	15.1	15.1	15.1
Dry Density - pcf	102.8	102.8	102.8
Diameter - inches	2.80	2.80	2.80
Height - inches	5.60	5.60	5.60

#### AT TEST

Final Moisture - %	24.0	23.6	22.4
Dry Density - pcf	103.0	103.8	105.7
Calculated Diameter (in.)	2.82	2.80	2.80
Height - inches	5.65	5.60	5.59
Effect. Cell Pressure - psi	3.5	6.9	13.9
Failure Stress - psi	8.98	13.98	20.49
Total Pore Pressure - psi	50.6	51.2	55.7
Strain Rate - inches/min.	0.00060	0.00060	0.00060
Failure Strain - %	3.5	4.0	4.5
$S_1'$ Failure - psi	11.91	19.73	28.69
$S_3'$ Failure - psi	2.93	5.75	8.20

## TEST DESCRIPTION

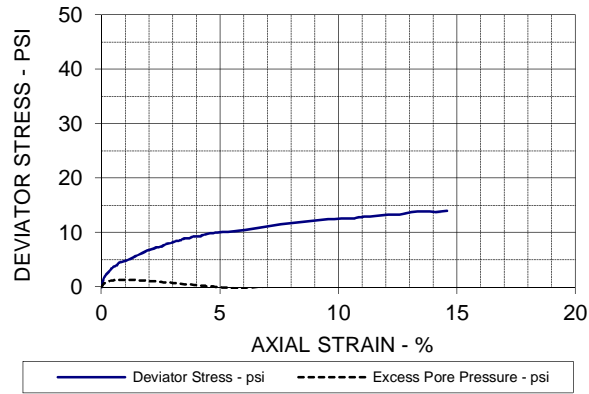
TYPE OF TEST & NO: CU with Pore Pressure  
 SAMPLE TYPE: Remolded  
 DESCRIPTION: Sandy Silt (ML)  
 SAMPLE LOCATION: B-26 Bulk, 0.0-5.0 ft  
 ASSUMED SPECIFIC GRAVITY: 2.75  
 LL: 36 PL: 25 PI: 11 Percent -200: 67  
 REMARKS: Specimens remolded to 95% at optimum.

## PROJECT INFORMATION

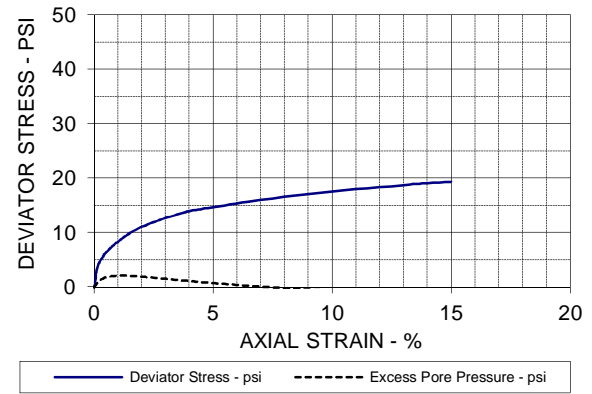
PROJECT: S-48 (Columbia Avenue) Corridor Improvements  
 LOCATION: Lexington County, SC  
 PROJECT NO: 73155095  
 CLIENT: Mead & Hunt  
 DATE: 3/17/16

**TERRACON**

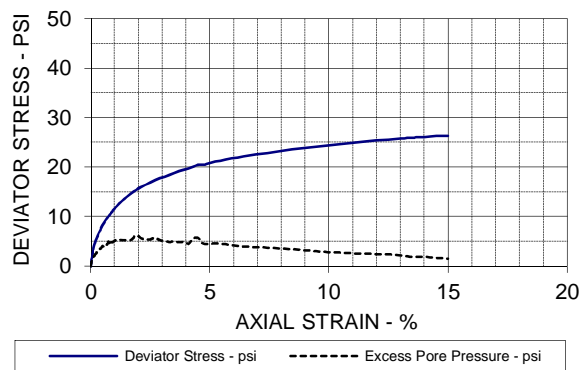
SPECIMEN NO. 1



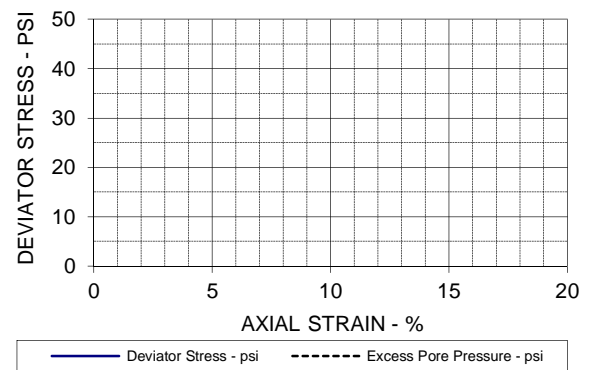
SPECIMEN NO. 2



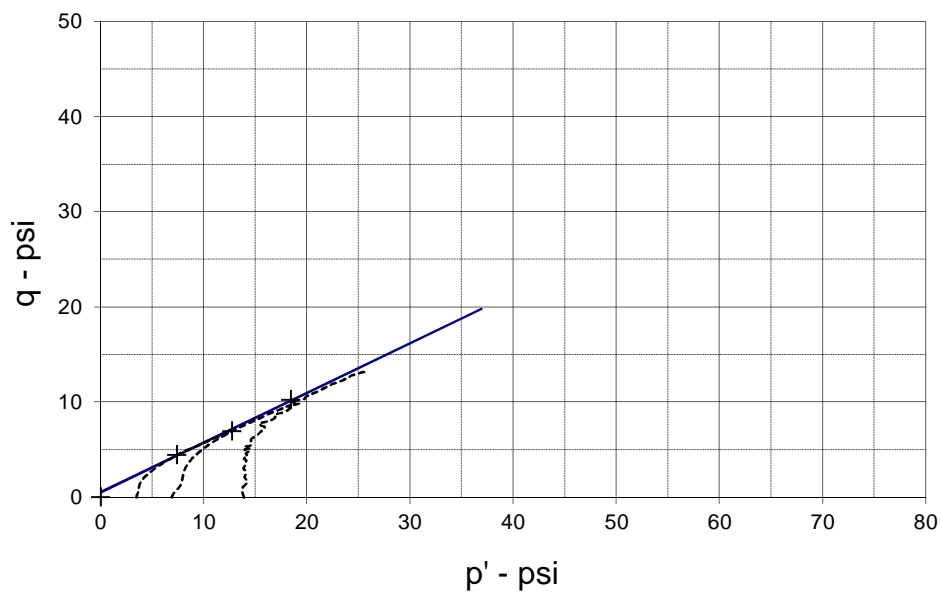
SPECIMEN NO. 3



SPECIMEN NO. 4

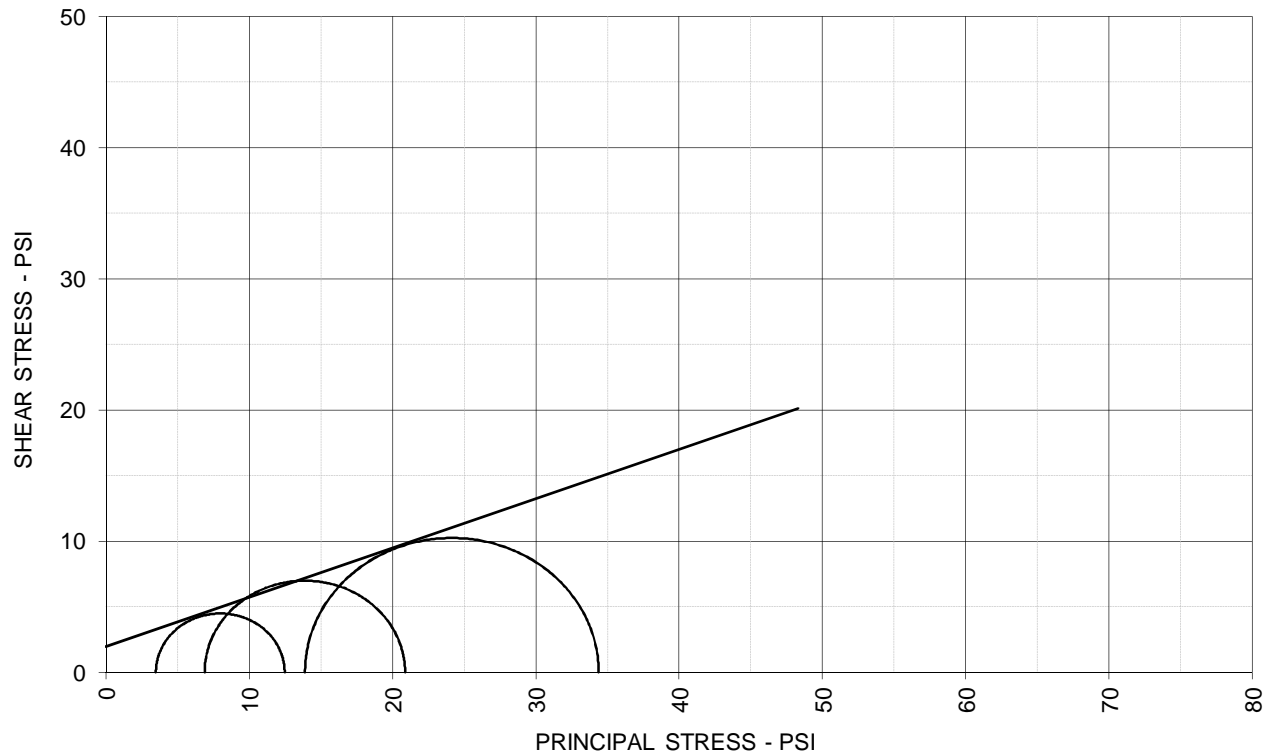


p - q DIAGRAM



EFFECTIVE STRESS PARAMETERS	$R^2 = 1.00$	$a \text{ (deg)} = 27.6$	$a \text{ (psi)} = 0.5$
PROJECT: S-48 (Columbia Avenue) Corridor Improvements	TYPE OF TEST & NO: CU with Pore Pressure		
PROJECT NO: 73155095	<b>TERRACON</b>		
DESCRIPTION: Sandy Silt (ML)			

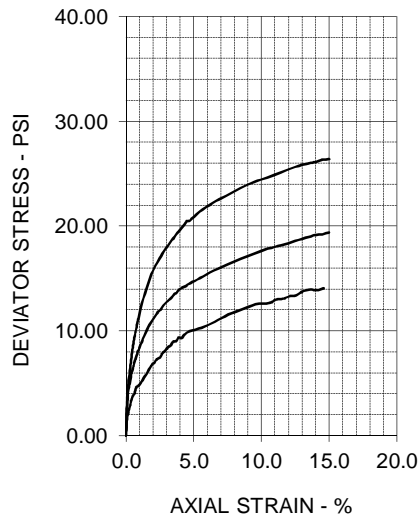
# TRIAXIAL SHEAR TEST REPORT



## TOTAL STRESS PARAMETERS

$\phi = 20.6 \text{ deg}$

$c = 2.0 \text{ psi}$



### SPECIMEN NO.

1 2 3 4

#### INITIAL

Moisture Content - %	15.1	15.1	15.1
Dry Density - pcf	102.8	102.8	102.8
Diameter - inches	2.80	2.80	2.80
Height - inches	5.60	5.60	5.60

#### AT TEST

Final Moisture - %	24.0	23.6	22.4
Dry Density - pcf	103.0	103.8	105.7
Calculated Diameter (in.)	2.82	2.80	2.80
Height - inches	5.65	5.60	5.59
Effect. Cell Pressure - psi	3.5	6.9	13.9
Failure Stress - psi	8.98	13.98	20.49
Total Pore Pressure - psi	50.6	51.2	55.7
Strain Rate - inches/min.	0.00060	0.00060	0.00060
Failure Strain - %	3.5	4.0	4.5
$S_1$ Failure - psi	12.48	20.88	34.39
$S_3$ Failure - psi	3.50	6.90	13.90

## TEST DESCRIPTION

TYPE OF TEST & NO: CU with Pore Pressure  
 SAMPLE TYPE: Remolded  
 DESCRIPTION: Sandy Silt (ML)  
 SAMPLE LOCATION: B-26 Bulk, 0.0-5.0 ft  
 ASSUMED SPECIFIC GRAVITY: 2.75  
 LL: 36 PL: 25 PI: 11 Percent -200: 67  
 REMARKS: Specimens remolded to 95% at optimum.

## PROJECT INFORMATION

PROJECT: S-48 (Columbia Avenue) Corridor Improvements  
 LOCATION: Lexington County, SC  
 PROJECT NO: 73155095  
 CLIENT: Mead & Hunt  
 DATE: 3/17/16

**TERRACON**














**APPENDIX C**  
**SUPPORTING DOCUMENTS**

Exhibit C-1 – Unified Soil Classification System  
Exhibit C-2 – Rig Calibration Reports

# GENERAL NOTES

## DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING			WATER LEVEL		Water Initially Encountered	FIELD TESTS	(HP)	Hand Penetrometer	
	Auger	Split Spoon			Water Level After a Specified Period of Time		(T)	Torvane	
					Water Level After a Specified Period of Time		(b/f)	Standard Penetration Test (blows per foot)	
	Shelby Tube	Macro Core		Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.			(PID)	Photo-Ionization Detector	
							(OVA)	Organic Vapor Analyzer	
Ring Sampler	Rock Core								
									
Grab Sample	No Recovery								

## DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

## LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

<b>STRENGTH TERMS</b>	<b>RELATIVE DENSITY OF COARSE-GRAINED SOILS</b> (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			<b>CONSISTENCY OF FINE-GRAINED SOILS</b> (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
	Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-Value Blows/Ft.
	Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1
	Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4
	Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8
	Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15
	Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30
				Hard	> 8,000	> 30

## RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 29
Modifier	> 30

## GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

## RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifier	> 12

## PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

# UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>					Soil Classification	
					Group Symbol	Group Name <sup>B</sup>
Coarse Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines <sup>C</sup>	Cu ≥ 4 and 1 ≤ Cc ≤ 3 <sup>E</sup>		GW	Well-graded gravel <sup>F</sup>
			Cu < 4 and/or 1 > Cc > 3 <sup>E</sup>		GP	Poorly graded gravel <sup>F</sup>
		Gravels with Fines: More than 12% fines <sup>C</sup>	Fines classify as ML or MH		GM	Silty gravel <sup>F,G,H</sup>
			Fines classify as CL or CH		GC	Clayey gravel <sup>F,G,H</sup>
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines <sup>D</sup>	Cu ≥ 6 and 1 ≤ Cc ≤ 3 <sup>E</sup>		SW	Well-graded sand <sup>I</sup>
			Cu < 6 and/or 1 > Cc > 3 <sup>E</sup>		SP	Poorly graded sand <sup>I</sup>
		Sands with Fines: More than 12% fines <sup>D</sup>	Fines classify as ML or MH		SM	Silty sand <sup>G,H,I</sup>
			Fines classify as CL or CH		SC	Clayey sand <sup>G,H,I</sup>
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots on or above “A” line <sup>J</sup>		CL	Lean clay <sup>K,L,M</sup>
			PI < 4 or plots below “A” line <sup>J</sup>		ML	Silt <sup>K,L,M</sup>
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay <sup>K,L,M,N</sup>
			Liquid limit - not dried			Organic silt <sup>K,L,M,O</sup>
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above “A” line		CH	Fat clay <sup>K,L,M</sup>
			PI plots below “A” line		MH	Elastic Silt <sup>K,L,M</sup>
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay <sup>K,L,M,P</sup>
			Liquid limit - not dried			Organic silt <sup>K,L,M,Q</sup>
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

$$^E Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

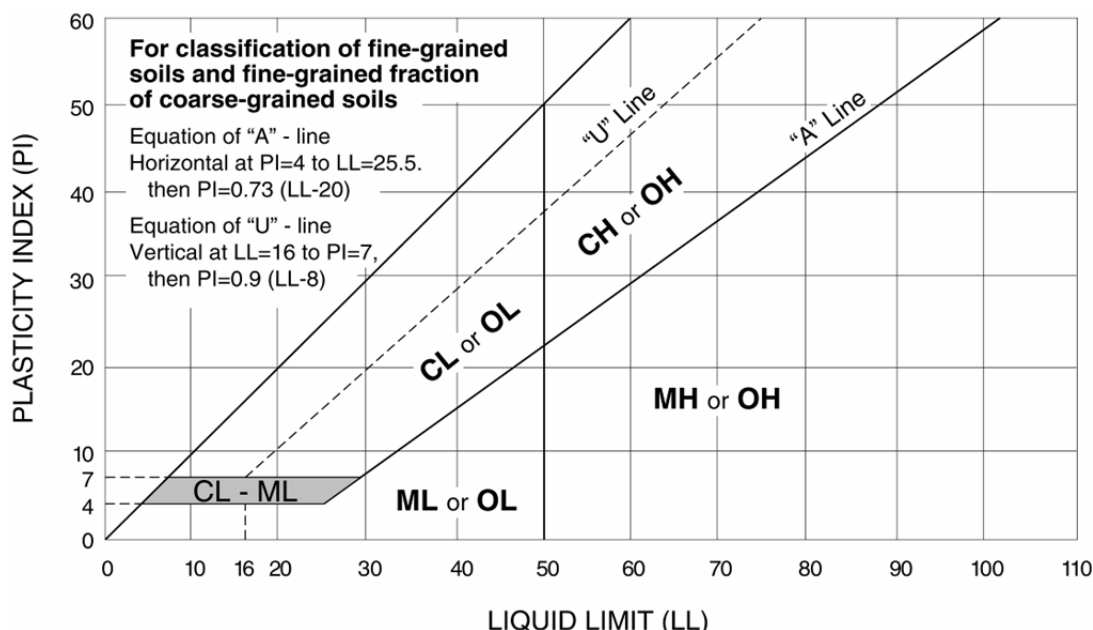
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

<sup>N</sup> PI  $\geq 4$  and plots on or above "A" line.

<sup>O</sup> PI < 4 or plots below "A" line.

<sup>P</sup> PI plots on or above "A" line.

<sup>Q</sup> PI plots below "A" line.



# DRILL RIG SPT HAMMER ENERGY CALIBRATION REPORT

Drill Rig Model CME-55 SN 359485

Terracon Drill Rig No. 727

Columbia, SC

July 09, 2015

Project No. 73155070A



**Prepared for:**

Terracon Consultants, Inc.  
Columbia, SC

**Prepared by:**

Terracon Consultants, Inc.  
North Charleston, SC

Offices Nationwide  
Employee-Owned

Established in 1965  
[terracon.com](http://terracon.com)

# Terracon

Geotechnical   ■   Environmental   ■   Construction Materials   ■   Facilities

July 09, 2015



Terracon Consultants Inc.  
521 Clemson Road  
Columbia, SC 29229

Attn: Mr. Phillip Morris  
P: (803) 212-0062  
M: (803) 518-3788  
E: Phillip.Morrison@terracon.com

Re: SPT Rig Calibration Report  
Columbia, SC  
Terracon Project Number: 73155070A

Mr. Morrison:

The Charleston office of Terracon Consultants, Inc. (Terracon) has completed the SPT rig calibration for the above referenced rig. This report provides Energy Transfer Ratio (ETR) for the SPT hammer found on CME-55 (Serial Number 359485).

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

A handwritten signature in black ink, appearing to read "Yulian A. Kebede".

Yulian A. Kebede,  
Project Manager  
Geotechnical Services

A handwritten signature in black ink, appearing to read "Bryan T. Shiver".

Bryan T. Shiver, P.E.  
Department Manager  
Geotechnical Services  
SC Registration No. 27816



Terracon Consultants, Inc. 1450 Fifth Street West North Charleston, South Carolina 29405  
P [843] 884 1234 F [843] 884 9234 [terracon.com](http://terracon.com)

**Geotechnical**



**Environmental**



**Construction Materials**



**Facilities**

## 1.0 PROJECT INFORMATION

ITEM	DESCRIPTION
Drill Rig Identification	CME-55, SN: 359485 (see photograph on cover page)
Drill Rig Owner	Terracon
Drill Rig Operator	Craig Fredrychowsky
Testing Date	July 2, 2015
Testing Location	Columbia, SC
Terracon Project Number	73155070A
Boring Identification	Test Hole (1)
Energy Measurement Depths	23.5 ft., 28.5 ft., 33.5 ft.
Hammer Type	Automatic
Boring Method	Mud Rotary
Drill Rods	■ AWJ ■ 1¾" outside diameter ■ 3/16" wall thickness
SPT Calibration Testing Equipment	■ 2 foot AWJ rod instrumented w/ 2 strain gauges and 2 accelerometers ■ Model PAX Pile Driving Analyzer™ (PDA)
SPT Calibration Personnel	Kenneth Zur

## 2.0 TEST RESULTS

**Table 1:**  
 SPT Hammer Energy Calibration Testing Summary.

Boring	Start Depth <sup>1</sup> (ft)	Rod Length <sup>2</sup> (ft)	Rod Sections <sup>3</sup>			Measured Blow Counts (blows/6 inches)				SPT N <sub>m</sub> (bpf)	Soil Type <sup>4</sup>
			2 ft	5 ft	10 ft	1 <sup>st</sup> Inc.	2 <sup>nd</sup> Inc.	3 <sup>rd</sup> Inc.	4 <sup>th</sup> Inc.		
Test Hole (1)	23.5	28.63	0	5	0	14	17	21	-	38	Sand
	28.5	33.65	0	6	0	6	12	12	-	24	Sand
	33.5	38.63	0	7	0	6	10	12	-	22	Sand

1. Depth from existing ground surface to bottom of drill rods at the beginning of SPT
2. Total rod length measured from instrumentation to bottom of sampler
3. Two foot section is instrumented and is located at top of drill rods
4. Soil type provided by Terracon personnel.



**Table 2:**  
Energy Measurement and Analysis Summary.

Boring	Start Depth <sup>1</sup> (ft)	SPT N <sub>m</sub> (bpf)	No. of Blows <sup>2</sup>	EFV (kip-ft) <sup>3</sup>			ETR (%) <sup>3</sup>		
				Max.	Min.	Ave.	Std. Dev.	Ave.	Std. Dev.
Test Hole (1)	23.5	38	50	0.29	0.27	0.28	0.01	81.3	1.93
	28.5	24	20	0.30	0.27	0.30	0.01	84.6	2.35
	33.5	22	6	0.29	0.26	0.28	0.01	80.0	3.13
Average:			25	0.29	0.27	0.29	0.01	81.9	2.47
1. Boring ID and depth from existing ground surface to bottom of drill rods at the beginning of SPT 2. Number of blows used in energy calibration analysis; limited to measurements recorded during the second and third 6-inch sampling intervals at each depth or during the first increment if refusal were encountered 3. EFV = Measured Transferred Energy, ETR = Energy Transfer Ratio.									

**Table 3:**  
Hammer Blow Rate Summary.

Boring	Start Depth <sup>1</sup> (ft)	SPT N <sub>m</sub> (bpf)	No. of Blows <sup>2</sup>	BPM <sup>3</sup>			
				Max.	Min.	Ave.	Std. Dev.
Test Hole (1)	23.5	38	50	54.50	2.00	52.40	7.28
	28.5	24	20	54.50	1.90	51.46	11.67
	33.5	22	6	52.20	46.40	50.57	2.34
Average:			25	53.73	16.77	51.48	7.10
1. Boring ID and depth from existing ground surface to bottom of drill rods at the beginning of SPT. 2. Number of blows used in energy calibration analysis. Limited to measurements recorded during the second and third 6-inch sampling intervals at each depth or during the 1st increment if refusal conditions were encountered. 3. BPM = Blows per minute							

## 3.0 CONCLUSIONS

### 3.1 Energy Transfer Ratio (ETR) and Hammer Efficiency Correction (CE)

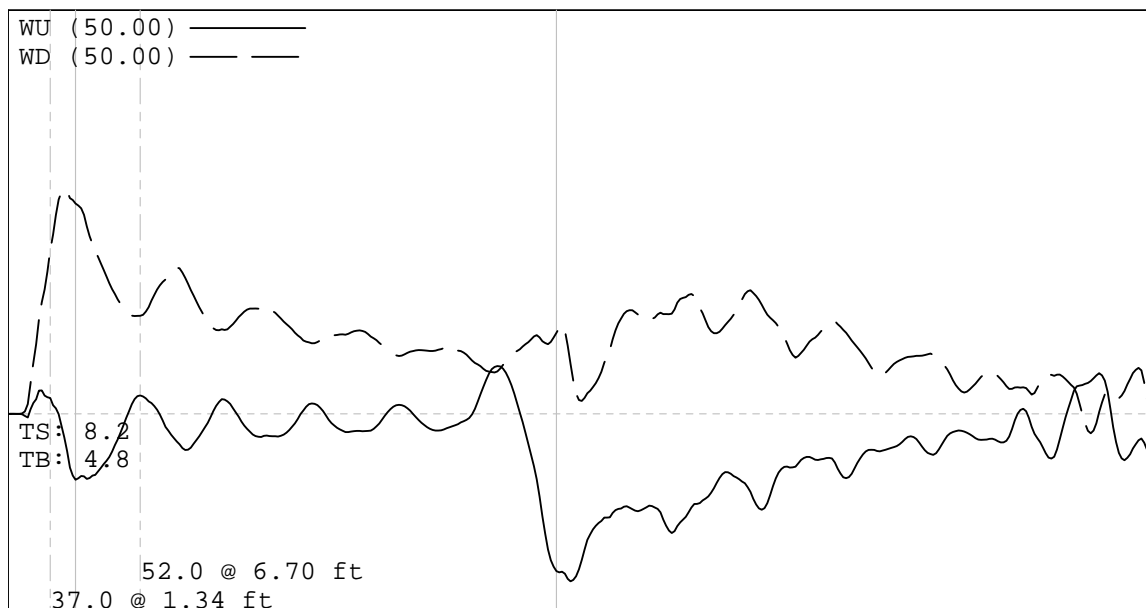
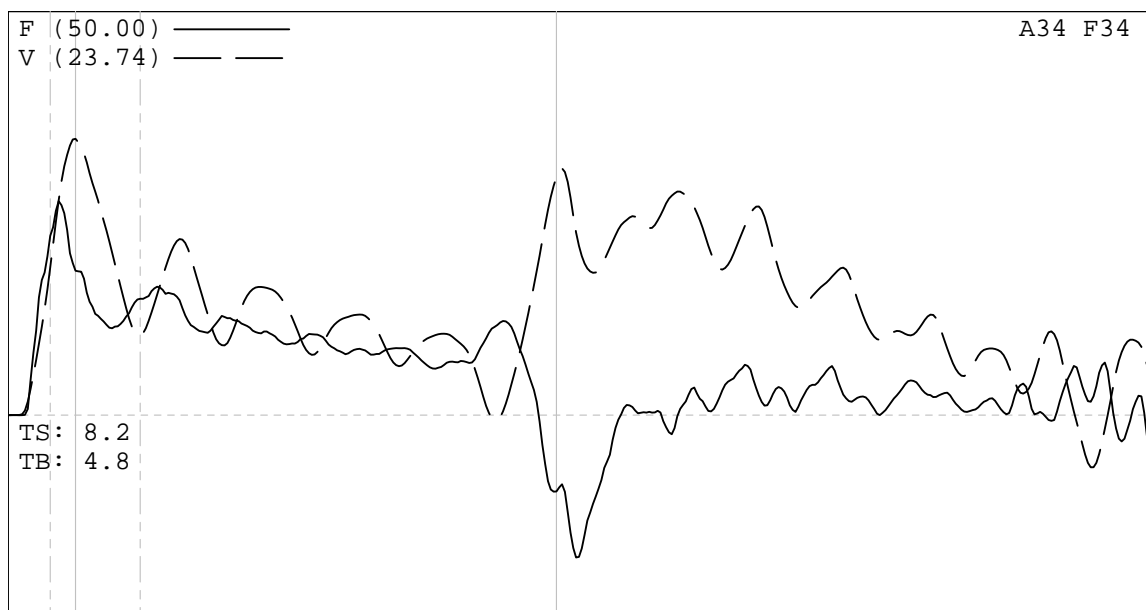
Based on our testing and subsequent analysis, CME-55 (Serial Number 359485) has an **ETR** of **81.9% ± 2.47%**. Based on this ETR, the hammer efficiency correction (**C<sub>E</sub>**) is **1.37**.

## **Exhibit A-1   Representative Blow**



CME55 727

B1 23.5 TO 25\_2

Project Information

PROJECT: CME55 727  
PILE NAME: B1 23.5 TO 25\_2  
DESCR: cme 55 auto  
OPERATOR: KJZ  
FILE: B1 23.5 TO 25\_2.w01  
7/2/2015 4:10:26 PM  
Blow Number 2

Pile Properties

LE 28.63 ft  
AR 1.18 in^2  
EM 30000 ksi  
SP 0.492 k/ft3  
WS 16807.9 f/s  
EA/C 2.1 ksec/ft  
2L/C 3.42 ms  
JC []

Quantity Results

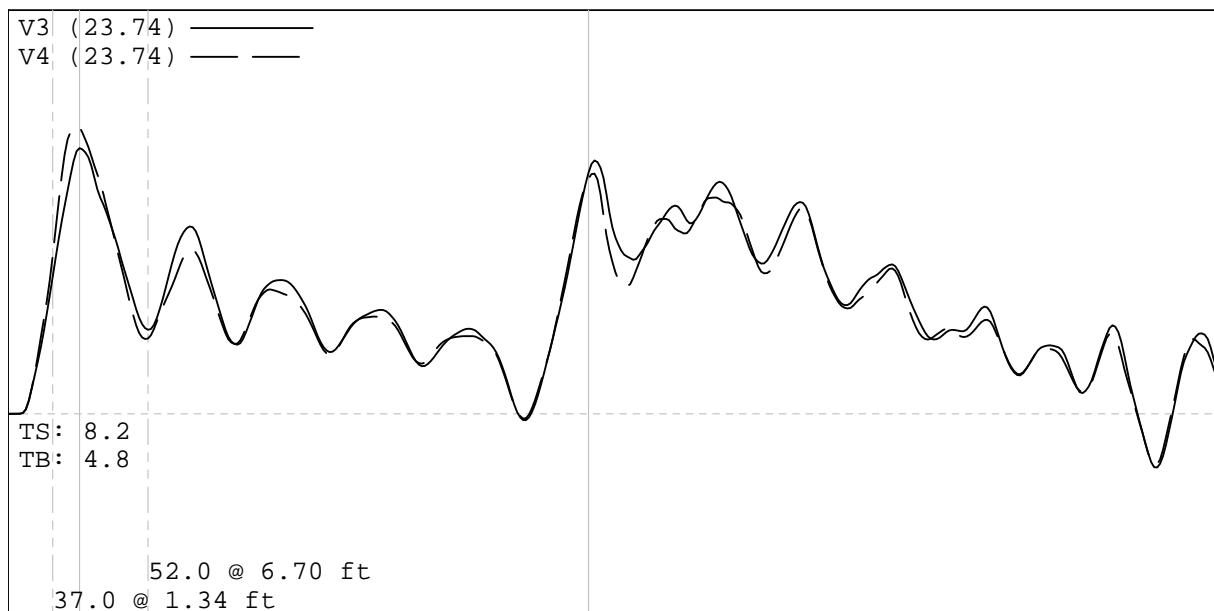
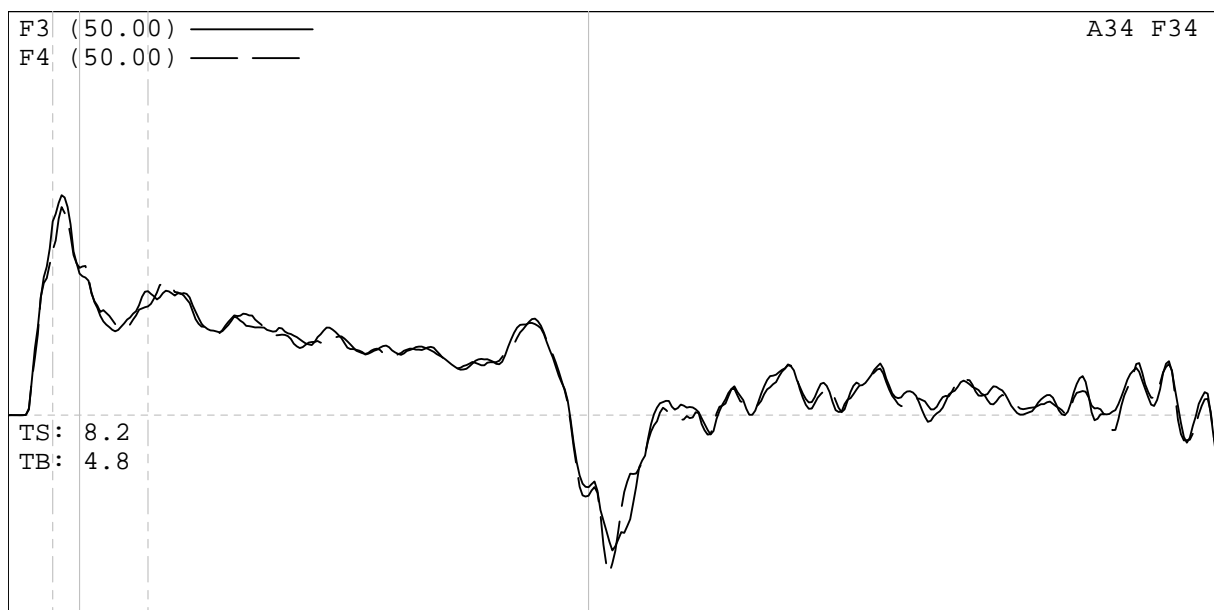
EMX 0.28 k-ft  
EF2 0.23 k-ft  
FMX 26.49 kips  
BPM 2.00 bpm  
VMX 16.24 f/s  
AMX 2108.49 g's  
DMX 0.85 in  
DFN 0.85 in  
TSX 14.95 ksi

Sensors

F3: [AWJ 1] 211.53 (1)  
F4: [AWJ 2] 211.77 (1)  
A3: [K4170] 390 mv/5000g's (1)  
A4: [K2578] 374 mv/5000g's (1)  
CLIP: OK

CME55 727

B1 23.5 TO 25\_2

Project Information

PROJECT: CME55 727  
PILE NAME: B1 23.5 TO 25\_2  
DESCR: cme 55 auto  
OPERATOR: KJZ  
FILE: B1 23.5 TO 25\_2.w01  
7/2/2015 4:10:26 PM  
Blow Number 2

Pile Properties

LE 28.63 ft  
AR 1.18 in<sup>2</sup>  
EM 30000 ksi  
SP 0.492 k/ft<sup>3</sup>  
WS 16807.9 f/s  
EA/C 2.1 ksec/ft  
2L/C 3.42 ms  
JC []

Quantity Results

EMX 0.28 k-ft  
EF2 0.23 k-ft  
FMX 26.49 kips  
BPM 2.00 bpm  
VMX 16.24 f/s  
AMX 2108.49 g's  
DMX 0.85 in  
DFN 0.85 in  
TSX 14.95 ksi

Sensors

F3: [AWJ 1] 211.53 (1)  
F4: [AWJ 2] 211.77 (1)  
A3: [K4170] 390 mv/5000g's (1)  
A4: [K2578] 374 mv/5000g's (1)  
CLIP: OK

## **Exhibit A-2    PDA Calibration Certification**

# *Certificate of Calibration*

**Pile Dynamics, Inc. certifies that the**

**Pile Driving Analyzer®, Model PAX**

**Serial Number: 3766L**

**was calibrated on**

28 March 2014

**using a PDA Calibration Box whose output was calibrated with test equipment  
traceable to NIST.**

**This certificate is valid for 2 years from above date.**



**Tested by:**



*[Signature]*  
Pile Dynamics, Inc.  
30725 Aurora Road  
Cleveland, Ohio 44139 USA



# DRILL RIG SPT HAMMER ENERGY CALIBRATION REPORT

**Drill Rig Model CME - 45C Rig (Serial Number 289849)**  
**Terracon Drill Rig No. 778**  
**Columbia, South Carolina**

February 9, 2016  
Project No. 73155095



**Prepared for:**  
Terracon Consultants, Inc.  
Columbia, South Carolina

**Prepared by:**  
Terracon Consultants, Inc.  
Ft. Lauderdale, Florida

February 9, 2016

Terracon Consultants Inc.  
5371 NW 33<sup>rd</sup> Avenue Suite 201  
Fort Lauderdale, FL 33309

Attention: Mr. Phillip A. Morrison, P.E.

**Re: SPT Rig Hammer Energy Calibration Report**  
**Drill Rig Model CME - 45C Drill Rig (Serial Number 289849)**  
Terracon Drill Rig No. 778  
Columbia, South Carolina  
Terracon Project Number: 73155095

Dear Mr. Morrison:

Terracon has completed the SPT Rig hammer energy calibration for the Terracon Rig Model CME - 45C drill rig (Serial Number 289849). This drill rig is equipped with an automatic hammer lifted by a hydraulic chain system and uses AWJ drill rods with a split-barrel sampler for the Standard Penetration Test (SPT). The dynamic testing was conducted using a Pile Driving Analyzer (PDA), Model SPT, manufactured by Pile Dynamics, Inc. (PDI). The SPT hammer energy calibration testing was carried out in general accordance with ASTM D4945 Standard Test Method for High Strain Dynamic Testing of Piles and ASTM D4633 Standard Test Method for Energy Measurement for Dynamic Penetrometers.

Based on our testing and subsequent analysis, the Terracon CME - 45C drill rig (Serial Number 289849) has an Energy Transfer Ratio (ETR) of  $76.3\% \pm 3.1\%$ . Based on this ETR, the hammer efficiency correction ( $C_E$ ) is 1.27.

Sincerely,  
**Terracon Consultants, Inc.**



Mingyu Kim, Ph.D., P.E. (P.E. in Florida)  
Senior Project Engineer  
Florida P.E. No. 64456



Carlos A. Quintana  
Project Geotechnical Engineer

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<b>2.0 TEST RESULTS .....</b>	<b>3</b>
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<b>3.0 ENERGY TRANSFER RATIO (ETR) AND Hammer EFFICIENCY CORRECTION (<math>C_E</math>)..</b>	<b>4</b>

## APPENDICES

**Appendix A – PDA Equipment Certification**

**Appendix B – Representative Blow**

## SPT HAMMER ENERGY CALIBRATION REPORT

### Drill Rig Model CME - 45C Serial Number 289849

### Terracon Drill Rig No. 778

## 1.0 PROJECT INFORMATION

### 1.1 Overview

Standard Penetration Test hammer energy calibration testing was carried out at various testing depths below the existing grades in general accordance with ASTM D4945 Standard Test Method for High Strain Dynamic Testing of Piles and ASTM D4633 Standard Test Method for Energy Measurement for Dynamic Penetrometers. Dynamic testing was conducted using a Pile Driving Analyzer (PDA), Model SPT, manufactured by Pile Dynamics, Inc. (PDI).

ITEM	DESCRIPTION
Drill Rig Identification	CME – 45C, SN: 289849 (See photograph on cover page)
Drill Rig Owner	Terracon Consultants, Columbia, South Carolina
Drill Rig Operator	Craig F.
Testing Date	January 20, 2016
Testing Location	Columbia, South Carolina
Terracon Project Number	73155095
Boring Identification	TB-1 (Calibration Only)
Energy Measurement Depths and Soil Type	23.5 ft to 25.0 ft (SP), 28.5 ft to 30.0 ft (SP), 33.5 ft to 35.0 ft (SP), and 38.5 to 40.0 ft (SP)
Hammer Type	Automatic
Boring Method	Hollow Stem Augers (HSA)
Drill Rods	<ul style="list-style-type: none"> <li>■ AWJ</li> <li>■ 1 ¾ -in outside diameter</li> <li>■ 1.18-in<sup>2</sup> area</li> </ul>
SPT Hammer Calibration Testing Equipment	<ul style="list-style-type: none"> <li>■ 2-foot AWJ instrumented rod w/ 2 strain gauges and 2 accelerometers</li> <li>■ SPT Analyzer, SN: 3766L</li> </ul>
Tester	Kenneth J. Zur, P.E., Columbia Office, South Carolina



## **1.2 Drill Rig and Drilling Equipment**

The tested drill rig is a CME - 45C (SN 289849) drill rig with an automatic hammer lifted by a hydraulic chain system. According to information provided, this drill rig was built in 1999. The automatic hammer, with a theoretical potential energy (PE) of 350 ft-lbs., weighs about 140-pounds and has a drop height of 30 inches (2.5 feet). Manufacturer specifications for this drill rig are provided in Appendix A.

The HSA technique using a drill bit was used to reach the depths at which the Standard Penetration testing was to be performed. AWJ drill rod sections have a nominal outside diameter of 1 ¾ inches and a cross sectional area of 1.18 square inches. The instrumented sub-assembly (i.e. where gages were attached) consisted of a two-foot long section of AWJ rod that was threaded into the top drill rod at each testing interval.

## **1.3 Energy Measurement Instrumentation**

The SPT Energy measurement instrumentation consists of a 2-foot long AWJ instrumented drill rod with two strain gages and two accelerometer transducers attached at the center of the instrumented rod. The rod has a cross-sectional area of 1.18 square inches at the strain gauge locations. The strain gages and accelerometers are located on opposite sides of the AWJ drill rod to reduce the effects of uneven hammer impact and rod bending.

The strain gages and accelerometers are connected to a Pile Driving Analyzer (PDA), Model SPT, serial number 3766L, to collect the instrumentation data. The analyzer is a computer, fitted with a data acquisition and signal conditioning system. During driving, the strain and acceleration signals are recorded and processed for each hammer blow. The strain signal is converted to a force record and the acceleration signal is converted to a velocity record. The sampling frequency used during the SPT Energy Measurement Testing was 50,000 hertz (50 kHz). The PDA evaluates the energy at the point of measurement and saves all blows. Equipment calibrations for PAX, strain gauges, and accelerometers are provided in Appendix B.

# **2.0 TEST RESULTS**

## **2.1 Testing Summary**

Standard Penetration energy measurements were performed at four testing depths during SPT boring by Kenneth J. Zur (Terracon, Columbia office). A summary of the testing is provided in Table 1. No unusual operating conditions regarding drilling or hammer operations were observed during Standard Penetration energy measurements. However, due to the poor quality data collected along the first testing depth of 23.5 feet to 25 feet, the data at Test No. 1 was excluded in this report. In addition, two hammer blows (i.e. blow numbers 13 and 15) recorded during the second 6-inch sampling interval at Test No. 2 were excluded for our analyses.

**Table 1: Standard Penetration Hammer Energy Calibration Testing Summary.**

Boring	Start Depth <sup>1</sup> (ft)	Rod Length <sup>2</sup> (ft)	Rod Sections <sup>3</sup>			Measured Blow Counts (blows/6 inches)				SPT N <sub>m</sub> (bpf)
			2 ft	5 ft	10 ft	1 <sup>st</sup> Inc.	2 <sup>nd</sup> Inc.	3 <sup>rd</sup> Inc.	4 <sup>th</sup> Inc.	
TB-1	28.5	30.0	0	6	0	7	7	12	NA	19
	33.5	35.0	0	7	0	7	8	10	NA	18
	38.5	40.0	0	8	0	7	11	12	NA	23

1. Depth from existing ground surface to start of Standard Penetration Testing

2. Total rod length from instrumentation to bottom of split-barrel sampler

3. Two foot instrumented rod section is included and is located at top of drill rods

A representative output from the analyzer showing Individual Force and Velocity measurements with time are presented in Appendix C.

## 2.2 Hammer Energy Calibration

The measured transferred energies (EFV) and Energy Transfer Ratios (ETR) estimated from the testing results are summarized in Table 2. Note that the EFV's and ETR's shown in Table 2 are estimated from measurements recorded during the second and third 6-inch sampling intervals at each depth or during the 1<sup>st</sup> increment if refusal conditions were encountered. The ETR is based on measured EFV divided by the 0.35 kip-ft. theoretical potential energy of the SPT hammer.

**Table 2: Energy Measurement and Analysis Summary.**

Boring	Start Depth <sup>1</sup> (ft)	SPT N <sub>m</sub> (bpf)	No. of Blows <sup>2</sup>	EFV (kip-ft) <sup>3</sup>				ETR (%) <sup>3</sup>	
				Max.	Min.	Ave.	Std. Dev.	Ave.	Std. Dev.
TB-1	28.5	21	19	0.300	0.260	0.276	0.010	78.8	2.8
	33.5	18	18	0.290	0.240	0.262	0.012	74.8	3.4
	38.5	23	23	0.280	0.250	0.266	0.007	76.0	2.1
<b>TOTAL:</b>			<b>60</b>	<b>0.300</b>	<b>0.240</b>	<b>0.267</b>	<b>0.011</b>	<b>76.3</b>	<b>3.1</b>

1. Depth from existing ground surface to start of Standard Penetration Testing

2. Number of blows used in energy calibration analysis; limited to measurements recorded during the second and third 6-inch sampling intervals at each depth or during the first increment if refusal conditions were encountered

3. EFV = Measured Transferred Energy, ETR = Energy Transfer Ratio.

## 3.0 ENERGY TRANSFER RATIO (ETR) AND HAMMER EFFICIENCY CORRECTION (C<sub>E</sub>)

The automatic hammer mounted on the CME – 45C (Serial Number 289849) during Standard Penetration Testing has an estimated **ETR of 76.3% ± 3.1%**. Therefore, the hammer efficiency correction (C<sub>E</sub>) is **1.27**.

**SPT Hammer Energy Calibration Report**

Drill Rig CME – 45C SN 289849, Terracon Drill Rig No. 778 ■ Columbia, South Carolina  
February 9, 2016 ■ Terracon Project No. 73155095



If a change or repair in the hammer driving system will void this calibration and require a new calibration to be performed.

## **4.0 GENERAL COMMENTS**

We appreciate being of service to you in this phase of this project. For additional information regarding the interpretation of the test data and logs, or if you have any questions concerning this report, please do not hesitate to contact us.

Our professional services were performed using that degree of care and skill ordinarily exercised under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No warranties, either expressed or implied, are intended or made.

## **APPENDIX A**

### **PDATESTINGEQUIPMENTCERTIFICATION**



# *Certificate of Calibration*

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model PAX

Serial Number: 3766L

was calibrated on 28 March 2014  
using a PDA Calibration Box whose output was calibrated with test equipment  
traceable to NIST.

This certificate is valid for 2 years from above date.



Tested by:

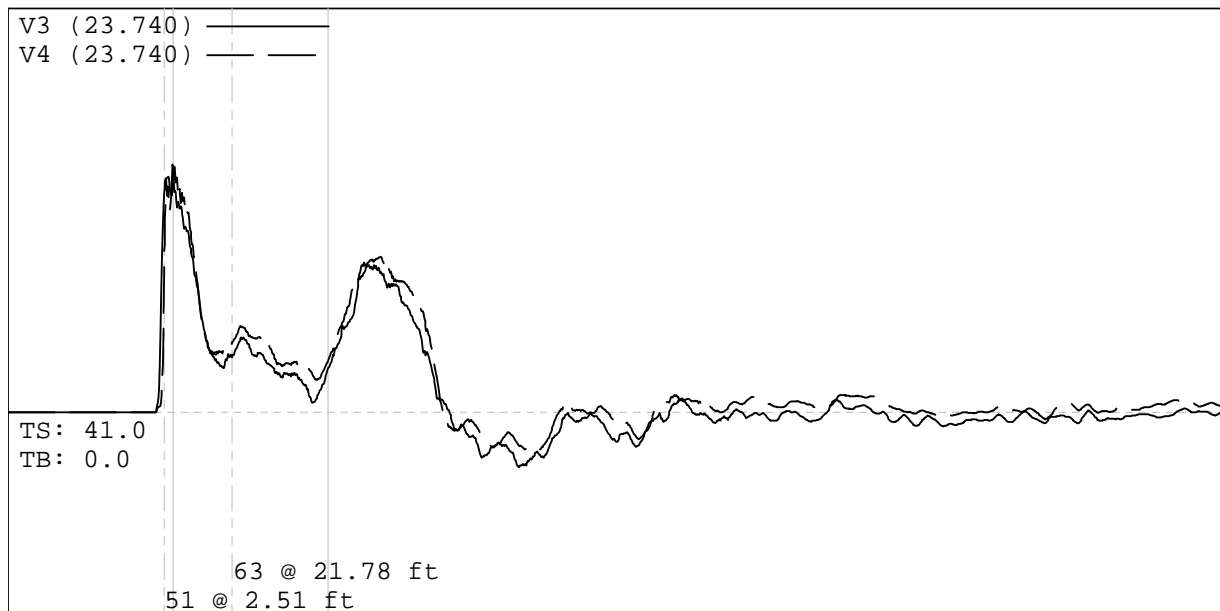
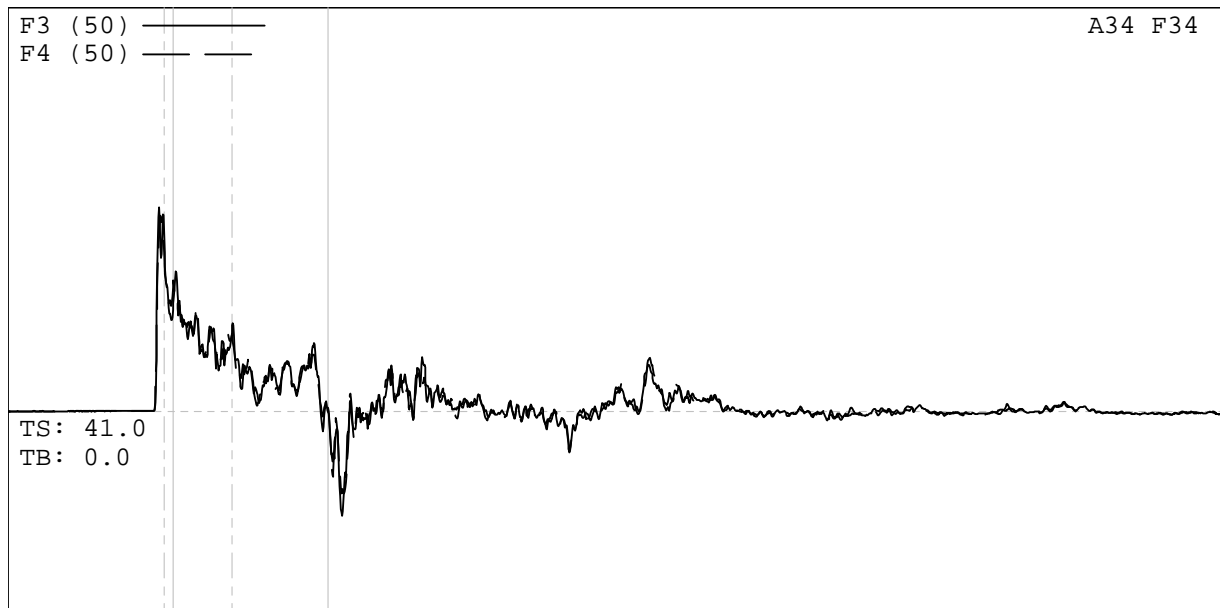


Pile Dynamics, Inc.  
30725 Aurora Road  
Cleveland, Ohio 44139 USA

**APPENDIX B  
REPRESENTATIVE BLOW**

COLUMBIA CME-45 RIG CAL

CME-45\_3

Project Information

PROJECT: COLUMBIA CME-45 RIG CAL  
PILE NAME: CME-45\_3  
DESCR: HOLE 1 38.5 TO 40  
OPERATOR: KJZ  
FILE: CME-45\_3.W01  
1/20/2016 1:35:26 PM  
Blow Number 18

Quantity Results

EMX 0.3 k-ft  
EF2 0.2 k-ft  
BPM 58.10 bpm  
FMX 24 kips  
VMX 14.101 f/s  
AMX 2924.752 g's  
DMX 0.62 in  
DFN 0.54 in  
TSX 9.94 ksi

Pile Properties

LE 43.71 ft  
AR 1.18 in<sup>2</sup>  
EM 30000 ksi  
SP 0.492 k/ft<sup>3</sup>  
WS 16807.9 f/s  
EA/C 2.1 ksec/ft  
2L/C 5.22 ms  
JC []  
LP 39.24 ft

Sensors

F3: [AWJ 1] 211.53 (1)  
F4: [AWJ 2] 211.77 (1)  
A3: [K5168] 348 mv/5000g's (1)  
A4: [K5170] 335 mv/5000g's (1)  
CLIP: OK

# DRILL RIG SPT HAMMER ENERGY CALIBRATION REPORT

Drill Rig Model CME-550X SN 347863

Terracon Drill Rig No. 975

Columbia, SC

October 5, 2015

Project No. 73150500

**Prepared for:**

Terracon Consultants, Inc.

Columbia, SC

**Prepared by:**

Terracon Consultants, Inc.

North Charleston, SC



Offices Nationwide  
Employee-Owned

Established in 1965  
[terracon.com](http://terracon.com)

# Terracon

Geotechnical   ■   Environmental   ■   Construction Materials   ■   Facilities



October 5, 2015



Terracon Consultants Inc.  
521 Clemson Road  
Columbia, SC 29229

Attn: Mr. Phillip Morrison  
P: (803) 212-0062  
M: (803) 518-3788  
E: Phillip.Morrison@terracon.com

Re: SPT Rig Calibration Report  
Columbia, SC  
Terracon Project Number: 73150500

Mr. Morrison:

The Charleston office of Terracon Consultants, Inc. (Terracon) has completed the SPT rig calibration for the above referenced rig. This report provides Energy Transfer Ratio (ETR) for the SPT hammer found on CME-550X (Serial Number 347863).

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,  
**Terracon Consultants, Inc.**

A handwritten signature in black ink, reading "Yulian A. Kebede".

Yulian A. Kebede,  
Project Manager  
Geotechnical Services

A handwritten signature in black ink, reading "Bryan T. Shiver".

Bryan T. Shiver, P.E.  
Department Manager  
Geotechnical Services  
SC Registration No. 27816



Terracon Consultants, Inc. 1450 Fifth Street West North Charleston, South Carolina 29405  
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**Geotechnical** ■ **Environmental** ■ **Construction Materials** ■ **Facilities**

## 1.0 PROJECT INFORMATION

ITEM	DESCRIPTION
Drill Rig Identification	CME-550X, SN: 347863 (see photograph on cover page)
Drill Rig Owner	Terracon
Drill Rig Operator	Jared Pawless
Testing Date	September 25, 2015
Testing Location	Columbia, SC
Terracon Project Number	73150500
Boring Identification	Test Hole (1)
Energy Measurement Depths	23.5 feet, 28.5 feet, 33.5 feet, and 38.5 feet
Hammer Type	Automatic
Boring Method	Hollow Stem Augers
Drill Rods	■ AWJ ■ 1¾" outside diameter ■ 3/16" wall thickness
SPT Calibration Testing Equipment	■ 2 foot AWJ rod instrumented w/ 2 strain gauges and 2 accelerometers ■ Model PAX Pile Driving Analyzer™ (PDA)
SPT Calibration Personnel	Kenneth Zur

## 2.0 TEST RESULTS

**Table 1:**

SPT Hammer Energy Calibration Testing Summary.

Boring	Start Depth <sup>1</sup> (ft)	Rod Length <sup>2</sup> (ft)	Rod Sections <sup>3</sup>			Measured Blow Counts (blows/6 inches)				SPT N <sub>m</sub> (bpf)	Soil Type <sup>4</sup>
			2 ft	5 ft	10 ft	1 <sup>st</sup> Inc.	2 <sup>nd</sup> Inc.	3 <sup>rd</sup> Inc.	4 <sup>th</sup> Inc.		
Test Hole (1)	23.5	28.8	0	1	2	18	10	11	-	21	Sand
	28.5	33.8	0	0	3	7	8	8	-	16	Sand
	33.5	38.8	0	1	3	5	7	9	-	16	Sand
	38.5	43.8	0	2	3	4	8	11	-	19	Sand

1. Depth from existing ground surface to bottom of drill rods at the beginning of SPT

2. Total rod length measured from instrumentation to bottom of sampler

3. Two foot section is instrumented and is located at top of drill rods

4. Soil type provided by Terracon personnel.

**Table 2:**  
Energy Measurement and Analysis Summary.

Boring	Start Depth <sup>1</sup> (ft)	SPT N <sub>m</sub> (bpf)	No. of Blows <sup>2</sup>	EFV (kip-ft) <sup>3</sup>				ETR (%) <sup>3</sup>	
				Max.	Min.	Ave.	Std. Dev.	Ave.	Std. Dev.
Test Hole (1)	23.5	21	38	0.280	0.250	0.262	0.008	74.8	2.29
	28.5	16	22	0.270	0.240	0.256	0.007	73.1	2.10
	33.5	16	19	0.270	0.250	0.254	0.006	72.5	1.71
	38.5	19	21	0.280	0.260	0.268	0.007	76.5	2.00
Average:			25	0.275	0.250	0.260	0.007	74.2	2.02

1. Boring ID and depth from existing ground surface to bottom of drill rods at the beginning of SPT  
2. Number of blows used in energy calibration analysis; limited to measurements recorded during the second and third 6-inch sampling intervals at each depth or during the first increment if refusal were encountered  
3. EFV = Measured Transferred Energy, ETR = Energy Transfer Ratio.

**Table 3:**  
Hammer Blow Rate Summary.

Boring	Start Depth <sup>1</sup> (ft)	SPT N <sub>m</sub> (bpf)	No. of Blows <sup>2</sup>	BPM <sup>3</sup>			
				Max.	Min.	Ave.	Std. Dev.
Test Hole (1)	23.5	21	38	52.0	48.9	50.2	0.8
	28.5	16	22	54.0	51.0	52.4	0.7
	33.5	16	19	53.0	52.1	52.5	0.2
	38.5	19	21	55.1	52.1	54.1	0.5
Average:			25	53.5	51.0	52.3	0.56

1. Boring ID and depth from existing ground surface to bottom of drill rods at the beginning of SPT.  
2. Number of blows used in energy calibration analysis. Limited to measurements recorded during the second and third 6-inch sampling intervals at each depth or during the 1st increment if refusal conditions were encountered.  
3. BPM = Blows per minute

## 3.0 CONCLUSIONS

### 3.1 Energy Transfer Ratio (ETR) and Hammer Efficiency Correction (CE)

Based on our testing and subsequent analysis, CME-55 (Serial Number 347863) has an **ETR** of **74.2% ± 2.02%**. Based on this ETR, the hammer efficiency correction (**C<sub>E</sub>**) is **1.24**.

## **Appendix B.     Consultant Geotechnical Seismic Response**

## Consultant Geotechnical Seismic Response

<b>To:</b>	Tony Steffee		
<b>Consultant:</b>	Mead & Hunt, Inc.		
<b>Date Requested:</b>	11/18/2016		
<b>PROJECT INFORMATION</b>			
<b>File No.</b>	Project ID No.: 0042383-B01	<b>Project No. (PIN):</b>	0042383
<b>County:</b>	Lexington	<b>Route:</b>	S-48
<b>Description:</b>	RBO I-26		
<b>Latitude (4 decimals):</b>	34.1772	<b>Longitude (4 decimals):</b>	-81.3227
<b>Bridge Category / Seismic OC:</b>	II		
<b>Type of Seismic Information Requested:</b>	Consultant Seismic Design		
<b>Seismic Site Class:</b>	C – Hard Rock Basement Outcrop Condition		
<b>Pseudo-Spectral Acceleration (PSA)</b>			
The SCDOT Geotechnical Design Section has generated the required Design Earthquake the pseudo-spectral acceleration (PSA) oscillator response for frequencies 0.5, 1.0, 2.0, 3.3, 5.0, 6.7 and 13 Hz, for 5% critical damping and peak horizontal ground acceleration (PGA) at the B-C Boundary.			
<b>SEE – 3% Probability of Exceedance in 75 years</b>			
<b>PSA and PGA as Percentage of g</b>			
0.5Hz	1.0Hz	2.0Hz	3.3Hz
3.51130	7.37203	12.12826	16.87524
5.0Hz	6.7Hz	13.0Hz	PGA
20.61781	20.88922	24.10959	13.67754
<b>Thickness of sediments:</b>	10.0 meters		
<b>FEE – 15% Probability of Exceedance in 75 years</b>			
<b>PSA and PGA as Percentage of g</b>			
0.5Hz	1.0Hz	2.0Hz	3.3Hz
1.09090	2.71953	3.73828	6.80458
5.0Hz	6.7Hz	13.0Hz	PGA
8.31769	8.29283	9.25824	5.16229
<b>Thickness of sediments:</b>	10.0 meters		
<b>Time Series</b>			
Unscaled and Scaled time series were generated for the B-C Boundary in Shake91 data format. The Scaled time series are based on the earthquake magnitude (Mw) and Epicentral distance requested.			
<b>The Time Series Files are Attached:</b>	Yes <input type="checkbox"/>		No <input checked="" type="checkbox"/>
<b>Design Response Spectrum</b>			
<b>Two-Point Method</b>	<input type="checkbox"/>		
<b>Three-Point Method</b>	<input checked="" type="checkbox"/>		
<b>The Design Response Spectrum is Attached:</b>	Yes <input checked="" type="checkbox"/>		No <input type="checkbox"/>
<b>Geotechnical Designer:</b>	Renée S. Gardner, PE	<b>RPG<sup>1</sup>:</b>	3 - Midlands
<b>Date:</b>	11/18/2016	<b>Phone Number:</b>	(803) 737-3987
<b>Geotechnical Review:</b>		<b>RPG<sup>1,2</sup>:</b>	

<sup>1</sup>RPG – Region Production Group

Lowcountry – Beaufort, Berkeley, Charleston, Colleton, Dorchester, Hampton, Jasper

Pee Dee – Chesterfield, Clarendon, Darlington, Dillon, Florence, Georgetown, Horry, Kershaw, Lee, Marion, Marlboro, Sumter, Williamsburg

Midlands – Aiken, Allendale, Bamberg, Barnwell, Calhoun, Chester, Fairfield, Lancaster, Lexington, Newberry, Orangeburg, Richland, Union, York

Upstate – Abbeville, Anderson, Cherokee, Edgefield, Greenville, Greenwood, Laurens, McCormick, Oconee, Pickens, Saluda, Spartanburg

<sup>2</sup>RPG – PreConstruction Support – Geotechnical Design Section (PCS/GDS)

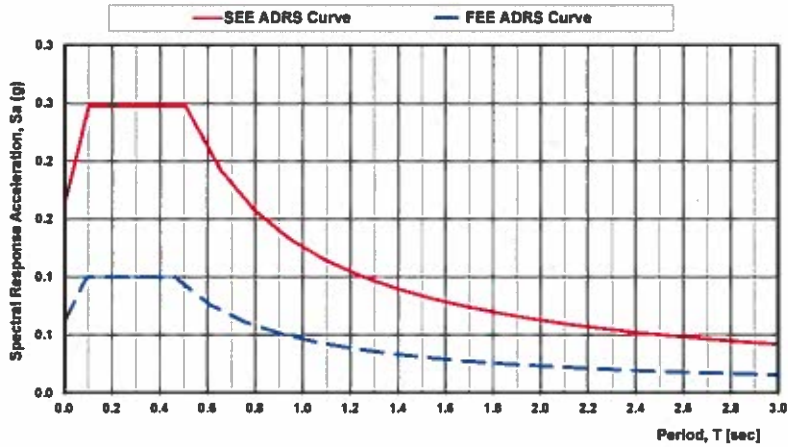
**SC Seismic Hazard Map  
Three-Point ADRS Curves**

PIN No:	42383	File No:	0042383-B01	Latitude:	34.1772
Route:	S-48	County:	Lexington	Longitude:	-81.3227
Project:	RBO1-28				

Designer:	R. Gardner - Midlands RPG
Date:	11/18/2018

Design EQ	PGA	$S_{a0}$	$S_{a1}$	$M_w$	R (km)	Geologic Condition	Site Class	Damping
FEE	0.06	0.10	0.05	7.35	161.1	Hard Rock Basement Outcrop	C	5%
SEE	0.16	0.25	0.13	7.37	147.56	Hard Rock Basement Outcrop	C	

**SC Seismic Hazard Map Three-Point ADRS Curve From Ground Surface**



**FEE ADRS Curve  
Three-Point Method**

T	$S_a$
0.00	0.06
0.02	0.07
0.03	0.07
0.05	0.08
0.08	0.08
0.08	0.08
0.09	0.10
0.12	0.10
0.15	0.10
0.19	0.10
0.22	0.10
0.25	0.10
0.28	0.10
0.31	0.10
0.34	0.10
0.37	0.10
0.40	0.10
0.43	0.10
0.46	0.10
0.51	0.08
0.76	0.06
0.91	0.05
1.06	0.04
1.21	0.04
1.36	0.03
1.51	0.03
1.66	0.03
1.81	0.03
1.99	0.02
2.10	0.02
2.25	0.02
2.40	0.02
2.55	0.02
2.70	0.02
2.85	0.02
3.00	0.02

**SEE ADRS Curve  
Three-Point Method**

T	$S_a$
0.00	0.16
0.02	0.18
0.03	0.18
0.05	0.21
0.08	0.22
0.08	0.23
0.09	0.23
0.12	0.25
0.15	0.25
0.19	0.25
0.22	0.25
0.25	0.25
0.28	0.25
0.31	0.25
0.34	0.25
0.37	0.25
0.40	0.25
0.43	0.25
0.46	0.25
0.51	0.19
0.76	0.16
0.91	0.13
1.06	0.11
1.21	0.10
1.36	0.09
1.51	0.09
1.66	0.07
1.81	0.07
1.99	0.06
2.10	0.06
2.25	0.06
2.40	0.05
2.55	0.05
2.70	0.05
2.85	0.04
3.00	0.04

## **Appendix C.      Liquefaction Evaluation Results**

# Soil Boring Profile B-30

<b>Input Parameters:</b>		
peak ground accelerations (g) =		0.16
earthquake magnitude, M =		7.37
water table depth (m) =		3
average unit weight above water table (kN/m3) =		19
average unit weight below water table (kN/m3) =		20
borehole diameter (mm) =		100
requires correction for sample liner (YES/NO) =		NO
rod lengths assumed equal to the depth plus 1.5 m (for above ground extension) =		1.5
Soil type flags	CLAY    UNSATURATED    UNRELIABLE	

SPT Sample Number	Depth (m)	Measured (N)	Soil Type (USCS)	Flag (CLAY, UNSATURATED, UNRELIABLE)	Fines Content (%)	Energy Ratio, ER (%)	C <sub>E</sub>	C <sub>B</sub>	C <sub>R</sub>	C <sub>S</sub>	N <sub>60</sub>	S <sub>VC</sub> (kPa)	S <sub>VC</sub> ' (kPa)	C <sub>N</sub>	(N <sub>1</sub> ) <sub>60</sub>	ΔN for Fines Content	(N <sub>1</sub> ) <sub>60-CS</sub>	Stress Reduction Coefficient, r <sub>d</sub>	CSR	MSF for Sand	K <sub>o</sub> for Sand	CRR for M=7.5 & σ <sub>vc</sub> ' =1atm	CRR	Factor of Safety
1	0.5	9	MH	UNSATURATED	70.2	81.9	1.37	1.00	0.75	1.00	9.2	10	10	1.70	15.66	5.57	21.24	1.00	0.10	1.04	1.10	0.22	n.a.	n.a.
2	1	16	ML	UNSATURATED	70.2	81.9	1.37	1.00	0.75	1.00	16.4	19	19	1.70	27.85	5.57	33.42	1.00	0.10	1.04	1.10	0.82	n.a.	n.a.
3	1.5	23	ML		60	81.9	1.37	1.00	0.80	1.00	25.1	29	29	1.44	36.15	5.60	41.75	0.99	0.10	1.04	1.10	2.00	2.00	2.00
4	2	19	ML		60	81.9	1.37	1.00	0.80	1.00	20.7	38	38	1.39	28.75	5.60	34.36	0.99	0.10	1.04	1.10	0.97	1.11	2.00
5	2.5	35	ML		60	81.9	1.37	1.00	0.85	1.00	40.6	48	48	1.22	49.52	5.60	55.13	0.99	0.10	1.04	1.10	2.00	2.00	2.00
6	4.3	10	ML		60	81.9	1.37	1.00	0.85	1.00	11.6	83	70	1.18	13.65	5.60	19.25	0.97	0.12	1.04	1.05	0.20	0.21	1.80
7	5.8	45	SC		49.4	81.9	1.37	1.00	0.95	1.00	58.4	113	86	1.04	60.96	5.61	66.58	0.95	0.13	1.04	1.05	2.00	2.00	2.00
8	8.8	50	ML		60	81.9	1.37	1.00	1.00	1.00	68.3	173	116	0.96	65.79	5.60	71.40	0.91	0.14	1.04	0.96	2.00	1.99	2.00
9	12	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	237	149	0.90	123.29	5.60	128.89	0.86	0.14	1.04	0.89	2.00	1.83	2.00
10	20	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	397	230	0.81	109.90	5.60	115.50	0.73	0.13	1.04	0.76	2.00	1.57	2.00
11	30	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	597	332	0.73	99.79	5.60	105.40	0.62	0.12	1.04	0.65	2.00	1.34	2.00
12	36	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	717	393	0.70	95.45	5.60	101.06	0.60	0.11	1.04	0.60	2.00	1.24	2.00

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# Soil Boring Profile B-31

<b>Input Parameters:</b>			
peak ground accelerations (g) =		0.16	
earthquake magnitude, M =		7.37	
water table depth (m) =		3	
average unit weight above water table (kN/m3) =		19	
average unit weight below water table (kN/m3) =		20	
borehole diameter (mm) =		100	
requires correction for sample liner (YES/NO) =		NO	
rod lengths assumed equal to the depth plus 1.5 m (for above ground extension) =		1.5	
Soil type flags	CLAY	UNSATURATED	UNRELIABLE

SPT Sample Number	Depth (m)	Measured (N)	Soil Type (USCS)	Flag (CLAY, UNSATURATED, UNRELIABLE)	Fines Content (%)	Energy Ratio, ER (%)	C <sub>E</sub>	C <sub>B</sub>	C <sub>R</sub>	C <sub>S</sub>	N <sub>60</sub>	S <sub>VC</sub> (kPa)	S <sub>VC</sub> ' (kPa)	C <sub>N</sub>	(N <sub>1</sub> ) <sub>60</sub>	ΔN for Fines Content	(N <sub>1</sub> ) <sub>60-CS</sub>	Stress Reduction Coefficient, r <sub>d</sub>	CSR	MSF for Sand	K <sub>σ</sub> for Sand	CRR for M=7.5 & σ <sub>VC</sub> ' =1atm	CRR	Factor of Safety
1	0.3	5	CL	UNSATURATED	79	81.9	1.37	1.00	0.75	1.00	5.1	6	6	1.70	8.70	5.55	14.25	1.00	0.10	1.04	1.10	0.15	n.a.	n.a.
2	1	8	ML	UNSATURATED	79	81.9	1.37	1.00	0.75	1.00	8.2	19	19	1.70	13.92	5.55	19.47	1.00	0.10	1.04	1.10	0.20	n.a.	n.a.
3	1.5	13	ML	UNSATURATED	60	81.9	1.37	1.00	0.80	1.00	14.2	29	29	1.61	22.81	5.60	28.41	0.99	0.10	1.04	1.10	0.40	n.a.	n.a.
4	2.4	4	ML		60	81.9	1.37	1.00	0.80	1.00	4.4	46	46	1.51	6.58	5.60	12.19	0.99	0.10	1.04	1.08	0.13	0.15	1.46
5	5.2	13	ML		60	81.9	1.37	1.00	0.95	1.00	16.9	101	79	1.10	18.59	5.60	24.19	0.95	0.13	1.04	1.04	0.27	0.29	2.00
6	7.3	21	ML		60	81.9	1.37	1.00	0.95	1.00	27.2	143	101	1.00	27.25	5.60	32.85	0.93	0.14	1.04	1.00	0.74	0.77	2.00
7	9.2	53	ML		60	81.9	1.37	1.00	1.00	1.00	72.3	181	120	0.96	69.11	5.60	74.71	0.90	0.14	1.04	0.95	2.00	1.96	2.00
8	11.8	32	ML		60	81.9	1.37	1.00	1.00	1.00	43.7	233	147	0.90	39.52	5.60	45.12	0.86	0.14	1.04	0.89	2.00	1.84	2.00
9	13.7	13	ML		60	81.9	1.37	1.00	1.00	1.00	17.7	271	166	0.80	14.25	5.60	19.85	0.83	0.14	1.04	0.93	0.20	0.20	1.40
10	14.9	48	ML		60	81.9	1.37	1.00	1.00	1.00	65.5	295	178	0.86	56.42	5.60	62.03	0.81	0.14	1.04	0.83	2.00	1.72	2.00
11	18.3	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	363	213	0.82	112.18	5.60	117.78	0.76	0.13	1.04	0.78	2.00	1.61	2.00
12	23	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	457	261	0.78	106.35	5.60	111.95	0.69	0.13	1.04	0.72	2.00	1.49	2.00
13	30	100	CL	CLAY	70	81.9	1.37	1.00	1.00	1.00	136.5	597	332	0.73	n.a.	n.a.	n.a.	0.62	0.12	1.04	0.65	n.a.	n.a.	n.a.

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# Soil Boring Profile B-32

<b>Input Parameters:</b>	
peak ground accelerations (g) =	0.16
earthquake magnitude, M =	7.37
water table depth (m) =	3
average unit weight above water table (kN/m3) =	19
average unit weight below water table (kN/m3) =	20
borehole diameter (mm) =	100
requires correction for sample liner (YES/NO) =	NO
rod lengths assumed equal to the depth plus 1.5 m (for above ground extension) =	1.5
Soil type flags	CLAY      UNSATURATED      UNRELIABLE

SPT Sample Number	Depth (m)	Measured (N)	Soil Type (USCS)	Flag (CLAY, UNSATURATED, UNRELIABLE)	Fines Content (%)	Energy Ratio, ER (%)	C <sub>E</sub>	C <sub>B</sub>	C <sub>R</sub>	C <sub>S</sub>	N <sub>60</sub>	S <sub>VC</sub> (kPa)	S <sub>VC</sub> ' (kPa)	C <sub>N</sub>	(N <sub>1</sub> ) <sub>60</sub>	ΔN for Fines Content	(N <sub>1</sub> ) <sub>60-CS</sub>	Stress Reduction Coefficient, r <sub>d</sub>	CSR	MSF for Sand	K <sub>σ</sub> for Sand	CRR for M=7.5 & σ <sub>VC</sub> ' =1atm	CRR	Factor of Safety
1	0.3	4	MH	UNSATURATED	55	81.9	1.37	1.00	0.75	1.00	4.1	6	6	1.70	6.96	5.61	12.57	1.00	0.10	1.04	1.10	0.14	n.a.	n.a.
2	1	10	MH	UNSATURATED	55	81.9	1.37	1.00	0.75	1.00	10.2	19	19	1.70	17.40	5.61	23.02	1.00	0.10	1.04	1.10	0.25	n.a.	n.a.
3	2.1	10	ML		55	81.9	1.37	1.00	0.80	1.00	10.9	40	40	1.48	16.21	5.61	21.82	0.99	0.10	1.04	1.10	0.23	0.26	2.00
4	5.2	7	ML		75	81.9	1.37	1.00	0.95	1.00	9.1	101	79	1.12	10.19	5.56	15.75	0.95	0.13	1.04	1.03	0.16	0.17	1.37
5	7.3	13	ML		75	81.9	1.37	1.00	0.95	1.00	16.9	143	101	1.00	16.87	5.56	22.43	0.93	0.14	1.04	1.00	0.24	0.25	1.82
6	13.5	35	ML		60	81.9	1.37	1.00	1.00	1.00	47.8	267	164	0.88	42.05	5.60	47.66	0.83	0.14	1.04	0.86	2.00	1.77	2.00
7	20	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	397	230	0.81	109.90	5.60	115.50	0.73	0.13	1.04	0.76	2.00	1.57	2.00
8	28	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	557	312	0.74	101.47	5.60	107.07	0.64	0.12	1.04	0.67	2.00	1.38	2.00

Spreadsheet copied from: *Soil Liquefaction During Earthquakes, Indriss and Boulanger, 2008, Appendix A*

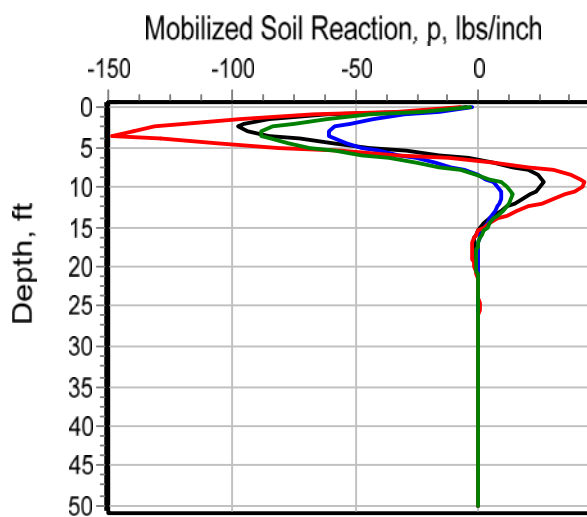
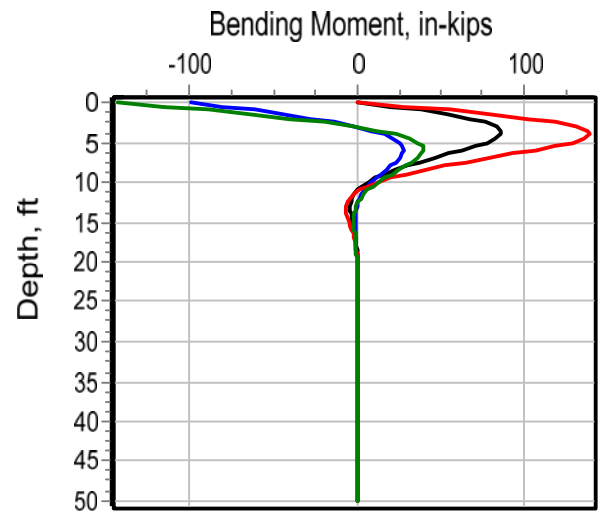
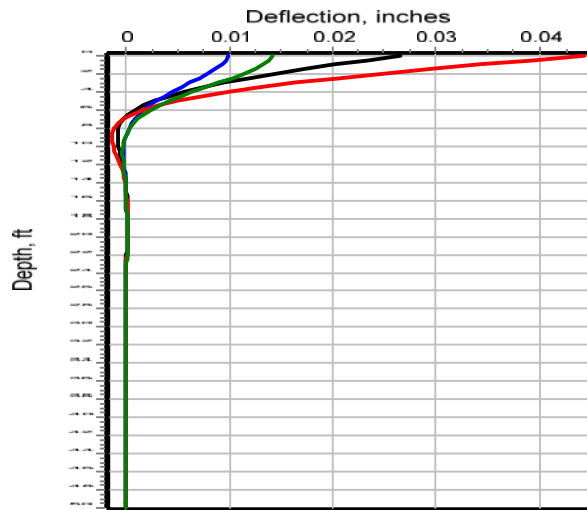
### Soil Boring Profile B-33

<b>Input Parameters:</b>		
peak ground accelerations (g) =		0.16
earthquake magnitude, M =		7.37
water table depth (m) =		4
average unit weight above water table (kN/m3) =		19
average unit weight below water table (kN/m3) =		20
borehole diameter (mm) =		100
requires correction for sample liner (YES/NO) =		NO
rod lengths assumed equal to the depth plus 1.5 m (for above ground extension) =		1.5
Soil type flags	CLAY	UNSATURATED UNRELIABLE

SPT Sample Number	Depth (m)	Measure d (N)	Soil Type (USCS)	Flag (CLAY, UNSATURATED, UNRELIABLE)	Fines Content (%)	Energy Ratio, ER (%)	C <sub>E</sub>	C <sub>B</sub>	C <sub>R</sub>	C <sub>S</sub>	N <sub>60</sub>	S <sub>VC</sub> (kPa)	S <sub>VC</sub> ' (kPa)	C <sub>N</sub>	(N <sub>1</sub> ) <sub>60</sub>	ΔN for Fines Content	(N <sub>1</sub> ) <sub>60-CS</sub>	Stress Reduction Coefficient, r <sub>d</sub>	CSR	MSF for Sand	K <sub>σ</sub> for Sand	CRR for M=7.5 & σ <sub>VC</sub> ' =1atm	Factor of Safety
1	1	8	MH	UNSATURATED	68	81.9	1.37	1.00	0.75	1.00	8.2	19	19	1.70	13.92	5.58	19.50	1.00	0.10	1.04	1.10	0.20	n.a.
2	3	38	MH		83.1	81.9	1.37	1.00	0.85	1.00	44.1	57	57	1.16	51.25	5.53	56.79	0.98	0.10	1.04	1.10	2.00	2.00
3	4.3	25	ML		60	81.9	1.37	1.00	0.85	1.00	29.0	82	79	1.08	31.35	5.60	36.95	0.97	0.10	1.04	1.07	1.73	1.92
4	7.3	7	ML		91.1	81.9	1.37	1.00	0.95	1.00	9.1	142	110	0.96	8.72	5.51	14.23	0.93	0.12	1.04	0.99	0.15	0.15
5	8.8	10	ML		60	81.9	1.37	1.00	1.00	1.00	13.7	172	125	0.91	12.38	5.60	17.99	0.91	0.13	1.04	0.97	0.18	0.19
6	10.5	69	ML		60	81.9	1.37	1.00	1.00	1.00	94.2	206	142	0.91	86.07	5.60	91.67	0.88	0.13	1.04	0.90	2.00	1.86
7	15	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	296	188	0.85	115.90	5.60	121.50	0.81	0.13	1.04	0.82	2.00	1.69
8	20	100	ML		60	81.9	1.37	1.00	1.00	1.00	136.5	396	239	0.80	108.81	5.60	114.42	0.73	0.13	1.04	0.75	2.00	1.54
9	25	100	SM		41.5	81.9	1.37	1.00	1.00	1.00	136.5	496	290	0.76	103.42	5.59	109.01	0.67	0.12	1.04	0.69	2.00	1.43
10	30	100	SM		41.5	81.9	1.37	1.00	1.00	1.00	136.5	596	341	0.73	99.11	5.59	104.70	0.62	0.11	1.04	0.64	2.00	1.33
11	35	100	SM		41.5	81.9	1.37	1.00	1.00	1.00	136.5	696	392	0.70	95.54	5.59	101.13	0.60	0.11	1.04	0.60	2.00	1.24

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## **Appendix D.    L-pile Results**



S-48 Interior Bent Strong Axis

S-48 Int. Bent Strong Axis.lp9o

LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts  
Subjected to Lateral Loading Using the p-y Method  
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This copy of LPile is being used by:

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is a violation of the software license agreement.

Files Used for Analysis

Path to file locations:

\\corp.meadhunt.com\sharedfolders\entp\4035500\121734.01\42383\geotechnical\engapps\  
Lpile\

Name of input data file:

S-48 Int. Bent Major Axis.lp9d

Name of output report file:

S-48 Int. Bent Major Axis.lp9o

Name of plot output file:

S-48 Int. Bent Major Axis.lp9p

Name of runtime message file:

S-48 Int. Bent Major Axis.lp9r

Date and Time of Analysis

Date: January 3, 2017

Time: 14:36:43

Problem Title

Project Name:

Job Number:

Client:

Engineer:

Description:

---

### Program Options and Settings

---

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- |  |   |               |
|--|---|---------------|
| - Maximum number of iterations allowed | = | 500           |
| - Deflection tolerance for convergence | = | 1.0000E-05 in |
| - Maximum allowable deflection         | = | 100.0000 in   |
| - Number of pile increments            | = | 100           |

Loading Type and Number of Cycles of Loading:

- Static loading specified
- Use of p-y modification factors for p-y curves not selected
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

---

### Pile Structural Properties and Geometry

---

Number of pile sections defined	=	1
Total length of pile	=	50.000 ft
Depth of ground surface below top of pile	=	0.0000 ft

# S-48 Int. Bent Strong Axis.lp9o

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	12.0450
2	50.000	12.0450

## Input Structural Properties for Pile Sections:

### Pile Section No. 1:

Section 1 is an elastic pile	= Strong H-Pile
Cross-sectional Shape	= 50.000000 ft
Length of section	= 12.045000 in
Flange Width	= 11.780000 in
Section Depth	= 0.435000 in
Flange Thickness	= 0.435000 in
Web Thickness	= 15.500000 sq. in
Section Area	= 393.000000 in^4
Moment of Inertia	= 29000000. psi
Elastic Modulus	

## Ground Slope and Pile Batter Angles

Ground Slope Angle	= 0.000 degrees
	= 0.000 radians
Pile Batter Angle	= 0.000 degrees
	= 0.000 radians

## Soil and Rock Layering Information

The soil profile is modelled using 5 layers

Layer 1 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	= 0.0000 ft
Distance from top of pile to bottom of layer	= 8.000000 ft
Effective unit weight at top of layer	= 115.000000 pcf
Effective unit weight at bottom of layer	= 115.000000 pcf
Undrained cohesion at top of layer	= 100.000000 psf
Undrained cohesion at bottom of layer	= 100.000000 psf
Friction angle at top of layer	= 26.000000 deg.
Friction angle at bottom of layer	= 26.000000 deg.
Epsilon-50 at top of layer	= 0.015000
Epsilon-50 at bottom of layer	= 0.015000
Subgrade k at top of layer	= 0.0000 pci



Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 2 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	8.000000	ft
Distance from top of pile to bottom of layer	=	20.000000	ft
Effective unit weight at top of layer	=	68.000000	pcf
Effective unit weight at bottom of layer	=	68.000000	pcf
Undrained cohesion at top of layer	=	200.000000	psf
Undrained cohesion at bottom of layer	=	200.000000	psf
Friction angle at top of layer	=	28.000000	deg.
Friction angle at bottom of layer	=	28.000000	deg.
Epsilon-50 at top of layer	=	0.030000	
Epsilon-50 at bottom of layer	=	0.030000	
Subgrade k at top of layer	=	0.0000	pci
Subgrade k at bottom of layer	=	0.0000	pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	20.000000	ft
Distance from top of pile to bottom of layer	=	27.000000	ft
Effective unit weight at top of layer	=	68.000000	pcf
Effective unit weight at bottom of layer	=	68.000000	pcf
Undrained cohesion at top of layer	=	200.000000	psf
Undrained cohesion at bottom of layer	=	200.000000	psf
Friction angle at top of layer	=	32.000000	deg.
Friction angle at bottom of layer	=	32.000000	deg.
Epsilon-50 at top of layer	=	0.007000	
Epsilon-50 at bottom of layer	=	0.007000	
Subgrade k at top of layer	=	0.0000	pci
Subgrade k at bottom of layer	=	0.0000	pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 4 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	27.000000	ft
Distance from top of pile to bottom of layer	=	53.000000	ft
Effective unit weight at top of layer	=	68.000000	pcf
Effective unit weight at bottom of layer	=	68.000000	pcf
Undrained cohesion at top of layer	=	200.000000	psf
Undrained cohesion at bottom of layer	=	200.000000	psf
Friction angle at top of layer	=	35.000000	deg.
Friction angle at bottom of layer	=	35.000000	deg.
Epsilon-50 at top of layer	=	0.0000	
Epsilon-50 at bottom of layer	=	0.0000	
Subgrade k at top of layer	=	0.0000	pci
Subgrade k at bottom of layer	=	0.0000	pci

NOTE: Default values for Epsilon-50 will be computed for this layer.

NOTE: Default values for subgrade k will be computed for this layer.

Layer 5 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	53.000000	ft
Distance from top of pile to bottom of layer	=	100.000000	ft
Effective unit weight at top of layer	=	70.000000	pcf
Effective unit weight at bottom of layer	=	70.000000	pcf
Undrained cohesion at top of layer	=	200.000000	psf

S-48 Int. Bent Strong Axis. I p9o

Undrained cohesion at bottom of layer	=	200.000000 psf
Friction angle at top of layer	=	40.000000 deg.
Friction angle at bottom of layer	=	40.000000 deg.
Epsilon-50 at top of layer	=	0.0000
Epsilon-50 at bottom of layer	=	0.0000
Subgrade k at top of layer	=	0.0000 pci
Subgrade k at bottom of layer	=	0.0000 pci

NOTE: Default values for Epsilon-50 will be computed for this layer.

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 50.000 ft below the pile tip)

-----  
Summary of Input Soil Properties  
-----

Layer E50 Layer or Num. krm	Soil Type Name kpy (p-y Curve Type) pci	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.
-----	-----	-----	-----	-----	-----
1	Cemented	0.00	115.0000	100.0000	26.0000
0.01500	default				
	Silt	8.0000	115.0000	100.0000	26.0000
0.01500	default				
2	Cemented	8.0000	68.0000	200.0000	28.0000
0.03000	default				
	Silt	20.0000	68.0000	200.0000	28.0000
0.03000	default				
3	Cemented	20.0000	68.0000	200.0000	32.0000
0.00700	default				
	Silt	27.0000	68.0000	200.0000	32.0000
0.00700	default				
4	Cemented	27.0000	68.0000	200.0000	35.0000
default	default				
	Silt	53.0000	68.0000	200.0000	35.0000
default	default				
5	Cemented	53.0000	70.0000	200.0000	40.0000
default	default				
	Silt	100.0000	70.0000	200.0000	40.0000
default	default				

-----  
Static Loading Type  
-----

Static loading criteria were used when computing p-y curves for all analyses.

-----  
Pile-head Loading and Pile-head Fixity Conditions  
-----

Number of loads specified = 4

Load Compute No. vs. Pile Length	Load Top y Type	S-48 Int. Bent Strong Axis. I p90		Condi ti on		Axial Thrust Force, lbs
		Condi ti on		1	2	
1 No	1	V =	3200. lbs	M =	0.0000 in-lbs	128670.
2 No	2	V =	3200. lbs	S =	0.0000 in/in	128670.
3 No	1	V =	4600. lbs	M =	0.0000 in-lbs	190910.
4 No	2	V =	4600. lbs	S =	0.0000 in/in	190910.

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

#### Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

#### Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equi val ent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N. A.	No	0.00	31887.
2	8.0000	8.0000	Yes	No	31887.	301946.
3	20.0000	20.0000	Yes	No	333833.	449390.
4	27.0000	27.0000	Yes	No	783223.	3270629.
5	53.0000	53.0000	No	No	4053852.	N. A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

S-48 Int. Bent Strong Axis.l p9o

Computed Values of Pile Loading and Deflection  
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 3200.0 lbs  
Applied moment at pile head = 0.0 in-lbs  
Axial thrust load on pile head = 128670.0 lbs

Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Lat. Load inches lb/inch	Bending Distrib. Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
-4.9646	0.00	0.02649	-7.69E-09	3200.	-5.28E-04	8301.	1.14E+10	
-28.4688	0.5000	0.02332	19519.	3100.	-5.23E-04	8600.	1.14E+10	
-61.4418	1.0000	0.02021	38004.	2830.	-5.08E-04	8884.	1.14E+10	
-85.2436	1.5000	0.01722	54263.	2390.	-4.84E-04	9133.	1.14E+10	
-95.0646	2.0000	0.01440	67430.	1849.	-4.52E-04	9335.	1.14E+10	
-97.3460	2.5000	0.01180	77148.	1272.	-4.14E-04	9484.	1.14E+10	
-93.4461	3.0000	0.00944	83330.	699.3800	-3.71E-04	9578.	1.14E+10	
-84.7966	3.5000	0.00734	86114.	164.6520	-3.27E-04	9621.	1.14E+10	
-72.8166	4.0000	0.00552	85811.	-308.1878	-2.82E-04	9616.	1.14E+10	
-58.8383	4.5000	0.00396	82851.	-703.1525	-2.37E-04	9571.	1.14E+10	
-44.0491	5.0000	0.00267	77739.	-1012.	-1.95E-04	9493.	1.14E+10	
-29.4514	5.5000	0.00162	71010.	-1232.	-1.56E-04	9389.	1.14E+10	
-15.8399	6.0000	8.00E-04	63192.	-1368.	-1.20E-04	9270.	1.14E+10	
-3.7951	6.5000	1.77E-04	54778.	-1427.	-8.94E-05	9141.	1.14E+10	
6.3089	7.0000	-2.73E-04	46205.	-1420.	-6.28E-05	9009.	1.14E+10	
14.2858	7.5000	-5.77E-04	37840.	-1358.	-4.07E-05	8881.	1.14E+10	
20.1107	8.0000	-7.62E-04	29975.	-1255.	-2.29E-05	8761.	1.14E+10	
23.8888	8.5000	-8.52E-04	22821.	-1123.	-8.97E-06	8651.	1.14E+10	
25.8226	9.0000	-8.69E-04	16517.	-973.4476	1.38E-06	8554.	1.14E+10	
26.1796	9.5000	-8.35E-04	11137.	-817.4410	8.66E-06	8472.	1.14E+10	
25.2621	10.0000	-7.66E-04	6695.	-663.1159	1.34E-05	8404.	1.14E+10	
			0.00					

		S-48 Int. Bent Strong Axis.l p9o				
10.5000	-6.75E-04	3159.	-517.1822	1.59E-05	8350.	1.14E+10
23.3824	207900.	0.00				
11.0000	-5.74E-04	463.9211	-384.5112	1.69E-05	8308.	1.14E+10
20.8412	217800.	0.00				
11.5000	-4.72E-04	-1481.	-268.2512	1.66E-05	8324.	1.14E+10
17.9121	227700.	0.00				
12.0000	-3.75E-04	-2781.	-170.0211	1.55E-05	8344.	1.14E+10
14.8312	237600.	0.00				
12.5000	-2.86E-04	-3545.	-90.1543	1.38E-05	8356.	1.14E+10
11.7910	247500.	0.00				
13.0000	-2.08E-04	-3884.	-27.9655	1.19E-05	8361.	1.14E+10
8.9386	257400.	0.00				
13.5000	-1.43E-04	-3899.	17.9814	9.84E-06	8361.	1.14E+10
6.3770	267300.	0.00				
14.0000	-9.02E-05	-3683.	49.6203	7.85E-06	8358.	1.14E+10
4.1693	277200.	0.00				
14.5000	-4.90E-05	-3316.	69.1593	6.00E-06	8352.	1.14E+10
2.3437	287100.	0.00				
15.0000	-1.82E-05	-2863.	78.8917	4.38E-06	8345.	1.14E+10
0.9004	297000.	0.00				
15.5000	3.56E-06	-2376.	81.0473	3.00E-06	8338.	1.14E+10
-0.1819	306900.	0.00				
16.0000	1.78E-05	-1895.	77.6824	1.87E-06	8330.	1.14E+10
-0.9397	316800.	0.00				
16.5000	2.61E-05	-1447.	70.6072	9.95E-07	8323.	1.14E+10
-1.4187	326700.	0.00				
17.0000	2.97E-05	-1049.	61.3458	3.38E-07	8317.	1.14E+10
-1.6685	336600.	0.00				
17.5000	3.01E-05	-711.1089	51.1232	-1.25E-07	8312.	1.14E+10
-1.7391	346500.	0.00				
18.0000	2.82E-05	-435.4318	40.8736	-4.27E-07	8308.	1.14E+10
-1.6775	356400.	0.00				
18.5000	2.50E-05	-219.9664	31.2641	-5.99E-07	8305.	1.14E+10
-1.5257	366300.	0.00				
19.0000	2.10E-05	-59.3374	22.7279	-6.73E-07	8302.	1.14E+10
-1.3197	376200.	0.00				
19.5000	1.69E-05	53.8071	15.5031	-6.74E-07	8302.	1.14E+10
-1.0886	386100.	0.00				
20.0000	1.30E-05	127.7412	9.6723	-6.27E-07	8303.	1.14E+10
-0.8550	396000.	0.00				
20.5000	9.40E-06	170.8418	4.7491	-5.48E-07	8304.	1.14E+10
-0.7860	501840.	0.00				
21.0000	6.38E-06	185.5766	0.7513	-4.54E-07	8304.	1.14E+10
-0.5466	514080.	0.00				
21.5000	3.95E-06	180.5586	-1.9274	-3.58E-07	8304.	1.14E+10
-0.3463	526320.	0.00				
22.0000	2.09E-06	163.0008	-3.5280	-2.67E-07	8304.	1.14E+10
-0.1873	538560.	0.00				
22.5000	7.39E-07	138.6357	-4.2934	-1.88E-07	8303.	1.14E+10
-0.06788	550800.	0.00				
23.0000	-1.69E-07	111.7705	-4.4494	-1.22E-07	8303.	1.14E+10
0.01588	563040.	0.00				
23.5000	-7.25E-07	85.4316	-4.1932	-7.01E-08	8303.	1.14E+10
0.06951	575280.	0.00				
24.0000	-1.01E-06	61.5603	-3.6878	-3.14E-08	8302.	1.14E+10
0.09897	587520.	0.00				
24.5000	-1.10E-06	41.2270	-3.0603	-4.38E-09	8302.	1.14E+10
0.1102	599760.	0.00				
25.0000	-1.06E-06	24.8430	-2.4045	1.30E-08	8302.	1.14E+10
0.1085	612000.	0.00				
25.5000	-9.46E-07	12.3534	-1.7838	2.28E-08	8301.	1.14E+10
0.09842	624240.	0.00				
26.0000	-7.90E-07	3.4018	-1.2373	2.70E-08	8301.	1.14E+10

		S-48 Int. Bent Strong Axis.l p9o				
0.08376	636480.	0.00				
26.5000	-6.23E-07	-2.5358	-0.7841	2.72E-08	8301.	1.14E+10
0.06731	648720.	0.00				
27.0000	-4.63E-07	-6.0492	-0.4290	2.49E-08	8301.	1.14E+10
0.05105	660960.	0.00				
27.5000	-3.23E-07	-7.7222	-0.1669	2.13E-08	8301.	1.14E+10
0.03629	673200.	0.00				
28.0000	-2.08E-07	-8.0854	0.01319	1.71E-08	8301.	1.14E+10
0.02375	685440.	0.00				
28.5000	-1.18E-07	-7.5903	0.1256	1.30E-08	8301.	1.14E+10
0.01371	697680.	0.00				
29.0000	-5.18E-08	-6.5988	0.1851	9.27E-09	8301.	1.14E+10
0.00613	709920.	0.00				
29.5000	-6.58E-09	-5.3839	0.2058	6.12E-09	8301.	1.14E+10
7.92E-04	722160.	0.00				
30.0000	2.16E-08	-4.1383	0.2003	3.61E-09	8301.	1.14E+10
-0.00265	734400.	0.00				
30.5000	3.68E-08	-2.9864	0.1786	1.74E-09	8301.	1.14E+10
-0.00458	746640.	0.00				
31.0000	4.25E-08	-1.9980	0.1487	4.26E-10	8301.	1.14E+10
-0.00537	758880.	0.00				
31.5000	4.19E-08	-1.2023	0.1165	-4.17E-10	8301.	1.14E+10
-0.00538	771120.	0.00				
32.0000	3.75E-08	-0.5998	0.08563	-8.91E-10	8301.	1.14E+10
-0.00489	783360.	0.00				
32.5000	3.12E-08	-0.1733	0.05855	-1.09E-09	8301.	1.14E+10
-0.00414	795600.	0.00				
33.0000	2.43E-08	0.1044	0.03631	-1.11E-09	8301.	1.14E+10
-0.00328	807840.	0.00				
33.5000	1.78E-08	0.2641	0.01916	-1.02E-09	8301.	1.14E+10
-0.00244	820080.	0.00				
34.0000	1.22E-08	0.3359	0.00679	-8.58E-10	8301.	1.14E+10
-0.00169	832320.	0.00				
34.5000	7.54E-09	0.3469	-0.00145	-6.78E-10	8301.	1.14E+10
-0.00106	844560.	0.00				
35.0000	4.02E-09	0.3195	-0.00635	-5.03E-10	8301.	1.14E+10
-5.73E-04	856800.	0.00				
35.5000	1.50E-09	0.2714	-0.00873	-3.47E-10	8301.	1.14E+10
-2.18E-04	869040.	0.00				
36.0000	-1.52E-10	0.2153	-0.00931	-2.19E-10	8301.	1.14E+10
2.24E-05	881280.	0.00				
36.5000	-1.13E-09	0.1600	-0.00874	-1.20E-10	8301.	1.14E+10
1.68E-04	893520.	0.00				
37.0000	-1.60E-09	0.1106	-0.00752	-4.92E-11	8301.	1.14E+10
2.41E-04	905760.	0.00				
37.5000	-1.72E-09	0.06984	-0.00600	-1.69E-12	8301.	1.14E+10
2.63E-04	918000.	0.00				
38.0000	-1.62E-09	0.03853	-0.00446	2.68E-11	8301.	1.14E+10
2.51E-04	930240.	0.00				
38.5000	-1.40E-09	0.01623	-0.00311	4.12E-11	8301.	1.14E+10
2.00E-04	859320.	0.00				
39.0000	-1.12E-09	0.00112	-0.00202	4.58E-11	8301.	1.14E+10
1.63E-04	870480.	0.00				
39.5000	-8.46E-10	-0.00813	-0.00116	4.40E-11	8301.	1.14E+10
1.24E-04	881640.	0.00				
40.0000	-5.95E-10	-0.01290	-5.24E-04	3.84E-11	8301.	1.14E+10
8.85E-05	892800.	0.00				
40.5000	-3.85E-10	-0.01448	-8.50E-05	3.12E-11	8301.	1.14E+10
5.79E-05	903960.	0.00				
41.0000	-2.20E-10	-0.01397	1.89E-04	2.37E-11	8301.	1.14E+10
3.36E-05	915120.	0.00				
41.5000	-9.97E-11	-0.01224	3.36E-04	1.68E-11	8301.	1.14E+10
1.54E-05	926280.	0.00				

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42.0000	-1.80E-11	-0.00996	3.91E-04	1.10E-11	8301.	1.14E+10
2.81E-06	937440.	0.00				
42.5000	3.23E-11	-0.00757	3.84E-04	6.38E-12	8301.	1.14E+10
-5.10E-06	948600.	0.00				
43.0000	5.86E-11	-0.00536	3.41E-04	2.98E-12	8301.	1.14E+10
-9.38E-06	959760.	0.00				
43.5000	6.80E-11	-0.00349	2.79E-04	0.00	8301.	1.14E+10
-1.10E-05	970920.	0.00				
44.0000	6.64E-11	-0.00201	2.14E-04	0.00	8301.	1.14E+10
-1.09E-05	982080.	0.00				
44.5000	5.85E-11	-9.19E-04	1.52E-04	-1.56E-12	8301.	1.14E+10
-9.69E-06	993240.	0.00				
45.0000	4.77E-11	-1.79E-04	9.91E-05	-1.85E-12	8301.	1.14E+10
-7.98E-06	1004400.	0.00				
45.5000	3.63E-11	2.73E-04	5.68E-05	-1.83E-12	8301.	1.14E+10
-6.14E-06	1015560.	0.00				
46.0000	2.57E-11	5.05E-04	2.51E-05	-1.62E-12	8301.	1.14E+10
-4.40E-06	1026720.	0.00				
46.5000	1.68E-11	5.77E-04	3.20E-06	-1.34E-12	8301.	1.14E+10
-2.90E-06	1037880.	0.00				
47.0000	9.67E-12	5.45E-04	-1.06E-05	-1.04E-12	8301.	1.14E+10
-1.69E-06	1049040.	0.00				
47.5000	4.28E-12	4.52E-04	-1.79E-05	0.00	8301.	1.14E+10
-7.56E-07	1060200.	0.00				
48.0000	0.00	3.31E-04	-2.04E-05	0.00	8301.	1.14E+10
-5.51E-08	1071360.	0.00				
48.5000	-2.61E-12	2.09E-04	-1.91E-05	0.00	8301.	1.14E+10
4.72E-07	1082520.	0.00				
49.0000	-4.88E-12	1.03E-04	-1.50E-05	0.00	8301.	1.14E+10
8.89E-07	1093680.	0.00				
49.5000	-6.82E-12	2.88E-05	-8.60E-06	0.00	8301.	1.14E+10
1.25E-06	1104840.	0.00				
50.0000	-8.66E-12	0.00	0.00	0.00	8301.	1.14E+10
1.61E-06	558000.	0.00				

\* The above values of total stress are combined axial and bending stresses.

#### Output Summary for Load Case No. 1:

Pile-head deflection = 0.02648847 inches  
 Computed slope at pile head = -0.00052838 radians  
 Maximum bending moment = 86114. inch-lbs  
 Maximum shear force = 3200. lbs  
 Depth of maximum bending moment = 3.5000000 feet below pile head  
 Depth of maximum shear force = 0.000000 feet below pile head  
 Number of iterations = 6  
 Number of zero deflection points = 7

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#### Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 2

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Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 3200.0 lbs  
 Rotation of pile head = 0.000E+00 radians  
 Axial load at pile head = 128670.0 lbs

(Zero slope for this load indicates fixed-head conditions)

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Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Lat. inches lb/inch	Bending Distrib. Moment Load in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
-2.2391	0.00	0.00979	-99424.	3200.	0.00	9825.	1.14E+10	
-15.8946	0.5000	0.00963	-80244.	3146.	-4.73E-05	9531.	1.14E+10	
-30.4346	1.0000	0.00922	-61603.	3007.	-8.46E-05	9245.	1.14E+10	
-42.6567	1.5000	0.00862	-44034.	2787.	-1.12E-04	8976.	1.14E+10	
-51.9640	2.0000	0.00787	-27982.	2503.	-1.31E-04	8730.	1.14E+10	
-58.0864	2.5000	0.00704	-13789.	2173.	-1.42E-04	8513.	1.14E+10	
-61.0302	3.0000	0.00616	-1682.	1816.	-1.46E-04	8327.	1.14E+10	
-61.0213	3.5000	0.00528	8229.	1450.	-1.45E-04	8427.	1.14E+10	
-58.4469	4.0000	0.00443	15939.	1091.	-1.38E-04	8546.	1.14E+10	
-53.7972	4.5000	0.00362	21539.	754.6831	-1.29E-04	8631.	1.14E+10	
-47.6134	5.0000	0.00289	25194.	450.4513	-1.16E-04	8687.	1.14E+10	
-40.4416	5.5000	0.00223	27124.	186.2865	-1.02E-04	8717.	1.14E+10	
-32.7966	6.0000	0.00166	27588.	-33.4282	-8.80E-05	8724.	1.14E+10	
-25.1339	6.5000	0.00117	26859.	-207.2197	-7.37E-05	8713.	1.14E+10	
-17.8317	7.0000	7.72E-04	25215.	-336.1164	-6.00E-05	8688.	1.14E+10	
-11.1813	7.5000	4.52E-04	22918.	-423.1552	-4.73E-05	8652.	1.14E+10	
-5.3855	8.0000	2.04E-04	20210.	-472.8556	-3.60E-05	8611.	1.14E+10	
-0.5628	8.5000	2.01E-05	17300.	-490.7004	-2.61E-05	8566.	1.14E+10	
3.2440	9.0000	-1.09E-04	14362.	-482.6565	-1.78E-05	8521.	1.14E+10	
6.0553	9.5000	-1.93E-04	11535.	-454.7584	-1.10E-05	8478.	1.14E+10	
7.9411	10.0000	-2.41E-04	8922.	-412.7691	-5.57E-06	8438.	1.14E+10	
9.0072	10.5000	-2.60E-04	6590.	-361.9242	-1.48E-06	8402.	1.14E+10	
9.3813	11.0000	-2.58E-04	4581.	-306.7587	1.46E-06	8371.	1.14E+10	
9.2013	11.5000	-2.42E-04	2907.	-251.0110	3.43E-06	8346.	1.14E+10	
8.6049	12.0000	-2.17E-04	1563.	-197.5924	4.61E-06	8325.	1.14E+10	
7.7218	12.5000	-1.87E-04	528.8764	-148.6123	5.16E-06	8309.	1.14E+10	
6.6677	13.0000	-1.55E-04	-227.8928	-105.4438	5.24E-06	8305.	1.14E+10	
			0.00					



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13.5000	-1.24E-04	-744.5327	-68.8184	4.98E-06	8313.	1.14E+10
5.5408	267300.	0.00				
14.0000	-9.57E-05	-1061.	-38.9358	4.50E-06	8318.	1.14E+10
4.4201	277200.	0.00				
14.5000	-7.03E-05	-1219.	-15.5803	3.90E-06	8320.	1.14E+10
3.3651	287100.	0.00				
15.0000	-4.88E-05	-1254.	1.7660	3.25E-06	8321.	1.14E+10
2.4170	297000.	0.00				
15.5000	-3.13E-05	-1203.	13.8190	2.61E-06	8320.	1.14E+10
1.6006	306900.	0.00				
16.0000	-1.76E-05	-1093.	21.4019	2.00E-06	8318.	1.14E+10
0.9270	316800.	0.00				
16.5000	-7.27E-06	-948.8149	25.3706	1.46E-06	8316.	1.14E+10
0.3959	326700.	0.00				
17.0000	1.71E-08	-790.4025	26.5555	1.01E-06	8313.	1.14E+10
-9.62E-04	336600.	0.00				
17.5000	4.81E-06	-631.7035	25.7195	6.32E-07	8311.	1.14E+10
-0.2777	346500.	0.00				
18.0000	7.61E-06	-482.7454	23.5311	3.39E-07	8309.	1.14E+10
-0.4517	356400.	0.00				
18.5000	8.88E-06	-349.8539	20.5501	1.20E-07	8307.	1.14E+10
-0.5419	366300.	0.00				
19.0000	9.04E-06	-236.3293	17.2233	-3.45E-08	8305.	1.14E+10
-0.5670	376200.	0.00				
19.5000	8.46E-06	-143.1205	13.8886	-1.34E-07	8303.	1.14E+10
-0.5446	386100.	0.00				
20.0000	7.43E-06	-69.4586	10.7836	-1.90E-07	8302.	1.14E+10
-0.4904	396000.	0.00				
20.5000	6.18E-06	-13.4237	7.7619	-2.12E-07	8301.	1.14E+10
-0.5168	501840.	0.00				
21.0000	4.89E-06	24.0113	4.9558	-2.09E-07	8302.	1.14E+10
-0.4186	514080.	0.00				
21.5000	3.67E-06	46.3687	2.7351	-1.91E-07	8302.	1.14E+10
-0.3217	526320.	0.00				
22.0000	2.60E-06	57.1275	1.0713	-1.64E-07	8302.	1.14E+10
-0.2329	538560.	0.00				
22.5000	1.70E-06	59.4772	-0.09676	-1.33E-07	8302.	1.14E+10
-0.1564	550800.	0.00				
23.0000	1.00E-06	56.1715	-0.8477	-1.02E-07	8302.	1.14E+10
-0.09389	563040.	0.00				
23.5000	4.75E-07	49.4629	-1.2659	-7.46E-08	8302.	1.14E+10
-0.04551	575280.	0.00				
24.0000	1.05E-07	41.0960	-1.4332	-5.08E-08	8302.	1.14E+10
-0.01027	587520.	0.00				
24.5000	-1.35E-07	32.3427	-1.4236	-3.15E-08	8302.	1.14E+10
0.01349	599760.	0.00				
25.0000	-2.73E-07	24.0620	-1.2996	-1.66E-08	8302.	1.14E+10
0.02782	612000.	0.00				
25.5000	-3.34E-07	16.7730	-1.1118	-5.87E-09	8302.	1.14E+10
0.03480	624240.	0.00				
26.0000	-3.43E-07	10.7298	-0.8982	1.37E-09	8301.	1.14E+10
0.03641	636480.	0.00				
26.5000	-3.18E-07	5.9930	-0.6858	5.77E-09	8301.	1.14E+10
0.03439	648720.	0.00				
27.0000	-2.74E-07	2.4918	-0.4920	8.00E-09	8301.	1.14E+10
0.03018	660960.	0.00				
27.5000	-2.22E-07	0.07612	-0.3268	8.68E-09	8301.	1.14E+10
0.02491	673200.	0.00				
28.0000	-1.70E-07	-1.4427	-0.1938	8.32E-09	8301.	1.14E+10
0.01940	685440.	0.00				
28.5000	-1.22E-07	-2.2624	-0.09296	7.34E-09	8301.	1.14E+10
0.01421	697680.	0.00				
29.0000	-8.17E-08	-2.5695	-0.02130	6.07E-09	8301.	1.14E+10

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0. 00967	709920.	0. 00					
29. 5000	-4. 94E-08	-2. 5274	0. 02554	4. 73E-09	8301.	1. 14E+10	
0. 00594	722160.	0. 00					
30. 0000	-2. 50E-08	-2. 2703	0. 05255	3. 47E-09	8301.	1. 14E+10	
0. 00306	734400.	0. 00					
30. 5000	-7. 78E-09	-1. 9022	0. 06463	2. 37E-09	8301.	1. 14E+10	
9. 68E-04	746640.	0. 00					
31. 0000	3. 42E-09	-1. 4984	0. 06624	1. 47E-09	8301.	1. 14E+10	
-4. 33E-04	758880.	0. 00					
31. 5000	9. 89E-09	-1. 1096	0. 06113	7. 86E-10	8301.	1. 14E+10	
-0. 00127	771120.	0. 00					
32. 0000	1. 29E-08	-0. 7661	0. 05228	2. 93E-10	8301.	1. 14E+10	
-0. 00168	783360.	0. 00					
32. 5000	1. 34E-08	-0. 4827	0. 04191	-3. 61E-11	8301.	1. 14E+10	
-0. 00178	795600.	0. 00					
33. 0000	1. 24E-08	-0. 2631	0. 03156	-2. 32E-10	8301.	1. 14E+10	
-0. 00167	807840.	0. 00					
33. 5000	1. 06E-08	-0. 1037	0. 02218	-3. 29E-10	8301.	1. 14E+10	
-0. 00145	820080.	0. 00					
34. 0000	8. 48E-09	0. 00357	0. 01430	-3. 55E-10	8301.	1. 14E+10	
-0. 00118	832320.	0. 00					
34. 5000	6. 35E-09	0. 06849	0. 00809	-3. 36E-10	8301.	1. 14E+10	
-8. 94E-04	844560.	0. 00					
35. 0000	4. 44E-09	0. 1012	0. 00351	-2. 92E-10	8301.	1. 14E+10	
-6. 34E-04	856800.	0. 00					
35. 5000	2. 85E-09	0. 1110	3. 65E-04	-2. 36E-10	8301.	1. 14E+10	
-4. 13E-04	869040.	0. 00					
36. 0000	1. 61E-09	0. 1059	-0. 00158	-1. 79E-10	8301.	1. 14E+10	
-2. 37E-04	881280.	0. 00					
36. 5000	7. 07E-10	0. 09229	-0. 00261	-1. 27E-10	8301.	1. 14E+10	
-1. 05E-04	893520.	0. 00					
37. 0000	9. 38E-11	0. 07482	-0. 00297	-8. 25E-11	8301.	1. 14E+10	
-1. 42E-05	905760.	0. 00					
37. 5000	-2. 83E-10	0. 05680	-0. 00288	-4. 79E-11	8301.	1. 14E+10	
4. 33E-05	918000.	0. 00					
38. 0000	-4. 81E-10	0. 04031	-0. 00253	-2. 23E-11	8301.	1. 14E+10	
7. 45E-05	930240.	0. 00					
38. 5000	-5. 51E-10	0. 02650	-0. 00207	-4. 74E-12	8301.	1. 14E+10	
7. 89E-05	859320.	0. 00					
39. 0000	-5. 38E-10	0. 01551	-0. 00160	6. 32E-12	8301.	1. 14E+10	
7. 80E-05	870480.	0. 00					
39. 5000	-4. 75E-10	0. 00733	-0. 00115	1. 23E-11	8301.	1. 14E+10	
6. 98E-05	881640.	0. 00					
40. 0000	-3. 90E-10	0. 00166	-7. 69E-04	1. 47E-11	8301.	1. 14E+10	
5. 80E-05	892800.	0. 00					
40. 5000	-2. 99E-10	-0. 00193	-4. 60E-04	1. 46E-11	8301.	1. 14E+10	
4. 50E-05	903960.	0. 00					
41. 0000	-2. 14E-10	-0. 00389	-2. 27E-04	1. 31E-11	8301.	1. 14E+10	
3. 27E-05	915120.	0. 00					
41. 5000	-1. 42E-10	-0. 00467	-6. 32E-05	1. 08E-11	8301.	1. 14E+10	
2. 19E-05	926280.	0. 00					
42. 0000	-8. 43E-11	-0. 00466	4. 20E-05	8. 38E-12	8301.	1. 14E+10	
1. 32E-05	937440.	0. 00					
42. 5000	-4. 13E-11	-0. 00418	1. 01E-04	6. 05E-12	8301.	1. 14E+10	
6. 53E-06	948600.	0. 00					
43. 0000	-1. 16E-11	-0. 00346	1. 26E-04	4. 04E-12	8301.	1. 14E+10	
1. 86E-06	959760.	0. 00					
43. 5000	7. 18E-12	-0. 00267	1. 28E-04	2. 43E-12	8301.	1. 14E+10	
-1. 16E-06	970920.	0. 00					
44. 0000	1. 75E-11	-0. 00192	1. 16E-04	1. 22E-12	8301.	1. 14E+10	
-2. 87E-06	982080.	0. 00					
44. 5000	2. 18E-11	-0. 00128	9. 68E-05	0. 00	8301.	1. 14E+10	
-3. 61E-06	993240.	0. 00					

S-48 Int. Bent Strong Axis.l p9o						
45.0000	2.21E-11	-7.62E-04	7.49E-05	0.00	8301.	1.14E+10
-3.69E-06	1004400.	0.00				
45.5000	1.99E-11	-3.79E-04	5.37E-05	0.00	8301.	1.14E+10
-3.37E-06	1015560.	0.00				
46.0000	1.65E-11	-1.17E-04	3.51E-05	0.00	8301.	1.14E+10
-2.83E-06	1026720.	0.00				
46.5000	1.28E-11	4.33E-05	2.00E-05	0.00	8301.	1.14E+10
-2.21E-06	1037880.	0.00				
47.0000	9.20E-12	1.24E-04	8.52E-06	0.00	8301.	1.14E+10
-1.61E-06	1049040.	0.00				
47.5000	6.00E-12	1.46E-04	5.12E-07	0.00	8301.	1.14E+10
-1.06E-06	1060200.	0.00				
48.0000	3.26E-12	1.31E-04	-4.41E-06	0.00	8301.	1.14E+10
-5.82E-07	1071360.	0.00				
48.5000	0.00	9.41E-05	-6.66E-06	0.00	8301.	1.14E+10
-1.68E-07	1082520.	0.00				
49.0000	-1.10E-12	5.13E-05	-6.56E-06	0.00	8301.	1.14E+10
2.01E-07	1093680.	0.00				
49.5000	-2.97E-12	1.58E-05	-4.32E-06	0.00	8301.	1.14E+10
5.47E-07	1104840.	0.00				
50.0000	-4.79E-12	0.00	0.00	0.00	8301.	1.14E+10
8.91E-07	558000.	0.00				

\* The above values of total stress are combined axial and bending stresses.

#### Output Summary for Load Case No. 2:

Pile-head deflection	=	0.00979011 inches
Computed slope at pile head	=	0.000000 radians
Maximum bending moment	=	-99424. inch-lbs
Maximum shear force	=	3200. lbs
Depth of maximum bending moment	=	0.000000 feet below pile head
Depth of maximum shear force	=	0.000000 feet below pile head
Number of iterations	=	6
Number of zero deflection points	=	7

#### Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 3

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head	=	4600.0 lbs
Applied moment at pile head	=	0.0 in-lbs
Axial thrust load on pile head	=	190910.0 lbs

Depth Res.	Soil X	Deflect. Spr.	Bending Distrib. Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil p
	Es*h	y Lat.	Load					
feet		inches	in-lbs	lbs	radians	psi *	in-lb^2	
lb/inch	lb/inch	lb/inch	lb/inch					
0.00	0.04440	-1.10E-08	4600.	-8.59E-04	12317.	1.14E+10		
-7.5051	507.1008	0.00						
0.5000	0.03925	28449.	4478.	-8.52E-04	12753.	1.14E+10		
-33.0036	5046.	0.00						
1.0000	0.03418	55693.	4179.	-8.30E-04	13170.	1.14E+10		

S-48 Int. Bent Strong Axis.l p9o						
-66. 9528	11753.	0. 00				
1. 5000	0. 02929	80493.	3687.	-7. 94E-04	13550.	1. 14E+10
-96. 8734	19844.	0. 00				
2. 0000	0. 02466	101757.	3037.	-7. 46E-04	13876.	1. 14E+10
-119. 7087	29131.	0. 00				
2. 5000	0. 02034	118650.	2283.	-6. 88E-04	14135.	1. 14E+10
-131. 6304	38825.	0. 00				
3. 0000	0. 01640	130732.	1468.	-6. 22E-04	14320.	1. 14E+10
-140. 1160	51252.	0. 00				
3. 5000	0. 01288	137692.	601. 5698	-5. 51E-04	14427.	1. 14E+10
-148. 7351	69300.	0. 00				
4. 0000	0. 00979	139214.	-232. 1842	-4. 79E-04	14450.	1. 14E+10
-129. 1829	79200.	0. 00				
4. 5000	0. 00714	136002.	-937. 6156	-4. 06E-04	14401.	1. 14E+10
-105. 9609	89100.	0. 00				
5. 0000	0. 00491	128893.	-1499.	-3. 36E-04	14292.	1. 14E+10
-81. 0783	99000.	0. 00				
5. 5000	0. 00310	118788.	-1911.	-2. 71E-04	14137.	1. 14E+10
-56. 2541	108900.	0. 00				
6. 0000	0. 00166	106586.	-2178.	-2. 12E-04	13950.	1. 14E+10
-32. 8716	118800.	0. 00				
6. 5000	5. 58E-04	93136.	-2313.	-1. 59E-04	13744.	1. 14E+10
-11. 9613	128700.	0. 00				
7. 0000	-2. 51E-04	79199.	-2331.	-1. 14E-04	13530.	1. 14E+10
5. 7916	138600.	0. 00				
7. 5000	-8. 09E-04	65423.	-2254.	-7. 58E-05	13319.	1. 14E+10
20. 0204	148500.	0. 00				
8. 0000	-0. 00116	52329.	-2102.	-4. 48E-05	13119.	1. 14E+10
30. 6355	158400.	0. 00				
8. 5000	-0. 00135	40305.	-1896.	-2. 04E-05	12934.	1. 14E+10
37. 7742	168300.	0. 00				
9. 0000	-0. 00141	29618.	-1658.	-2. 02E-06	12771.	1. 14E+10
41. 7462	178200.	0. 00				
9. 5000	-0. 00137	20415.	-1404.	1. 11E-05	12630.	1. 14E+10
42. 9798	188100.	0. 00				
10. 0000	-0. 00127	12747.	-1149.	1. 99E-05	12512.	1. 14E+10
41. 9711	198000.	0. 00				
10. 5000	-0. 00113	6583.	-905. 2574	2. 50E-05	12418.	1. 14E+10
39. 2401	207900.	0. 00				
11. 0000	-9. 72E-04	1827.	-681. 6543	2. 72E-05	12345.	1. 14E+10
35. 2943	217800.	0. 00				
11. 5000	-8. 06E-04	-1659.	-483. 9685	2. 72E-05	12342.	1. 14E+10
30. 6010	227700.	0. 00				
12. 0000	-6. 46E-04	-4043.	-315. 4631	2. 57E-05	12379.	1. 14E+10
25. 5675	237600.	0. 00				
12. 5000	-4. 98E-04	-5504.	-177. 1688	2. 32E-05	12401.	1. 14E+10
20. 5306	247500.	0. 00				
13. 0000	-3. 67E-04	-6222.	-68. 3235	2. 01E-05	12412.	1. 14E+10
15. 7512	257400.	0. 00				
13. 5000	-2. 56E-04	-6370.	13. 1800	1. 68E-05	12414.	1. 14E+10
11. 4166	267300.	0. 00				
14. 0000	-1. 65E-04	-6102.	70. 3669	1. 35E-05	12410.	1. 14E+10
7. 6457	277200.	0. 00				
14. 5000	-9. 40E-05	-5556.	106. 7964	1. 05E-05	12402.	1. 14E+10
4. 4975	287100.	0. 00				
15. 0000	-4. 00E-05	-4845.	126. 2352	7. 72E-06	12391.	1. 14E+10
1. 9821	297000.	0. 00				
15. 5000	-1. 40E-06	-4059.	132. 3962	5. 37E-06	12379.	1. 14E+10
0. 07152	306900.	0. 00				
16. 0000	2. 44E-05	-3268.	128. 7418	3. 44E-06	12367.	1. 14E+10
-1. 2896	316800.	0. 00				
16. 5000	3. 99E-05	-2522.	118. 3513	1. 92E-06	12355.	1. 14E+10
-2. 1739	326700.	0. 00				

		S-48 Int. Bent Strong Axis.l p9o				
17.0000	4.75E-05	-1853.	103.8428	7.68E-07	12345.	1.14E+10
-2.6623	336600.	0.00				
17.5000	4.91E-05	-1278.	87.3429	-5.62E-08	12336.	1.14E+10
-2.8377	346500.	0.00				
18.0000	4.68E-05	-804.3440	70.4935	-6.04E-07	12329.	1.14E+10
-2.7788	356400.	0.00				
18.5000	4.19E-05	-430.4668	54.4858	-9.29E-07	12323.	1.14E+10
-2.5571	366300.	0.00				
19.0000	3.56E-05	-148.3852	40.1127	-1.08E-06	12319.	1.14E+10
-2.2339	376200.	0.00				
19.5000	2.89E-05	53.3639	27.8309	-1.11E-06	12318.	1.14E+10
-1.8600	386100.	0.00				
20.0000	2.23E-05	188.1208	17.8259	-1.04E-06	12320.	1.14E+10
-1.4750	396000.	0.00				
20.5000	1.64E-05	269.6646	9.2893	-9.23E-07	12321.	1.14E+10
-1.3706	501840.	0.00				
21.0000	1.13E-05	301.7059	2.2792	-7.72E-07	12321.	1.14E+10
-0.9661	514080.	0.00				
21.5000	7.12E-06	298.7839	-2.4927	-6.14E-07	12321.	1.14E+10
-0.6245	526320.	0.00				
22.0000	3.91E-06	273.2001	-5.4180	-4.64E-07	12321.	1.14E+10
-0.3506	538560.	0.00				
22.5000	1.56E-06	234.8305	-6.8981	-3.30E-07	12320.	1.14E+10
-0.1428	550800.	0.00				
23.0000	-5.32E-08	191.1790	-7.3115	-2.18E-07	12320.	1.14E+10
0.00499	563040.	0.00				
23.5000	-1.06E-06	147.5920	-6.9922	-1.29E-07	12319.	1.14E+10
0.1014	575280.	0.00				
24.0000	-1.60E-06	107.5676	-6.2189	-6.14E-08	12318.	1.14E+10
0.1563	587520.	0.00				
24.5000	-1.80E-06	73.1060	-5.2116	-1.39E-08	12318.	1.14E+10
0.1794	599760.	0.00				
25.0000	-1.76E-06	45.0606	-4.1337	1.72E-08	12317.	1.14E+10
0.1798	612000.	0.00				
25.5000	-1.59E-06	23.4619	-3.0984	3.53E-08	12317.	1.14E+10
0.1653	624240.	0.00				
26.0000	-1.34E-06	7.7988	-2.1762	4.35E-08	12317.	1.14E+10
0.1421	636480.	0.00				
26.5000	-1.07E-06	-2.7520	-1.4038	4.48E-08	12317.	1.14E+10
0.1153	648720.	0.00				
27.0000	-8.02E-07	-9.1493	-0.7927	4.17E-08	12317.	1.14E+10
0.08836	660960.	0.00				
27.5000	-5.66E-07	-12.3601	-0.3370	3.60E-08	12317.	1.14E+10
0.06356	673200.	0.00				
28.0000	-3.70E-07	-13.2754	-0.01953	2.93E-08	12317.	1.14E+10
0.04225	685440.	0.00				
28.5000	-2.15E-07	-12.6616	0.1823	2.24E-08	12317.	1.14E+10
0.02502	697680.	0.00				
29.0000	-1.00E-07	-11.1394	0.2930	1.62E-08	12317.	1.14E+10
0.01189	709920.	0.00				
29.5000	-2.10E-08	-9.1826	0.3362	1.08E-08	12317.	1.14E+10
0.00253	722160.	0.00				
30.0000	2.95E-08	-7.1293	0.3330	6.54E-09	12317.	1.14E+10
-0.00361	734400.	0.00				
30.5000	5.75E-08	-5.2017	0.3007	3.29E-09	12317.	1.14E+10
-0.00715	746640.	0.00				
31.0000	6.90E-08	-3.5286	0.2530	9.95E-10	12317.	1.14E+10
-0.00873	758880.	0.00				
31.5000	6.94E-08	-2.1676	0.2001	-5.04E-10	12317.	1.14E+10
-0.00892	771120.	0.00				
32.0000	6.30E-08	-1.1266	0.1486	-1.37E-09	12317.	1.14E+10
-0.00822	783360.	0.00				
32.5000	5.30E-08	-0.3809	0.1029	-1.77E-09	12317.	1.14E+10

		S-48 Int. Bent Strong Axis.l p9o					
-0. 00702	795600.	0. 00					
33. 0000	4. 18E-08	0. 1122	0. 06495	-1. 84E-09	12317.	1. 14E+10	
-0. 00562	807840.	0. 00					
33. 5000	3. 09E-08	0. 4028	0. 03541	-1. 70E-09	12317.	1. 14E+10	
-0. 00422	820080.	0. 00					
34. 0000	2. 13E-08	0. 5410	0. 01386	-1. 45E-09	12317.	1. 14E+10	
-0. 00296	832320.	0. 00					
34. 5000	1. 34E-08	0. 5724	-6. 91E-04	-1. 16E-09	12317.	1. 14E+10	
-0. 00189	844560.	0. 00					
35. 0000	7. 38E-09	0. 5354	-0. 00953	-8. 70E-10	12317.	1. 14E+10	
-0. 00105	856800.	0. 00					
35. 5000	3. 01E-09	0. 4600	-0. 01400	-6. 08E-10	12317.	1. 14E+10	
-4. 35E-04	869040.	0. 00					
36. 0000	8. 40E-11	0. 3688	-0. 01534	-3. 90E-10	12317.	1. 14E+10	
-1. 23E-05	881280.	0. 00					
36. 5000	-1. 67E-09	0. 2768	-0. 01463	-2. 20E-10	12317.	1. 14E+10	
2. 49E-04	893520.	0. 00					
37. 0000	-2. 56E-09	0. 1937	-0. 01273	-9. 62E-11	12317.	1. 14E+10	
3. 86E-04	905760.	0. 00					
37. 5000	-2. 83E-09	0. 1243	-0. 01027	-1. 25E-11	12317.	1. 14E+10	
4. 33E-04	918000.	0. 00					
38. 0000	-2. 71E-09	0. 07042	-0. 00771	3. 87E-11	12317.	1. 14E+10	
4. 20E-04	930240.	0. 00					
38. 5000	-2. 36E-09	0. 03162	-0. 00544	6. 56E-11	12317.	1. 14E+10	
3. 39E-04	859320.	0. 00					
39. 0000	-1. 92E-09	0. 00499	-0. 00359	7. 52E-11	12317.	1. 14E+10	
2. 79E-04	870480.	0. 00					
39. 5000	-1. 46E-09	-0. 01161	-0. 00211	7. 35E-11	12317.	1. 14E+10	
2. 15E-04	881640.	0. 00					
40. 0000	-1. 04E-09	-0. 02047	-0. 00100	6. 50E-11	12317.	1. 14E+10	
1. 55E-04	892800.	0. 00					
40. 5000	-6. 81E-10	-0. 02376	-2. 29E-04	5. 34E-11	12317.	1. 14E+10	
1. 03E-04	903960.	0. 00					
41. 0000	-3. 98E-10	-0. 02334	2. 62E-04	4. 10E-11	12317.	1. 14E+10	
6. 08E-05	915120.	0. 00					
41. 5000	-1. 89E-10	-0. 02071	5. 32E-04	2. 94E-11	12317.	1. 14E+10	
2. 92E-05	926280.	0. 00					
42. 0000	-4. 58E-11	-0. 01703	6. 41E-04	1. 94E-11	12317.	1. 14E+10	
7. 15E-06	937440.	0. 00					
42. 5000	4. 40E-11	-0. 01307	6. 41E-04	1. 15E-11	12317.	1. 14E+10	
-6. 96E-06	948600.	0. 00					
43. 0000	9. 25E-11	-0. 00936	5. 76E-04	5. 62E-12	12317.	1. 14E+10	
-1. 48E-05	959760.	0. 00					
43. 5000	1. 12E-10	-0. 00617	4. 78E-04	1. 54E-12	12317.	1. 14E+10	
-1. 80E-05	970920.	0. 00					
44. 0000	1. 11E-10	-0. 00363	3. 69E-04	-1. 04E-12	12317.	1. 14E+10	
-1. 82E-05	982080.	0. 00					
44. 5000	9. 90E-11	-0. 00174	2. 65E-04	-2. 46E-12	12317.	1. 14E+10	
-1. 64E-05	993240.	0. 00					
45. 0000	8. 15E-11	-4. 42E-04	1. 75E-04	-3. 03E-12	12317.	1. 14E+10	
-1. 36E-05	1004400.	0. 00					
45. 5000	6. 26E-11	3. 67E-04	1. 02E-04	-3. 05E-12	12317.	1. 14E+10	
-1. 06E-05	1015560.	0. 00					
46. 0000	4. 49E-11	7. 94E-04	4. 75E-05	-2. 74E-12	12317.	1. 14E+10	
-7. 69E-06	1026720.	0. 00					
46. 5000	2. 97E-11	9. 43E-04	9. 02E-06	-2. 29E-12	12317.	1. 14E+10	
-5. 14E-06	1037880.	0. 00					
47. 0000	1. 75E-11	9. 07E-04	-1. 56E-05	-1. 80E-12	12317.	1. 14E+10	
-3. 05E-06	1049040.	0. 00					
47. 5000	8. 10E-12	7. 61E-04	-2. 90E-05	-1. 36E-12	12317.	1. 14E+10	
-1. 43E-06	1060200.	0. 00					
48. 0000	1. 13E-12	5. 62E-04	-3. 39E-05	-1. 01E-12	12317.	1. 14E+10	
-2. 02E-07	1071360.	0. 00					

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48.5000	-4.06E-12	3.56E-04	-3.23E-05	0.00	12317.	1.14E+10
7.33E-07	1082520.	0.00				
49.0000	-8.13E-12	1.76E-04	-2.57E-05	0.00	12317.	1.14E+10
1.48E-06	1093680.	0.00				
49.5000	-1.16E-11	4.96E-05	-1.48E-05	0.00	12317.	1.14E+10
2.14E-06	1104840.	0.00				
50.0000	-1.50E-11	0.00	0.00	0.00	12317.	1.14E+10
2.79E-06	558000.	0.00				

\* The above values of total stress are combined axial and bending stresses.

#### Output Summary for Load Case No. 3:

Pile-head deflection	=	0.04440014 inches
Computed slope at pile head	=	-0.00085917 radians
Maximum bending moment	=	139214. inch-lbs
Maximum shear force	=	4600. lbs
Depth of maximum bending moment	=	4.00000000 feet below pile head
Depth of maximum shear force	=	0.000000 feet below pile head
Number of iterations	=	9
Number of zero deflection points	=	7

#### Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 4

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head	=	4600.0 lbs
Rotation of pile head	=	0.000E+00 radians
Axial load at pile head	=	190910.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Lat. inches lb/inch	Bending Distrib. Load Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
0.00	0.01411	-143239.	4600.	0.00	14512.	1.14E+10		
-2.9990	637.7913	0.00						
0.5000	0.01388	-115650.	4522.	-6.81E-05	14089.	1.14E+10		
-22.9024	9900.	0.00						
1.0000	0.01329	-88816.	4322.	-1.22E-04	13678.	1.14E+10		
-43.8528	19800.	0.00						
1.5000	0.01242	-63507.	4006.	-1.62E-04	13290.	1.14E+10		
-61.4624	29700.	0.00						
2.0000	0.01134	-40372.	3597.	-1.89E-04	12935.	1.14E+10		
-74.8702	39600.	0.00						
2.5000	0.01014	-19908.	3121.	-2.05E-04	12622.	1.14E+10		
-83.6860	49500.	0.00						
3.0000	0.00888	-2444.	2607.	-2.11E-04	12354.	1.14E+10		
-87.9187	59400.	0.00						
3.5000	0.00761	11855.	2079.	-2.09E-04	12498.	1.14E+10		
-87.8940	69300.	0.00						
4.0000	0.00638	22984.	1563.	-2.00E-04	12669.	1.14E+10		

		S-48 Int. Bent Strong Axis.l p9o					
-84.1700	79200.	0.00					
4.5000	0.00522	31068.	1078.	-1.85E-04	12793.	1.14E+10	
-77.4540	89100.	0.00					
5.0000	0.00415	36345.	640.1591	-1.68E-04	12874.	1.14E+10	
-68.5268	99000.	0.00					
5.5000	0.00321	39134.	260.0490	-1.48E-04	12916.	1.14E+10	
-58.1766	108900.	0.00					
6.0000	0.00238	39804.	-55.9193	-1.27E-04	12927.	1.14E+10	
-47.1462	118800.	0.00					
6.5000	0.00168	38754.	-305.6362	-1.06E-04	12911.	1.14E+10	
-36.0928	128700.	0.00					
7.0000	0.00111	36380.	-490.6011	-8.64E-05	12874.	1.14E+10	
-25.5622	138600.	0.00					
7.5000	6.45E-04	33064.	-615.2119	-6.82E-05	12823.	1.14E+10	
-15.9747	148500.	0.00					
8.0000	2.89E-04	29154.	-686.0042	-5.18E-05	12764.	1.14E+10	
-7.6227	158400.	0.00					
8.5000	2.41E-05	24951.	-710.9025	-3.75E-05	12699.	1.14E+10	
-0.6767	168300.	0.00					
9.0000	-1.62E-04	20709.	-698.5271	-2.55E-05	12634.	1.14E+10	
4.8018	178200.	0.00					
9.5000	-2.82E-04	16627.	-657.5933	-1.57E-05	12572.	1.14E+10	
8.8428	188100.	0.00					
10.0000	-3.50E-04	12854.	-596.4215	-7.93E-06	12514.	1.14E+10	
11.5478	198000.	0.00					
10.5000	-3.77E-04	9488.	-522.5679	-2.05E-06	12462.	1.14E+10	
13.0700	207900.	0.00					
11.0000	-3.74E-04	6588.	-442.5750	2.18E-06	12418.	1.14E+10	
13.5943	217800.	0.00					
11.5000	-3.51E-04	4172.	-361.8325	5.02E-06	12381.	1.14E+10	
13.3199	227700.	0.00					
12.0000	-3.14E-04	2234.	-284.5344	6.70E-06	12351.	1.14E+10	
12.4461	237600.	0.00					
12.5000	-2.71E-04	742.5003	-213.7157	7.49E-06	12328.	1.14E+10	
11.1601	247500.	0.00					
13.0000	-2.24E-04	-347.7114	-151.3479	7.59E-06	12322.	1.14E+10	
9.6291	257400.	0.00					
13.5000	-1.79E-04	-1091.	-98.4755	7.21E-06	12333.	1.14E+10	
7.9950	267300.	0.00					
14.0000	-1.38E-04	-1546.	-55.3758	6.52E-06	12340.	1.14E+10	
6.3716	277200.	0.00					
14.5000	-1.01E-04	-1771.	-21.7269	5.64E-06	12344.	1.14E+10	
4.8447	287100.	0.00					
15.0000	-7.02E-05	-1820.	3.2285	4.70E-06	12345.	1.14E+10	
3.4737	297000.	0.00					
15.5000	-4.49E-05	-1743.	20.5320	3.76E-06	12343.	1.14E+10	
2.2941	306900.	0.00					
16.0000	-2.50E-05	-1582.	31.3794	2.89E-06	12341.	1.14E+10	
1.3216	316800.	0.00					
16.5000	-1.02E-05	-1373.	37.0116	2.11E-06	12338.	1.14E+10	
0.5558	326700.	0.00					
17.0000	2.81E-07	-1143.	38.6315	1.45E-06	12334.	1.14E+10	
-0.01578	336600.	0.00					
17.5000	7.16E-06	-912.3297	37.3436	9.06E-07	12331.	1.14E+10	
-0.4135	346500.	0.00					
18.0000	1.12E-05	-696.4751	34.1145	4.83E-07	12327.	1.14E+10	
-0.6628	356400.	0.00					
18.5000	1.30E-05	-504.0615	29.7533	1.67E-07	12324.	1.14E+10	
-0.7910	366300.	0.00					
19.0000	1.32E-05	-339.8184	24.9047	-5.52E-08	12322.	1.14E+10	
-0.8252	376200.	0.00					
19.5000	1.23E-05	-205.0782	20.0559	-1.99E-07	12320.	1.14E+10	
-0.7911	386100.	0.00					



		S-48 Int. Bent Strong Axis. Ip90			
20.0000	1.08E-05	-98.6931	15.5487	-2.79E-07	12318. 1.14E+10
-0.7113	396000.	0.00			
20.5000	8.95E-06	-17.8560	11.1689	-3.09E-07	12317. 1.14E+10
-0.7486	501840.	0.00			
21.0000	7.07E-06	36.0428	7.1069	-3.04E-07	12317. 1.14E+10
-0.6054	514080.	0.00			
21.5000	5.30E-06	68.1244	3.8969	-2.77E-07	12318. 1.14E+10
-0.4646	526320.	0.00			
22.0000	3.74E-06	83.4402	1.4957	-2.37E-07	12318. 1.14E+10
-0.3358	538560.	0.00			
22.5000	2.45E-06	86.6165	-0.1864	-1.92E-07	12318. 1.14E+10
-0.2249	550800.	0.00			
23.0000	1.43E-06	81.6441	-1.2643	-1.48E-07	12318. 1.14E+10
-0.1344	563040.	0.00			
23.5000	6.72E-07	71.7842	-1.8609	-1.08E-07	12318. 1.14E+10
-0.06447	575280.	0.00			
24.0000	1.39E-07	59.5601	-2.0952	-7.32E-08	12318. 1.14E+10
-0.01364	587520.	0.00			
24.5000	-2.06E-07	46.8092	-2.0745	-4.52E-08	12317. 1.14E+10
0.02056	599760.	0.00			
25.0000	-4.03E-07	34.7700	-1.8896	-2.37E-08	12317. 1.14E+10
0.04108	612000.	0.00			
25.5000	-4.90E-07	24.1888	-1.6134	-8.18E-09	12317. 1.14E+10
0.05098	624240.	0.00			
26.0000	-5.01E-07	15.4282	-1.3011	2.25E-09	12317. 1.14E+10
0.05313	636480.	0.00			
26.5000	-4.63E-07	8.5709	-0.9915	8.57E-09	12317. 1.14E+10
0.05006	648720.	0.00			
27.0000	-3.98E-07	3.5105	-0.7098	1.17E-08	12317. 1.14E+10
0.04384	660960.	0.00			
27.5000	-3.22E-07	0.02638	-0.4699	1.27E-08	12317. 1.14E+10
0.03612	673200.	0.00			
28.0000	-2.46E-07	-2.1573	-0.2773	1.21E-08	12317. 1.14E+10
0.02808	685440.	0.00			
28.5000	-1.77E-07	-3.3286	-0.1314	1.07E-08	12317. 1.14E+10
0.02053	697680.	0.00			
29.0000	-1.18E-07	-3.7589	-0.02807	8.81E-09	12317. 1.14E+10
0.01393	709920.	0.00			
29.5000	-7.08E-08	-3.6856	0.03929	6.85E-09	12317. 1.14E+10
0.00852	722160.	0.00			
30.0000	-3.55E-08	-3.3032	0.07789	5.01E-09	12317. 1.14E+10
0.00435	734400.	0.00			
30.5000	-1.07E-08	-2.7623	0.09492	3.41E-09	12317. 1.14E+10
0.00133	746640.	0.00			
31.0000	5.46E-09	-2.1720	0.09683	2.12E-09	12317. 1.14E+10
-6.90E-04	758880.	0.00			
31.5000	1.47E-08	-1.6052	0.08909	1.12E-09	12317. 1.14E+10
-0.00189	771120.	0.00			
32.0000	1.89E-08	-1.1055	0.07600	4.08E-10	12317. 1.14E+10
-0.00247	783360.	0.00			
32.5000	1.96E-08	-0.6941	0.06079	-6.58E-11	12317. 1.14E+10
-0.00260	795600.	0.00			
33.0000	1.81E-08	-0.3759	0.04567	-3.47E-10	12317. 1.14E+10
-0.00244	807840.	0.00			
33.5000	1.54E-08	-0.1453	0.03202	-4.85E-10	12317. 1.14E+10
-0.00211	820080.	0.00			
34.0000	1.23E-08	0.00942	0.02056	-5.20E-10	12317. 1.14E+10
-0.00171	832320.	0.00			
34.5000	9.20E-09	0.1027	0.01156	-4.91E-10	12317. 1.14E+10
-0.00129	844560.	0.00			
35.0000	6.42E-09	0.1492	0.00492	-4.25E-10	12317. 1.14E+10
-9.16E-04	856800.	0.00			
35.5000	4.10E-09	0.1627	3.92E-04	-3.43E-10	12317. 1.14E+10

S-48 Int. Bent Strong Axis.l p9o						
-5. 94E-04	869040.	0. 00				
36. 0000	2. 31E-09	0. 1547	-0. 00241	-2. 59E-10	12317.	1. 14E+10
-3. 39E-04	881280.	0. 00				
36. 5000	9. 96E-10	0. 1344	-0. 00387	-1. 83E-10	12317.	1. 14E+10
-1. 48E-04	893520.	0. 00				
37. 0000	1. 11E-10	0. 1087	-0. 00436	-1. 19E-10	12317.	1. 14E+10
-1. 67E-05	905760.	0. 00				
37. 5000	-4. 31E-10	0. 08234	-0. 00421	-6. 86E-11	12317.	1. 14E+10
6. 60E-05	918000.	0. 00				
38. 0000	-7. 13E-10	0. 05829	-0. 00369	-3. 16E-11	12317.	1. 14E+10
1. 10E-04	930240.	0. 00				
38. 5000	-8. 10E-10	0. 03819	-0. 00301	-6. 18E-12	12317.	1. 14E+10
1. 16E-04	859320.	0. 00				
39. 0000	-7. 87E-10	0. 02224	-0. 00232	9. 72E-12	12317.	1. 14E+10
1. 14E-04	870480.	0. 00				
39. 5000	-6. 93E-10	0. 01038	-0. 00167	1. 83E-11	12317.	1. 14E+10
1. 02E-04	881640.	0. 00				
40. 0000	-5. 67E-10	0. 00219	-0. 00111	2. 16E-11	12317.	1. 14E+10
8. 44E-05	892800.	0. 00				
40. 5000	-4. 34E-10	-0. 00297	-6. 59E-04	2. 14E-11	12317.	1. 14E+10
6. 54E-05	903960.	0. 00				
41. 0000	-3. 10E-10	-0. 00578	-3. 21E-04	1. 91E-11	12317.	1. 14E+10
4. 73E-05	915120.	0. 00				
41. 5000	-2. 05E-10	-0. 00687	-8. 47E-05	1. 58E-11	12317.	1. 14E+10
3. 16E-05	926280.	0. 00				
42. 0000	-1. 21E-10	-0. 00683	6. 67E-05	1. 22E-11	12317.	1. 14E+10
1. 89E-05	937440.	0. 00				
42. 5000	-5. 86E-11	-0. 00610	1. 51E-04	8. 77E-12	12317.	1. 14E+10
9. 26E-06	948600.	0. 00				
43. 0000	-1. 56E-11	-0. 00504	1. 86E-04	5. 83E-12	12317.	1. 14E+10
2. 50E-06	959760.	0. 00				
43. 5000	1. 14E-11	-0. 00388	1. 88E-04	3. 49E-12	12317.	1. 14E+10
-1. 85E-06	970920.	0. 00				
44. 0000	2. 62E-11	-0. 00279	1. 70E-04	1. 73E-12	12317.	1. 14E+10
-4. 29E-06	982080.	0. 00				
44. 5000	3. 22E-11	-0. 00184	1. 41E-04	0. 00	12317.	1. 14E+10
-5. 33E-06	993240.	0. 00				
45. 0000	3. 24E-11	-0. 00109	1. 09E-04	0. 00	12317.	1. 14E+10
-5. 42E-06	1004400.	0. 00				
45. 5000	2. 91E-11	-5. 38E-04	7. 78E-05	0. 00	12317.	1. 14E+10
-4. 92E-06	1015560.	0. 00				
46. 0000	2. 41E-11	-1. 59E-04	5. 06E-05	0. 00	12317.	1. 14E+10
-4. 12E-06	1026720.	0. 00				
46. 5000	1. 86E-11	7. 14E-05	2. 86E-05	0. 00	12317.	1. 14E+10
-3. 22E-06	1037880.	0. 00				
47. 0000	1. 33E-11	1. 86E-04	1. 20E-05	0. 00	12317.	1. 14E+10
-2. 33E-06	1049040.	0. 00				
47. 5000	8. 66E-12	2. 17E-04	3. 87E-07	0. 00	12317.	1. 14E+10
-1. 53E-06	1060200.	0. 00				
48. 0000	4. 66E-12	1. 92E-04	-6. 70E-06	0. 00	12317.	1. 14E+10
-8. 33E-07	1071360.	0. 00				
48. 5000	1. 28E-12	1. 38E-04	-9. 89E-06	0. 00	12317.	1. 14E+10
-2. 31E-07	1082520.	0. 00				
49. 0000	-1. 67E-12	7. 50E-05	-9. 67E-06	0. 00	12317.	1. 14E+10
3. 04E-07	1093680.	0. 00				
49. 5000	-4. 38E-12	2. 30E-05	-6. 34E-06	0. 00	12317.	1. 14E+10
8. 07E-07	1104840.	0. 00				
50. 0000	-7. 02E-12	0. 00	0. 00	0. 00	12317.	1. 14E+10
1. 31E-06	558000.	0. 00				

\* The above values of total stress are combined axial and bending stresses.

S-48 Int. Bent Strong Axis.l p9o

Output Summary for Load Case No. 4:

Pile-head deflection = 0.01410649 inches  
 Computed slope at pile head = 0.000000 radians  
 Maximum bending moment = -143239. inch-lbs  
 Maximum shear force = 4600. lbs  
 Depth of maximum bending moment = 0.000000 feet below pile head  
 Depth of maximum shear force = 0.000000 feet below pile head  
 Number of iterations = 6  
 Number of zero deflection points = 7

Summary of Pile-head Responses for Conventional Analyses

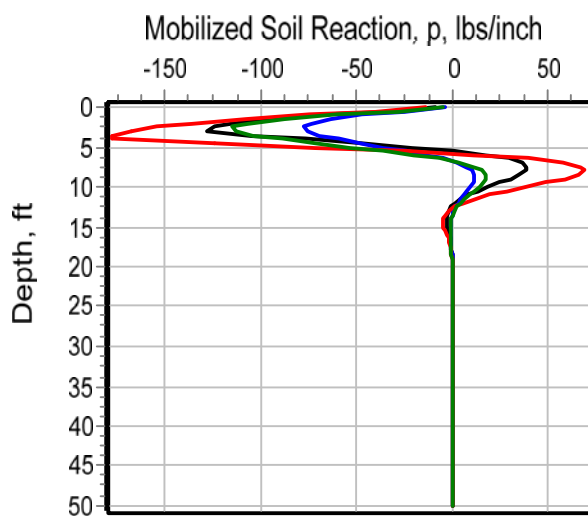
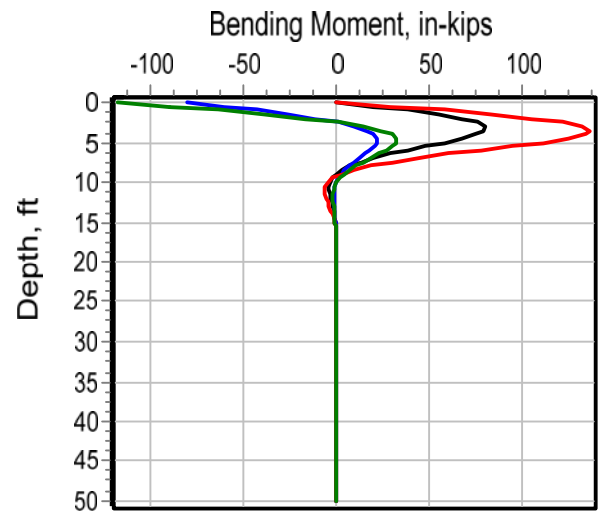
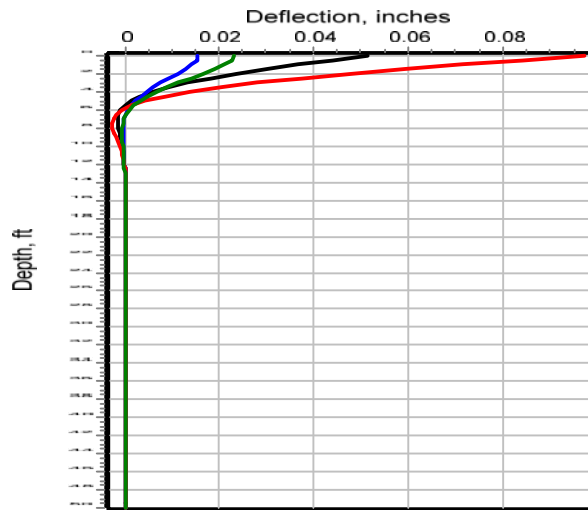
Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs  
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians  
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.  
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs  
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Load 1	Load 2	Load Type	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max in lbs
1	V, lb	3200.	M, in-lb	0.00	128670.	0.02649	-5.28E-04		
2	V, lb	3200.	S, rad	0.00	128670.	0.00979	0.00		
3	V, lb	4600.	M, in-lb	0.00	190910.	0.04440	-8.59E-04		
4	V, lb	4600.	S, rad	0.00	190910.	0.01411	0.00		

Maximum pile-head deflection = 0.0444001355 inches  
 Maximum pile-head rotation = -0.0008591715 radians = -0.049227 deg.

The analysis ended normally.



S-48 Interior Bent Weak Axis

S-48 Int. Bent Weak Axis.l p9o

LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts  
Subjected to Lateral Loading Using the p-y Method  
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Files Used for Analysis

Path to file locations:

\\corp.meadhunt.com\sharedfolders\entp\4035500\121734.01\42383\geotechnical\engapps\  
Lpile\

Name of input data file:

S-48 Int. Bent Weak Axis.l p9d

Name of output report file:

S-48 Int. Bent Weak Axis.l p9o

Name of plot output file:

S-48 Int. Bent Weak Axis.l p9p

Name of runtime message file:

S-48 Int. Bent Weak Axis.l p9r

Date and Time of Analysis

Date: January 3, 2017

Time: 14:44:14

Problem Title

Project Name:

Job Number:

Client:

Engineer:

Description:

---

Program Options and Settings

---

Computational Options:

- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- |  |   |               |
|--|---|---------------|
| - Maximum number of iterations allowed | = | 500           |
| - Deflection tolerance for convergence | = | 1.0000E-05 in |
| - Maximum allowable deflection         | = | 100.0000 in   |
| - Number of pile increments            | = | 100           |

Loading Type and Number of Cycles of Loading:

- Static loading specified
- Use of p-y modification factors for p-y curves not selected
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

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Pile Structural Properties and Geometry

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Number of pile sections defined	=	1
Total length of pile	=	50.000 ft
Depth of ground surface below top of pile	=	0.0000 ft

# S-48 Int. Bent Weak Axis.Ip9o

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	11.7800
2	50.000	11.7800

## Input Structural Properties for Pile Sections:

### Pile Section No. 1:

Section 1 is an elastic pile	=	Weak H-Pile
Cross-sectional Shape	=	50.000000 ft
Length of section	=	12.045000 in
Flange Width	=	11.780000 in
Section Depth	=	0.435000 in
Flange Thickness	=	0.435000 in
Web Thickness	=	15.500000 sq. in
Section Area	=	127.000000 in^4
Moment of Inertia	=	29000000. psi
Elastic Modulus	=	

## Ground Slope and Pile Batter Angles

Ground Slope Angle	=	0.000 degrees
	=	0.000 radians
Pile Batter Angle	=	0.000 degrees
	=	0.000 radians

## Soil and Rock Layering Information

The soil profile is modelled using 5 layers

Layer 1 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	0.0000 ft
Distance from top of pile to bottom of layer	=	8.000000 ft
Effective unit weight at top of layer	=	115.000000 pcf
Effective unit weight at bottom of layer	=	115.000000 pcf
Undrained cohesion at top of layer	=	100.000000 psf
Undrained cohesion at bottom of layer	=	100.000000 psf
Friction angle at top of layer	=	26.000000 deg.
Friction angle at bottom of layer	=	26.000000 deg.
Epsilon-50 at top of layer	=	0.015000
Epsilon-50 at bottom of layer	=	0.015000
Subgrade k at top of layer	=	0.0000 pci

Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 2 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	8.000000	ft
Distance from top of pile to bottom of layer	=	20.000000	ft
Effective unit weight at top of layer	=	68.000000	pcf
Effective unit weight at bottom of layer	=	68.000000	pcf
Undrained cohesion at top of layer	=	200.000000	psf
Undrained cohesion at bottom of layer	=	200.000000	psf
Friction angle at top of layer	=	28.000000	deg.
Friction angle at bottom of layer	=	28.000000	deg.
Epsilon-50 at top of layer	=	0.030000	
Epsilon-50 at bottom of layer	=	0.030000	
Subgrade k at top of layer	=	0.0000	pci
Subgrade k at bottom of layer	=	0.0000	pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	20.000000	ft
Distance from top of pile to bottom of layer	=	27.000000	ft
Effective unit weight at top of layer	=	68.000000	pcf
Effective unit weight at bottom of layer	=	68.000000	pcf
Undrained cohesion at top of layer	=	200.000000	psf
Undrained cohesion at bottom of layer	=	200.000000	psf
Friction angle at top of layer	=	32.000000	deg.
Friction angle at bottom of layer	=	32.000000	deg.
Epsilon-50 at top of layer	=	0.007000	
Epsilon-50 at bottom of layer	=	0.007000	
Subgrade k at top of layer	=	0.0000	pci
Subgrade k at bottom of layer	=	0.0000	pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 4 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	27.000000	ft
Distance from top of pile to bottom of layer	=	53.000000	ft
Effective unit weight at top of layer	=	68.000000	pcf
Effective unit weight at bottom of layer	=	68.000000	pcf
Undrained cohesion at top of layer	=	200.000000	psf
Undrained cohesion at bottom of layer	=	200.000000	psf
Friction angle at top of layer	=	35.000000	deg.
Friction angle at bottom of layer	=	35.000000	deg.
Epsilon-50 at top of layer	=	0.0000	
Epsilon-50 at bottom of layer	=	0.0000	
Subgrade k at top of layer	=	0.0000	pci
Subgrade k at bottom of layer	=	0.0000	pci

NOTE: Default values for Epsilon-50 will be computed for this layer.

NOTE: Default values for subgrade k will be computed for this layer.

Layer 5 is cemented silt with cohesion and friction

Distance from top of pile to top of layer	=	53.000000	ft
Distance from top of pile to bottom of layer	=	100.000000	ft
Effective unit weight at top of layer	=	70.000000	pcf
Effective unit weight at bottom of layer	=	70.000000	pcf
Undrained cohesion at top of layer	=	200.000000	psf



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Undrained cohesion at bottom of layer	=	200.000000 psf
Friction angle at top of layer	=	40.000000 deg.
Friction angle at bottom of layer	=	40.000000 deg.
Epsilon-50 at top of layer	=	0.0000
Epsilon-50 at bottom of layer	=	0.0000
Subgrade k at top of layer	=	0.0000 pci
Subgrade k at bottom of layer	=	0.0000 pci

NOTE: Default values for Epsilon-50 will be computed for this layer.

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 50.000 ft below the pile tip)

-----  
Summary of Input Soil Properties  
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Layer E50 Layer or Num. krm	Soil Type  Name kpy (p-y Curve Type) pci	Layer  Depth  ft	Effective  Unit Wt.  pcf	Undrained  Cohesion  psf	Angle of  Friction  deg.
-----	-----	-----	-----	-----	-----
1	Cemented	0.00	115.0000	100.0000	26.0000
0.01500	default				
	Silt	8.0000	115.0000	100.0000	26.0000
0.01500	default				
2	Cemented	8.0000	68.0000	200.0000	28.0000
0.03000	default				
	Silt	20.0000	68.0000	200.0000	28.0000
0.03000	default				
3	Cemented	20.0000	68.0000	200.0000	32.0000
0.00700	default				
	Silt	27.0000	68.0000	200.0000	32.0000
0.00700	default				
4	Cemented	27.0000	68.0000	200.0000	35.0000
default	default				
	Silt	53.0000	68.0000	200.0000	35.0000
default	default				
5	Cemented	53.0000	70.0000	200.0000	40.0000
default	default				
	Silt	100.0000	70.0000	200.0000	40.0000
default	default				

-----  
Static Loading Type  
-----

Static loading criteria were used when computing p-y curves for all analyses.

-----  
Pile-head Loading and Pile-head Fixity Conditions  
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Number of loads specified = 4

Load Compute No. vs. Pile Length	Load Top y Type	S-48 Int. Bent Weak Axis Ip90		Condi ti on		Axi al Thrust Force, lbs
		Condi ti on		1	2	
1 No	1	V =	3200. lbs	M =	0.0000 in-lbs	128670.
2 No	2	V =	3200. lbs	S =	0.0000 in/in	128670.
3 No	1	V =	4600. lbs	M =	0.0000 in-lbs	190910.
4 No	2	V =	4600. lbs	S =	0.0000 in/in	190910.

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

#### Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Moment-curvature properties were derived from elastic section properties

#### Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equi val ent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	0.00	0.00	N. A.	No	0.00	31618.
2	8.0000	8.0000	Yes	No	31618.	296842.
3	20.0000	20.0000	Yes	No	328460.	439503.
4	27.0000	27.0000	Yes	No	767963.	3198673.
5	53.0000	53.0000	No	No	3966636.	N. A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

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Computed Values of Pile Loading and Deflection  
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 3200.0 lbs  
Applied moment at pile head = 0.0 in-lbs  
Axial thrust load on pile head = 128670.0 lbs

Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Lat. Load inches lb/inch	Bending Distrib. Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
-8.3895	0.00	0.05132	7.10E-10	3200.	-0.00123	8301.	3.68E+09	
-33.6120	490.4474	0.04392	0.00	3074.	-0.00122	9229.	3.68E+09	
-66.5436	1.0000	0.03673	0.00	2774.	-0.00117	10099.	3.68E+09	
-95.2892	1.5000	0.02991	0.00	2288.	-0.00109	10856.	3.68E+09	
-115.8607	2.0000	0.02363	0.00	1655.	-9.91E-04	11451.	3.68E+09	
-124.2762	2.5000	0.01801	0.00	934.1704	-8.74E-04	11848.	3.68E+09	
-127.9485	3.0000	0.01315	0.00	177.4961	-7.46E-04	12033.	3.68E+09	
-104.7004	3.5000	0.00906	0.00	-520.4507	-6.15E-04	12000.	3.68E+09	
-76.0689	4.0000	0.00576	0.00	-1063.	-4.89E-04	11788.	3.68E+09	
-47.4515	4.5000	0.00320	0.00	-1433.	-3.73E-04	11444.	3.68E+09	
-21.2893	5.0000	0.00129	0.00	-1640.	-2.70E-04	11017.	3.68E+09	
0.7732	5.5000	-4.26E-05	0.00	-1701.	-1.83E-04	10550.	3.68E+09	
17.8482	6.0000	-9.01E-04	0.00	-1645.	-1.12E-04	10083.	3.68E+09	
29.7029	6.5000	-0.00138	0.00	-1503.	-5.70E-05	9643.	3.68E+09	
36.6210	7.0000	-0.00159	0.00	-1304.	-1.68E-05	9251.	3.68E+09	
39.2483	7.5000	-0.00159	0.00	-1076.	1.08E-05	8919.	3.68E+09	
38.4426	8.0000	-0.00146	0.00	-842.9212	2.77E-05	8651.	3.68E+09	
35.1408	8.5000	-0.00125	0.00	-622.1712	3.65E-05	8447.	3.68E+09	
30.2528	9.0000	-0.00102	0.00	-425.9905	3.90E-05	8302.	3.68E+09	
24.5856	9.5000	-7.84E-04	0.00	-261.4752	3.74E-05	8395.	3.68E+09	
18.7966	10.0000	-5.70E-04	0.00	-131.3285	3.32E-05	8449.	3.68E+09	

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10.5000	-3.86E-04	-3647.	-34.8156	2.76E-05	8470.	3.68E+09
13.3744	207900.	0.00				
11.0000	-2.38E-04	-3635.	31.2289	2.17E-05	8470.	3.68E+09
8.6405	217800.	0.00				
11.5000	-1.26E-04	-3306.	71.4499	1.60E-05	8455.	3.68E+09
4.7665	227700.	0.00				
12.0000	-4.55E-05	-2802.	91.1537	1.11E-05	8431.	3.68E+09
1.8014	237600.	0.00				
12.5000	7.23E-06	-2229.	95.6629	6.97E-06	8405.	3.68E+09
-0.2983	247500.	0.00				
13.0000	3.82E-05	-1665.	89.8565	3.80E-06	8379.	3.68E+09
-1.6371	257400.	0.00				
13.5000	5.28E-05	-1157.	77.8861	1.50E-06	8355.	3.68E+09
-2.3530	267300.	0.00				
14.0000	5.62E-05	-732.5501	63.0429	-3.91E-08	8335.	3.68E+09
-2.5947	277200.	0.00				
14.5000	5.23E-05	-400.5070	47.7441	-9.62E-07	8320.	3.68E+09
-2.5049	287100.	0.00				
15.0000	4.46E-05	-158.1357	33.6035	-1.42E-06	8309.	3.68E+09
-2.2086	297000.	0.00				
15.5000	3.53E-05	4.9235	21.5541	-1.54E-06	8302.	3.68E+09
-1.8078	306900.	0.00				
16.0000	2.61E-05	102.8944	11.9937	-1.45E-06	8306.	3.68E+09
-1.3790	316800.	0.00				
16.5000	1.79E-05	151.0932	4.9336	-1.25E-06	8308.	3.68E+09
-0.9744	326700.	0.00				
17.0000	1.12E-05	164.0232	0.1336	-9.90E-07	8309.	3.68E+09
-0.6256	336600.	0.00				
17.5000	6.01E-06	154.2262	-2.7843	-7.31E-07	8308.	3.68E+09
-0.3471	346500.	0.00				
18.0000	2.38E-06	131.7407	-4.2490	-4.98E-07	8307.	3.68E+09
-0.1412	356400.	0.00				
18.5000	3.04E-08	104.0080	-4.6780	-3.06E-07	8306.	3.68E+09
-0.00185	366300.	0.00				
19.0000	-1.30E-06	76.0777	-4.4392	-1.60E-07	8305.	3.68E+09
0.08144	376200.	0.00				
19.5000	-1.88E-06	50.9837	-3.8311	-5.61E-08	8304.	3.68E+09
0.1213	386100.	0.00				
20.0000	-1.97E-06	30.1912	-3.0769	1.00E-08	8303.	3.68E+09
0.1301	396000.	0.00				
20.5000	-1.76E-06	14.0459	-2.2438	4.61E-08	8302.	3.68E+09
0.1475	501840.	0.00				
21.0000	-1.42E-06	3.1946	-1.4364	6.01E-08	8301.	3.68E+09
0.1216	514080.	0.00				
21.5000	-1.04E-06	-3.2842	-0.7973	6.00E-08	8301.	3.68E+09
0.09146	526320.	0.00				
22.0000	-6.98E-07	-6.4663	-0.3349	5.21E-08	8302.	3.68E+09
0.06269	538560.	0.00				
22.5000	-4.17E-07	-7.3836	-0.03192	4.08E-08	8302.	3.68E+09
0.03831	550800.	0.00				
23.0000	-2.09E-07	-6.9124	0.1417	2.92E-08	8302.	3.68E+09
0.01957	563040.	0.00				
23.5000	-6.72E-08	-5.7281	0.2197	1.89E-08	8302.	3.68E+09
0.00644	575280.	0.00				
24.0000	1.81E-08	-4.3045	0.2338	1.07E-08	8301.	3.68E+09
-0.00177	587520.	0.00				
24.5000	6.13E-08	-2.9394	0.2101	4.81E-09	8301.	3.68E+09
-0.00613	599760.	0.00				
25.0000	7.58E-08	-1.7911	0.1685	9.56E-10	8301.	3.68E+09
-0.00773	612000.	0.00				
25.5000	7.28E-08	-0.9188	0.1226	-1.25E-09	8301.	3.68E+09
-0.00757	624240.	0.00				
26.0000	6.08E-08	-0.3179	0.08055	-2.26E-09	8301.	3.68E+09

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-0.00645	636480.	0.00				
26.5000	4.57E-08	0.05124	0.04640	-2.48E-09	8301.	3.68E+09
-0.00494	648720.	0.00				
27.0000	3.11E-08	0.2426	0.02132	-2.24E-09	8301.	3.68E+09
-0.00342	660960.	0.00				
27.5000	1.88E-08	0.3105	0.00472	-1.79E-09	8301.	3.68E+09
-0.00211	673200.	0.00				
28.0000	9.62E-09	0.3020	-0.00491	-1.29E-09	8301.	3.68E+09
-0.00110	685440.	0.00				
28.5000	3.38E-09	0.2536	-0.00939	-8.35E-10	8301.	3.68E+09
-3.93E-04	697680.	0.00				
29.0000	-3.92E-10	0.1907	-0.01043	-4.73E-10	8301.	3.68E+09
4.64E-05	709920.	0.00				
29.5000	-2.30E-09	0.1292	-0.00946	-2.12E-10	8301.	3.68E+09
2.77E-04	722160.	0.00				
30.0000	-2.94E-09	0.07748	-0.00755	-4.39E-11	8301.	3.68E+09
3.60E-04	734400.	0.00				
30.5000	-2.82E-09	0.03865	-0.00542	5.06E-11	8301.	3.68E+09
3.52E-04	746640.	0.00				
31.0000	-2.33E-09	0.01242	-0.00348	9.22E-11	8301.	3.68E+09
2.95E-04	758880.	0.00				
31.5000	-1.72E-09	-0.00320	-0.00193	9.97E-11	8301.	3.68E+09
2.21E-04	771120.	0.00				
32.0000	-1.14E-09	-0.01088	-8.22E-04	8.83E-11	8301.	3.68E+09
1.48E-04	783360.	0.00				
32.5000	-6.59E-10	-0.01320	-1.15E-04	6.87E-11	8301.	3.68E+09
8.73E-05	795600.	0.00				
33.0000	-3.11E-10	-0.01236	2.73E-04	4.78E-11	8301.	3.68E+09
4.19E-05	807840.	0.00				
33.5000	-8.44E-11	-0.01000	4.33E-04	2.96E-11	8301.	3.68E+09
1.15E-05	820080.	0.00				
34.0000	4.44E-11	-0.00721	4.49E-04	1.56E-11	8301.	3.68E+09
-6.17E-06	832320.	0.00				
34.5000	1.03E-10	-0.00464	3.87E-04	5.95E-12	8301.	3.68E+09
-1.45E-05	844560.	0.00				
35.0000	1.16E-10	-0.00258	2.94E-04	0.00	8301.	3.68E+09
-1.65E-05	856800.	0.00				
35.5000	1.04E-10	-0.00111	1.99E-04	-2.94E-12	8301.	3.68E+09
-1.50E-05	869040.	0.00				
36.0000	8.06E-11	-1.81E-04	1.19E-04	-3.99E-12	8301.	3.68E+09
-1.18E-05	881280.	0.00				
36.5000	5.58E-11	3.22E-04	5.84E-05	-3.87E-12	8301.	3.68E+09
-8.31E-06	893520.	0.00				
37.0000	3.41E-11	5.25E-04	1.80E-05	-3.18E-12	8301.	3.68E+09
-5.15E-06	905760.	0.00				
37.5000	1.76E-11	5.42E-04	-5.54E-06	-2.31E-12	8301.	3.68E+09
-2.69E-06	918000.	0.00				
38.0000	6.36E-12	4.62E-04	-1.66E-05	-1.50E-12	8301.	3.68E+09
-9.85E-07	930240.	0.00				
38.5000	0.00	3.46E-04	-1.94E-05	0.00	8301.	3.68E+09
5.20E-08	859320.	0.00				
39.0000	-3.70E-12	2.31E-04	-1.76E-05	0.00	8301.	3.68E+09
5.37E-07	870480.	0.00				
39.5000	-4.78E-12	1.35E-04	-1.39E-05	0.00	8301.	3.68E+09
7.03E-07	881640.	0.00				
40.0000	-4.55E-12	6.44E-05	-9.75E-06	0.00	8301.	3.68E+09
6.76E-07	892800.	0.00				
40.5000	-3.68E-12	1.80E-05	-6.06E-06	0.00	8301.	3.68E+09
5.54E-07	903960.	0.00				
41.0000	-2.63E-12	-8.53E-06	-3.19E-06	0.00	8301.	3.68E+09
4.02E-07	915120.	0.00				
41.5000	-1.68E-12	-2.05E-05	-1.21E-06	0.00	8301.	3.68E+09
2.59E-07	926280.	0.00				

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42.0000	0.00	-2.32E-05	-1.30E-09	0.00	8301.	3.68E+09
1.43E-07	937440.	0.00				
42.5000	0.00	-2.07E-05	6.10E-07	0.00	8301.	3.68E+09
6.07E-08	948600.	0.00				
43.0000	0.00	-1.60E-05	8.19E-07	0.00	8301.	3.68E+09
8.77E-09	959760.	0.00				
43.5000	0.00	-1.10E-05	7.88E-07	0.00	8301.	3.68E+09
-1.91E-08	970920.	0.00				
44.0000	0.00	-6.59E-06	6.40E-07	0.00	8301.	3.68E+09
-3.00E-08	982080.	0.00				
44.5000	0.00	-3.29E-06	4.59E-07	0.00	8301.	3.68E+09
-3.05E-08	993240.	0.00				
45.0000	0.00	-1.09E-06	2.90E-07	0.00	8301.	3.68E+09
-2.57E-08	1004400.	0.00				
45.5000	0.00	1.97E-07	1.56E-07	0.00	8301.	3.68E+09
-1.89E-08	1015560.	0.00				
46.0000	0.00	7.99E-07	6.26E-08	0.00	8301.	3.68E+09
-1.23E-08	1026720.	0.00				
46.5000	0.00	9.57E-07	5.02E-09	0.00	8301.	3.68E+09
-6.90E-09	1037880.	0.00				
47.0000	0.00	8.66E-07	-2.47E-08	0.00	8301.	3.68E+09
-3.02E-09	1049040.	0.00				
47.5000	0.00	6.65E-07	-3.54E-08	0.00	8301.	3.68E+09
-5.43E-10	1060200.	0.00				
48.0000	0.00	4.44E-07	-3.46E-08	0.00	8301.	3.68E+09
8.20E-10	1071360.	0.00				
48.5000	0.00	2.52E-07	-2.78E-08	0.00	8301.	3.68E+09
1.43E-09	1082520.	0.00				
49.0000	0.00	1.11E-07	-1.88E-08	0.00	8301.	3.68E+09
1.60E-09	1093680.	0.00				
49.5000	0.00	2.71E-08	-9.23E-09	0.00	8301.	3.68E+09
1.58E-09	1104840.	0.00				
50.0000	0.00	0.00	0.00	0.00	8301.	3.68E+09
1.50E-09	558000.	0.00				

\* The above values of total stress are combined axial and bending stresses.

#### Output Summary for Load Case No. 1:

Pile-head deflection = 0.05131733 inches  
 Computed slope at pile head = -0.00123206 radians  
 Maximum bending moment = 80466. inch-lbs  
 Maximum shear force = 3200. lbs  
 Depth of maximum bending moment = 3.00000000 feet below pile head  
 Depth of maximum shear force = 0.000000 feet below pile head  
 Number of iterations = 10  
 Number of zero deflection points = 9

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#### Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 2

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Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head = 3200.0 lbs  
 Rotation of pile head = 0.000E+00 radians  
 Axial load at pile head = 128670.0 lbs

(Zero slope for this load indicates fixed-head conditions)

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Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Lat. Load inches lb/inch	Bending Distrib. Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
-3.2211	0.00	0.01551	-79681.	3200.	0.00	11997.	3.68E+09	
		623.0267	0.00					
-24.8180	0.5000	0.01512	-60489.	3116.	-1.14E-04	11107.	3.68E+09	
		9848.	0.00					
-46.6623	1.0000	0.01414	-42114.	2901.	-1.98E-04	10254.	3.68E+09	
		19800.	0.00					
-63.1013	1.5000	0.01275	-25366.	2572.	-2.53E-04	9478.	3.68E+09	
		29700.	0.00					
-73.3092	2.0000	0.01111	-10858.	2163.	-2.82E-04	8805.	3.68E+09	
		39600.	0.00					
-77.2285	2.5000	0.00936	1024.	1711.	-2.90E-04	8349.	3.68E+09	
		49500.	0.00					
-75.4837	3.0000	0.00762	10126.	1253.	-2.81E-04	8771.	3.68E+09	
		59400.	0.00					
-69.1520	3.5000	0.00599	16497.	819.2633	-2.59E-04	9066.	3.68E+09	
		69300.	0.00					
-59.5451	4.0000	0.00451	20357.	433.1720	-2.29E-04	9245.	3.68E+09	
		79200.	0.00					
-48.0218	4.5000	0.00323	22049.	110.4710	-1.95E-04	9324.	3.68E+09	
		89100.	0.00					
-35.8398	5.0000	0.00217	21984.	-141.1140	-1.59E-04	9321.	3.68E+09	
		99000.	0.00					
-24.0544	5.5000	0.00133	20601.	-320.7968	-1.24E-04	9257.	3.68E+09	
		108900.	0.00					
-13.4617	6.0000	6.80E-04	18326.	-433.3453	-9.26E-05	9151.	3.68E+09	
		118800.	0.00					
-4.5815	6.5000	2.14E-04	15544.	-487.4748	-6.51E-05	9022.	3.68E+09	
		128700.	0.00					
2.3278	7.0000	-1.01E-04	12577.	-494.2359	-4.21E-05	8885.	3.68E+09	
		138600.	0.00					
7.2318	7.5000	-2.92E-04	9678.	-465.5572	-2.40E-05	8750.	3.68E+09	
		148500.	0.00					
10.2700	8.0000	-3.89E-04	7028.	-413.0521	-1.04E-05	8627.	3.68E+09	
		158400.	0.00					
11.7009	8.5000	-4.17E-04	4738.	-347.1396	-8.29E-07	8521.	3.68E+09	
		168300.	0.00					
11.8492	9.0000	-3.99E-04	2863.	-276.4894	5.36E-06	8434.	3.68E+09	
		178200.	0.00					
11.0602	9.5000	-3.53E-04	1412.	-207.7612	8.84E-06	8367.	3.68E+09	
		188100.	0.00					
9.6635	10.0000	-2.93E-04	356.3316	-145.5900	1.03E-05	8318.	3.68E+09	
		198000.	0.00					
7.9483	10.5000	-2.29E-04	-351.4280	-92.7544	1.03E-05	8318.	3.68E+09	
		207900.	0.00					
6.1484	11.0000	-1.69E-04	-772.6061	-50.4641	9.37E-06	8337.	3.68E+09	
		217800.	0.00					
4.4371	11.5000	-1.17E-04	-971.4693	-18.7076	7.95E-06	8346.	3.68E+09	
		227700.	0.00					
2.9287	12.0000	-7.40E-05	-1009.	3.3896	6.34E-06	8348.	3.68E+09	
		237600.	0.00					
1.6854	12.5000	-4.09E-05	-940.5810	17.2319	4.75E-06	8345.	3.68E+09	
		247500.	0.00					
0.7274	13.0000	-1.70E-05	-809.9273	24.4705	3.32E-06	8339.	3.68E+09	
		257400.	0.00					

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13.5000	-9.70E-07	-652.0677	26.7824	2.13E-06	8332.	3.68E+09
0.04322	267300.	0.00				
14.0000	8.64E-06	-491.8323	25.7142	1.20E-06	8324.	3.68E+09
-0.3993	277200.	0.00				
14.5000	1.34E-05	-345.3524	22.5860	5.20E-07	8317.	3.68E+09
-0.6435	287100.	0.00				
15.0000	1.49E-05	-221.6026	18.4464	5.77E-08	8312.	3.68E+09
-0.7364	297000.	0.00				
15.5000	1.41E-05	-124.0845	14.0674	-2.24E-07	8307.	3.68E+09
-0.7233	306900.	0.00				
16.0000	1.22E-05	-52.4477	9.9667	-3.68E-07	8304.	3.68E+09
-0.6436	316800.	0.00				
16.5000	9.73E-06	-3.9163	6.4467	-4.14E-07	8301.	3.68E+09
-0.5297	326700.	0.00				
17.0000	7.23E-06	25.5512	3.6413	-3.96E-07	8302.	3.68E+09
-0.4055	336600.	0.00				
17.5000	4.98E-06	40.3902	1.5627	-3.42E-07	8303.	3.68E+09
-0.2874	346500.	0.00				
18.0000	3.12E-06	44.8321	0.1444	-2.73E-07	8303.	3.68E+09
-0.1854	356400.	0.00				
18.5000	1.70E-06	42.5447	-0.7235	-2.02E-07	8303.	3.68E+09
-0.1039	366300.	0.00				
19.0000	7.01E-07	36.4617	-1.1671	-1.37E-07	8303.	3.68E+09
-0.04393	376200.	0.00				
19.5000	5.51E-08	28.7512	-1.3096	-8.42E-08	8303.	3.68E+09
-0.00355	386100.	0.00				
20.0000	-3.09E-07	20.8768	-1.2590	-4.38E-08	8302.	3.68E+09
0.02042	396000.	0.00				
20.5000	-4.70E-07	13.7112	-1.0798	-1.56E-08	8302.	3.68E+09
0.03930	501840.	0.00				
21.0000	-4.96E-07	7.9431	-0.8343	2.06E-09	8302.	3.68E+09
0.04252	514080.	0.00				
21.5000	-4.45E-07	3.6959	-0.5896	1.15E-08	8301.	3.68E+09
0.03905	526320.	0.00				
22.0000	-3.58E-07	0.8497	-0.3761	1.52E-08	8301.	3.68E+09
0.03212	538560.	0.00				
22.5000	-2.62E-07	-0.8413	-0.2076	1.53E-08	8301.	3.68E+09
0.02407	550800.	0.00				
23.0000	-1.75E-07	-1.6649	-0.08618	1.32E-08	8301.	3.68E+09
0.01640	563040.	0.00				
23.5000	-1.04E-07	-1.8959	-0.00717	1.03E-08	8301.	3.68E+09
0.00994	575280.	0.00				
24.0000	-5.11E-08	-1.7668	0.03765	7.33E-09	8301.	3.68E+09
0.00500	587520.	0.00				
24.5000	-1.57E-08	-1.4555	0.05736	4.70E-09	8301.	3.68E+09
0.00157	599760.	0.00				
25.0000	5.37E-09	-1.0857	0.06044	2.63E-09	8301.	3.68E+09
-5.47E-04	612000.	0.00				
25.5000	1.59E-08	-0.7343	0.05385	1.15E-09	8301.	3.68E+09
-0.00165	624240.	0.00				
26.0000	1.92E-08	-0.4413	0.04280	1.92E-10	8301.	3.68E+09
-0.00203	636480.	0.00				
26.5000	1.82E-08	-0.2209	0.03082	-3.47E-10	8301.	3.68E+09
-0.00196	648720.	0.00				
27.0000	1.50E-08	-0.07096	0.01997	-5.85E-10	8301.	3.68E+09
-0.00165	660960.	0.00				
27.5000	1.11E-08	0.01965	0.01127	-6.27E-10	8301.	3.68E+09
-0.00125	673200.	0.00				
28.0000	7.47E-09	0.06527	0.00497	-5.58E-10	8301.	3.68E+09
-8.53E-04	685440.	0.00				
28.5000	4.44E-09	0.08010	8.58E-04	-4.39E-10	8301.	3.68E+09
-5.16E-04	697680.	0.00				
29.0000	2.19E-09	0.07624	-0.00147	-3.12E-10	8301.	3.68E+09



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-2. 60E-04	709920.	0. 00				
29. 5000	6. 94E-10	0. 06294	-0. 00250	-1. 99E-10	8301.	3. 68E+09
-8. 35E-05	722160.	0. 00				
30. 0000	-1. 91E-10	0. 04656	-0. 00268	-1. 10E-10	8301.	3. 68E+09
2. 33E-05	734400.	0. 00				
30. 5000	-6. 20E-10	0. 03095	-0. 00238	-4. 64E-11	8301.	3. 68E+09
7. 72E-05	746640.	0. 00				
31. 0000	-7. 47E-10	0. 01809	-0. 00186	-6. 43E-12	8301.	3. 68E+09
9. 45E-05	758880.	0. 00				
31. 5000	-6. 97E-10	0. 00861	-0. 00131	1. 53E-11	8301.	3. 68E+09
8. 96E-05	771120.	0. 00				
32. 0000	-5. 63E-10	0. 00234	-8. 22E-04	2. 42E-11	8301.	3. 68E+09
7. 35E-05	783360.	0. 00				
32. 5000	-4. 06E-10	-0. 00129	-4. 39E-04	2. 51E-11	8301.	3. 68E+09
5. 39E-05	795600.	0. 00				
33. 0000	-2. 62E-10	-0. 00297	-1. 72E-04	2. 16E-11	8301.	3. 68E+09
3. 53E-05	807840.	0. 00				
33. 5000	-1. 47E-10	-0. 00338	-5. 36E-06	1. 64E-11	8301.	3. 68E+09
2. 01E-05	820080.	0. 00				
34. 0000	-6. 51E-11	-0. 00306	8. 20E-05	1. 12E-11	8301.	3. 68E+09
9. 03E-06	832320.	0. 00				
34. 5000	-1. 30E-11	-0. 00242	1. 15E-04	6. 72E-12	8301.	3. 68E+09
1. 82E-06	844560.	0. 00				
35. 0000	1. 56E-11	-0. 00170	1. 13E-04	3. 37E-12	8301.	3. 68E+09
-2. 22E-06	856800.	0. 00				
35. 5000	2. 74E-11	-0. 00106	9. 48E-05	1. 12E-12	8301.	3. 68E+09
-3. 98E-06	869040.	0. 00				
36. 0000	2. 90E-11	-5. 63E-04	7. 01E-05	0. 00	8301.	3. 68E+09
-4. 26E-06	881280.	0. 00				
36. 5000	2. 50E-11	-2. 18E-04	4. 62E-05	0. 00	8301.	3. 68E+09
-3. 72E-06	893520.	0. 00				
37. 0000	1. 89E-11	-7. 67E-06	2. 64E-05	-1. 02E-12	8301.	3. 68E+09
-2. 85E-06	905760.	0. 00				
37. 5000	1. 27E-11	1. 00E-04	1. 20E-05	0. 00	8301.	3. 68E+09
-1. 95E-06	918000.	0. 00				
38. 0000	7. 53E-12	1. 38E-04	2. 67E-06	0. 00	8301.	3. 68E+09
-1. 17E-06	930240.	0. 00				
38. 5000	3. 68E-12	1. 34E-04	-2. 41E-06	0. 00	8301.	3. 68E+09
-5. 28E-07	859320.	0. 00				
39. 0000	1. 14E-12	1. 10E-04	-4. 49E-06	0. 00	8301.	3. 68E+09
-1. 66E-07	870480.	0. 00				
39. 5000	0. 00	8. 01E-05	-4. 85E-06	0. 00	8301.	3. 68E+09
4. 82E-08	881640.	0. 00				
40. 0000	-1. 01E-12	5. 20E-05	-4. 25E-06	0. 00	8301.	3. 68E+09
1. 51E-07	892800.	0. 00				
40. 5000	-1. 19E-12	2. 92E-05	-3. 26E-06	0. 00	8301.	3. 68E+09
1. 80E-07	903960.	0. 00				
41. 0000	-1. 08E-12	1. 29E-05	-2. 22E-06	0. 00	8301.	3. 68E+09
1. 65E-07	915120.	0. 00				
41. 5000	0. 00	2. 53E-06	-1. 33E-06	0. 00	8301.	3. 68E+09
1. 31E-07	926280.	0. 00				
42. 0000	0. 00	-3. 14E-06	-6. 62E-07	0. 00	8301.	3. 68E+09
9. 24E-08	937440.	0. 00				
42. 5000	0. 00	-5. 47E-06	-2. 12E-07	0. 00	8301.	3. 68E+09
5. 74E-08	948600.	0. 00				
43. 0000	0. 00	-5. 74E-06	5. 03E-08	0. 00	8301.	3. 68E+09
3. 01E-08	959760.	0. 00				
43. 5000	0. 00	-4. 91E-06	1. 75E-07	0. 00	8301.	3. 68E+09
1. 13E-08	970920.	0. 00				
44. 0000	0. 00	-3. 67E-06	2. 08E-07	0. 00	8301.	3. 68E+09
-1. 44E-10	982080.	0. 00				
44. 5000	0. 00	-2. 43E-06	1. 90E-07	0. 00	8301.	3. 68E+09
-5. 91E-09	993240.	0. 00				

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45.0000	0.00	-1.39E-06	1.49E-07	0.00	8301.	3.68E+09
-7.83E-09	1004400.	0.00				
45.5000	0.00	-6.44E-07	1.03E-07	0.00	8301.	3.68E+09
-7.48E-09	1015560.	0.00				
46.0000	0.00	-1.61E-07	6.21E-08	0.00	8301.	3.68E+09
-6.05E-09	1026720.	0.00				
46.5000	0.00	1.04E-07	3.10E-08	0.00	8301.	3.68E+09
-4.32E-09	1037880.	0.00				
47.0000	0.00	2.13E-07	9.87E-09	0.00	8301.	3.68E+09
-2.72E-09	1049040.	0.00				
47.5000	0.00	2.24E-07	-2.64E-09	0.00	8301.	3.68E+09
-1.45E-09	1060200.	0.00				
48.0000	0.00	1.83E-07	-8.65E-09	0.00	8301.	3.68E+09
-5.51E-10	1071360.	0.00				
48.5000	0.00	1.22E-07	-1.02E-08	0.00	8301.	3.68E+09
4.70E-11	1082520.	0.00				
49.0000	0.00	6.18E-08	-8.69E-09	0.00	8301.	3.68E+09
4.41E-10	1093680.	0.00				
49.5000	0.00	1.77E-08	-5.18E-09	0.00	8301.	3.68E+09
7.31E-10	1104840.	0.00				
50.0000	0.00	0.00	0.00	0.00	8301.	3.68E+09
9.95E-10	558000.	0.00				

\* The above values of total stress are combined axial and bending stresses.

#### Output Summary for Load Case No. 2:

Pile-head deflection	=	0.01551019 inches
Computed slope at pile head	=	0.000000 radians
Maximum bending moment	=	-79681. inch-lbs
Maximum shear force	=	3200. lbs
Depth of maximum bending moment	=	0.000000 feet below pile head
Depth of maximum shear force	=	0.000000 feet below pile head
Number of iterations	=	6
Number of zero deflection points	=	9

#### Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 3

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head	=	4600.0 lbs
Applied moment at pile head	=	0.0 in-lbs
Axial thrust load on pile head	=	190910.0 lbs

Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Lat. inches lb/inch	Bending Distrib. Load Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
0.00	0.09722	1.14E-08	4600.	-0.00218	12317.	3.68E+09		
-13.9867	431.6054	0.00	4437.	-0.00216	13701.	3.68E+09		
0.5000	0.08413	29848.						
-40.4295	2884.	0.00	4093.	-0.00209	15015.	3.68E+09		
1.0000	0.07132	58185.						

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-74.3069	6251.	0.00				
1.5000	0.05909	83738.	3546.	-0.00197	16200.	3.68E+09
-107.8051	10946.	0.00				
2.0000	0.04768	105253.	2813.	-0.00182	17198.	3.68E+09
-136.4325	17169.	0.00				
2.5000	0.03729	121661.	1940.	-0.00163	17959.	3.68E+09
-154.6854	24887.	0.00				
3.0000	0.02810	132273.	975.2726	-0.00142	18451.	3.68E+09
-166.9370	35650.	0.00				
3.5000	0.02019	136629.	-57.9313	-0.00121	18653.	3.68E+09
-177.4644	52730.	0.00				
4.0000	0.01363	134341.	-1122.	-9.85E-04	18547.	3.68E+09
-177.3553	78099.	0.00				
4.5000	0.00837	125417.	-2027.	-7.74E-04	18133.	3.68E+09
-124.3086	89100.	0.00				
5.0000	0.00434	111784.	-2615.	-5.80E-04	17501.	3.68E+09
-71.6482	99000.	0.00				
5.5000	0.00141	95364.	-2907.	-4.12E-04	16740.	3.68E+09
-25.5250	108900.	0.00				
6.0000	-5.97E-04	77846.	-2948.	-2.71E-04	15927.	3.68E+09
11.8304	118800.	0.00				
6.5000	-0.00184	60609.	-2794.	-1.58E-04	15128.	3.68E+09
39.4767	128700.	0.00				
7.0000	-0.00249	44681.	-2503.	-7.20E-05	14389.	3.68E+09
57.5394	138600.	0.00				
7.5000	-0.00270	30740.	-2129.	-1.06E-05	13742.	3.68E+09
66.9395	148500.	0.00				
8.0000	-0.00262	19151.	-1721.	3.01E-05	13205.	3.68E+09
69.1125	158400.	0.00				
8.5000	-0.00234	10015.	-1317.	5.38E-05	12781.	3.68E+09
65.7484	168300.	0.00				
9.0000	-0.00197	3228.	-943.7477	6.46E-05	12466.	3.68E+09
58.5729	178200.	0.00				
9.5000	-0.00157	-1458.	-620.4852	6.60E-05	12384.	3.68E+09
49.1813	188100.	0.00				
10.0000	-0.00118	-4370.	-356.1551	6.13E-05	12519.	3.68E+09
38.9288	198000.	0.00				
10.5000	-8.33E-04	-5872.	-152.7527	5.30E-05	12589.	3.68E+09
28.8721	207900.	0.00				
11.0000	-5.44E-04	-6324.	-6.8695	4.30E-05	12610.	3.68E+09
19.7557	217800.	0.00				
11.5000	-3.17E-04	-6053.	88.4918	3.29E-05	12597.	3.68E+09
12.0314	227700.	0.00				
12.0000	-1.49E-04	-5337.	142.2868	2.37E-05	12564.	3.68E+09
5.9003	237600.	0.00				
12.5000	-3.31E-05	-4400.	164.0879	1.57E-05	12521.	3.68E+09
1.3667	247500.	0.00				
13.0000	3.97E-05	-3404.	163.0755	9.37E-06	12475.	3.68E+09
-1.7042	257400.	0.00				
13.5000	7.93E-05	-2464.	147.3634	4.59E-06	12431.	3.68E+09
-3.5331	267300.	0.00				
14.0000	9.48E-05	-1647.	123.6244	1.24E-06	12393.	3.68E+09
-4.3798	277200.	0.00				
14.5000	9.42E-05	-983.5738	96.9622	-9.01E-07	12362.	3.68E+09
-4.5076	287100.	0.00				
15.0000	8.40E-05	-480.9865	70.9674	-2.09E-06	12339.	3.68E+09
-4.1574	297000.	0.00				
15.5000	6.91E-05	-127.1673	47.8962	-2.59E-06	12323.	3.68E+09
-3.5330	306900.	0.00				
16.0000	5.29E-05	99.7005	28.9157	-2.61E-06	12321.	3.68E+09
-2.7938	316800.	0.00				
16.5000	3.77E-05	225.8054	14.3713	-2.35E-06	12327.	3.68E+09
-2.0543	326700.	0.00				

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17.0000	2.48E-05	277.5330	4.0426	-1.94E-06	12330.	3.68E+09	
-1.3886	336600.	0.00					
17.5000	1.45E-05	278.7541	-2.6330	-1.48E-06	12330.	3.68E+09	
-0.8366	346500.	0.00					
18.0000	6.95E-06	249.3358	-6.3811	-1.05E-06	12328.	3.68E+09	
-0.4127	356400.	0.00					
18.5000	1.85E-06	204.5948	-7.9572	-6.84E-07	12326.	3.68E+09	
-0.1127	366300.	0.00					
19.0000	-1.26E-06	155.4160	-8.0587	-3.90E-07	12324.	3.68E+09	
0.07882	376200.	0.00					
19.5000	-2.84E-06	108.7847	-7.2739	-1.75E-07	12322.	3.68E+09	
0.1828	386100.	0.00					
20.0000	-3.36E-06	68.5305	-6.0602	-3.09E-08	12320.	3.68E+09	
0.2218	396000.	0.00					
20.5000	-3.21E-06	36.1331	-4.5892	5.44E-08	12318.	3.68E+09	
0.2685	501840.	0.00					
21.0000	-2.71E-06	13.3359	-3.0875	9.47E-08	12317.	3.68E+09	
0.2320	514080.	0.00					
21.5000	-2.07E-06	-1.1341	-1.8456	1.05E-07	12317.	3.68E+09	
0.1820	526320.	0.00					
22.0000	-1.45E-06	-9.0511	-0.9086	9.63E-08	12317.	3.68E+09	
0.1303	538560.	0.00					
22.5000	-9.18E-07	-12.2586	-0.2647	7.90E-08	12317.	3.68E+09	
0.08431	550800.	0.00					
23.0000	-5.04E-07	-12.4080	0.1303	5.89E-08	12317.	3.68E+09	
0.04734	563040.	0.00					
23.5000	1.12E-07	-10.8300	0.3332	4.00E-08	12317.	3.68E+09	
0.02031	575280.	0.00					
24.0000	-2.50E-08	-8.5007	0.4015	2.42E-08	12317.	3.68E+09	
0.00245	587520.	0.00					
24.5000	7.87E-08	-6.0673	0.3853	1.23E-08	12317.	3.68E+09	
-0.00787	599760.	0.00					
25.0000	1.23E-07	-3.9058	0.3240	4.22E-09	12317.	3.68E+09	
-0.01256	612000.	0.00					
25.5000	1.29E-07	-2.1892	0.2459	-7.45E-10	12317.	3.68E+09	
-0.01346	624240.	0.00					
26.0000	1.14E-07	-0.9528	0.1692	-3.30E-09	12317.	3.68E+09	
-0.01211	636480.	0.00					
26.5000	8.97E-08	-0.1508	0.1038	-4.20E-09	12317.	3.68E+09	
-0.00970	648720.	0.00					
27.0000	6.37E-08	0.3025	0.05365	-4.08E-09	12317.	3.68E+09	
-0.00702	660960.	0.00					
27.5000	4.07E-08	0.5024	0.01887	-3.42E-09	12317.	3.68E+09	
-0.00457	673200.	0.00					
28.0000	2.27E-08	0.5368	-0.00260	-2.58E-09	12317.	3.68E+09	
-0.00259	685440.	0.00					
28.5000	9.81E-09	0.4771	-0.01379	-1.75E-09	12317.	3.68E+09	
-0.00114	697680.	0.00					
29.0000	1.63E-09	0.3754	-0.01779	-1.06E-09	12317.	3.68E+09	
-1.93E-04	709920.	0.00					
29.5000	-2.88E-09	0.2660	-0.01733	-5.35E-10	12317.	3.68E+09	
3.46E-04	722160.	0.00					
30.0000	-4.79E-09	0.1687	-0.01453	-1.81E-10	12317.	3.68E+09	
5.86E-04	734400.	0.00					
30.5000	-5.05E-09	0.09209	-0.01089	3.16E-11	12317.	3.68E+09	
6.28E-04	746640.	0.00					
31.0000	-4.41E-09	0.03796	-0.00733	1.38E-10	12317.	3.68E+09	
5.58E-04	758880.	0.00					
31.5000	-3.40E-09	0.00382	-0.00435	1.72E-10	12317.	3.68E+09	
4.37E-04	771120.	0.00					
32.0000	-2.35E-09	-0.01460	-0.00212	1.63E-10	12317.	3.68E+09	
3.07E-04	783360.	0.00					
32.5000	-1.44E-09	-0.02196	-6.23E-04	1.33E-10	12317.	3.68E+09	

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1. 91E-04	795600.	0. 00				
33. 0000	-7. 53E-10	-0. 02238	2. 56E-04	9. 69E-11	12317.	3. 68E+09
1. 01E-04	807840.	0. 00				
33. 5000	-2. 81E-10	-0. 01911	6. 75E-04	6. 31E-11	12317.	3. 68E+09
3. 84E-05	820080.	0. 00				
34. 0000	4. 33E-12	-0. 01442	7. 89E-04	3. 58E-11	12317.	3. 68E+09
-6. 00E-07	832320.	0. 00				
34. 5000	1. 49E-10	-0. 00973	7. 24E-04	1. 61E-11	12317.	3. 68E+09
-2. 09E-05	844560.	0. 00				
35. 0000	1. 98E-10	-0. 00577	5. 77E-04	3. 51E-12	12317.	3. 68E+09
-2. 83E-05	856800.	0. 00				
35. 5000	1. 91E-10	-0. 00282	4. 09E-04	-3. 49E-12	12317.	3. 68E+09
-2. 76E-05	869040.	0. 00				
36. 0000	1. 56E-10	-8. 54E-04	2. 57E-04	-6. 48E-12	12317.	3. 68E+09
-2. 29E-05	881280.	0. 00				
36. 5000	1. 13E-10	2. 85E-04	1. 38E-04	-6. 94E-12	12317.	3. 68E+09
-1. 68E-05	893520.	0. 00				
37. 0000	7. 27E-11	8. 18E-04	5. 47E-05	-6. 04E-12	12317.	3. 68E+09
-1. 10E-05	905760.	0. 00				
37. 5000	4. 05E-11	9. 55E-04	3. 16E-06	-4. 60E-12	12317.	3. 68E+09
-6. 19E-06	918000.	0. 00				
38. 0000	1. 75E-11	8. 67E-04	-2. 36E-05	-3. 11E-12	12317.	3. 68E+09
-2. 72E-06	930240.	0. 00				
38. 5000	3. 09E-12	6. 79E-04	-3. 31E-05	-1. 86E-12	12317.	3. 68E+09
-4. 42E-07	859320.	0. 00				
39. 0000	-4. 72E-12	4. 74E-04	-3. 23E-05	0. 00	12317.	3. 68E+09
6. 85E-07	870480.	0. 00				
39. 5000	-7. 90E-12	2. 93E-04	-2. 68E-05	0. 00	12317.	3. 68E+09
1. 16E-06	881640.	0. 00				
40. 0000	-8. 20E-12	1. 54E-04	-1. 96E-05	0. 00	12317.	3. 68E+09
1. 22E-06	892800.	0. 00				
40. 5000	-7. 01E-12	5. 76E-05	-1. 28E-05	0. 00	12317.	3. 68E+09
1. 06E-06	903960.	0. 00				
41. 0000	-5. 25E-12	-6. 37E-07	-7. 24E-06	0. 00	12317.	3. 68E+09
8. 00E-07	915120.	0. 00				
41. 5000	-3. 50E-12	-3. 00E-05	-3. 22E-06	0. 00	12317.	3. 68E+09
5. 40E-07	926280.	0. 00				
42. 0000	-2. 04E-12	-3. 99E-05	-6. 49E-07	0. 00	12317.	3. 68E+09
3. 18E-07	937440.	0. 00				
42. 5000	0. 00	-3. 83E-05	7. 64E-07	0. 00	12317.	3. 68E+09
1. 53E-07	948600.	0. 00				
43. 0000	0. 00	-3. 11E-05	1. 35E-06	0. 00	12317.	3. 68E+09
4. 35E-08	959760.	0. 00				
43. 5000	0. 00	-2. 23E-05	1. 43E-06	0. 00	12317.	3. 68E+09
-1. 93E-08	970920.	0. 00				
44. 0000	0. 00	-1. 41E-05	1. 22E-06	0. 00	12317.	3. 68E+09
-4. 80E-08	982080.	0. 00				
44. 5000	0. 00	-7. 62E-06	9. 16E-07	0. 00	12317.	3. 68E+09
-5. 44E-08	993240.	0. 00				
45. 0000	0. 00	-3. 10E-06	6. 07E-07	0. 00	12317.	3. 68E+09
-4. 86E-08	1004400.	0. 00				
45. 5000	0. 00	-3. 19E-07	3. 49E-07	0. 00	12317.	3. 68E+09
-3. 74E-08	1015560.	0. 00				
46. 0000	0. 00	1. 11E-06	1. 60E-07	0. 00	12317.	3. 68E+09
-2. 55E-08	1026720.	0. 00				
46. 5000	0. 00	1. 63E-06	3. 79E-08	0. 00	12317.	3. 68E+09
-1. 52E-08	1037880.	0. 00				
47. 0000	0. 00	1. 59E-06	-3. 01E-08	0. 00	12317.	3. 68E+09
-7. 45E-09	1049040.	0. 00				
47. 5000	0. 00	1. 28E-06	-5. 93E-08	0. 00	12317.	3. 68E+09
-2. 27E-09	1060200.	0. 00				
48. 0000	0. 00	8. 88E-07	-6. 37E-08	0. 00	12317.	3. 68E+09
7. 80E-10	1071360.	0. 00				

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48.5000	0.00	5.21E-07	-5.44E-08	0.00	12317.	3.68E+09
2.33E-09	1082520.	0.00				
49.0000	0.00	2.37E-07	-3.84E-08	0.00	12317.	3.68E+09
2.99E-09	1093680.	0.00				
49.5000	0.00	6.05E-08	-1.98E-08	0.00	12317.	3.68E+09
3.23E-09	1104840.	0.00				
50.0000	0.00	0.00	0.00	0.00	12317.	3.68E+09
3.37E-09	558000.	0.00				

\* The above values of total stress are combined axial and bending stresses.

#### Output Summary for Load Case No. 3:

Pile-head deflection	=	0.09721887 inches
Computed slope at pile head	=	-0.00218218 radians
Maximum bending moment	=	136629. inch-lbs
Maximum shear force	=	4600. lbs
Depth of maximum bending moment	=	3.50000000 feet below pile head
Depth of maximum shear force	=	0.000000 feet below pile head
Number of iterations	=	13
Number of zero deflection points	=	9

#### Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 4

Pile-head conditions are Shear and Pile-head Rotation (Loading Type 2)

Shear force at pile head	=	4600.0 lbs
Rotation of pile head	=	0.000E+00 radians
Axial load at pile head	=	190910.0 lbs

(Zero slope for this load indicates fixed-head conditions)

Depth Res.	Soil X Es*h feet lb/inch	Deflect. Spr. y Lat. inches lb/inch	Bending Distrib. Load Moment in-lbs lb/inch	Shear Force lbs	Slope S radians	Total Stress psi *	Bending Stiffness in-lb^2	Soil p
0.00	0.02311	-117405.	4600.	0.00	17762.	3.68E+09		
-4.4319	575.2755	0.00						
0.5000	0.02254	-89775.	4503.	-1.69E-04	16480.	3.68E+09		
-27.8033	7402.	0.00						
1.0000	0.02109	-62978.	4238.	-2.93E-04	15238.	3.68E+09		
-60.6729	17264.	0.00						
1.5000	0.01902	-38249.	3793.	-3.76E-04	14091.	3.68E+09		
-87.7742	27689.	0.00						
2.0000	0.01658	-16608.	3209.	-4.20E-04	13087.	3.68E+09		
-106.6743	38605.	0.00						
2.5000	0.01398	1224.	2544.	-4.33E-04	12374.	3.68E+09		
-115.1296	49426.	0.00						
3.0000	0.01138	14909.	1860.	-4.20E-04	13008.	3.68E+09		
-112.7109	59400.	0.00						
3.5000	0.00894	24509.	1212.	-3.88E-04	13453.	3.68E+09		
-103.2517	69300.	0.00						
4.0000	0.00673	30346.	635.9482	-3.43E-04	13724.	3.68E+09		

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-88.8849	79200.	0.00					
4.5000	0.00482	32926.	154.3630	-2.91E-04	13844.	3.68E+09	
-71.6435	89100.	0.00					
5.0000	0.00324	32865.	-220.8039	-2.38E-04	13841.	3.68E+09	
-53.4121	99000.	0.00					
5.5000	0.00197	30821.	-488.3590	-1.86E-04	13746.	3.68E+09	
-35.7729	108900.	0.00					
6.0000	0.00101	27431.	-655.4395	-1.38E-04	13589.	3.68E+09	
-19.9206	118800.	0.00					
6.5000	3.09E-04	23273.	-735.1075	-9.72E-05	13396.	3.68E+09	
-6.6354	128700.	0.00					
7.0000	-1.60E-04	18832.	-743.9317	-6.29E-05	13190.	3.68E+09	
3.6941	138600.	0.00					
7.5000	-4.45E-04	14490.	-699.8011	-3.57E-05	12989.	3.68E+09	
11.0161	148500.	0.00					
8.0000	-5.89E-04	10517.	-620.1318	-1.54E-05	12805.	3.68E+09	
15.5403	158400.	0.00					
8.5000	-6.29E-04	7083.	-520.5470	-1.02E-06	12645.	3.68E+09	
17.6547	168300.	0.00					
9.0000	-6.01E-04	4272.	-414.0413	8.23E-06	12515.	3.68E+09	
17.8472	178200.	0.00					
9.5000	-5.31E-04	2096.	-310.5898	1.34E-05	12414.	3.68E+09	
16.6366	188100.	0.00					
10.0000	-4.40E-04	514.5519	-217.1256	1.55E-05	12341.	3.68E+09	
14.5181	198000.	0.00					
10.5000	-3.44E-04	-545.1577	-137.7936	1.55E-05	12342.	3.68E+09	
11.9259	207900.	0.00					
11.0000	-2.54E-04	-1175.	-74.3826	1.41E-05	12371.	3.68E+09	
9.2111	217800.	0.00					
11.5000	-1.75E-04	-1470.	-26.8483	1.20E-05	12385.	3.68E+09	
6.6336	227700.	0.00					
12.0000	-1.10E-04	-1524.	6.1463	9.52E-06	12387.	3.68E+09	
4.3646	237600.	0.00					
12.5000	-6.05E-05	-1418.	26.7310	7.13E-06	12383.	3.68E+09	
2.4970	247500.	0.00					
13.0000	-2.47E-05	-1220.	37.4021	4.98E-06	12373.	3.68E+09	
1.0601	257400.	0.00					
13.5000	-8.10E-07	-980.7212	40.6905	3.18E-06	12362.	3.68E+09	
0.03607	267300.	0.00					
14.0000	1.35E-05	-738.6615	38.9270	1.78E-06	12351.	3.68E+09	
-0.6239	277200.	0.00					
14.5000	2.06E-05	-517.6847	34.0982	7.61E-07	12341.	3.68E+09	
-0.9857	287100.	0.00					
15.0000	2.26E-05	-331.2262	27.7801	6.92E-08	12332.	3.68E+09	
-1.1204	297000.	0.00					
15.5000	2.14E-05	-184.4824	21.1306	-3.51E-07	12325.	3.68E+09	
-1.0961	306900.	0.00					
16.0000	1.84E-05	-76.8555	14.9239	-5.64E-07	12320.	3.68E+09	
-0.9728	316800.	0.00					
16.5000	1.47E-05	-4.1043	9.6100	-6.30E-07	12317.	3.68E+09	
-0.7985	326700.	0.00					
17.0000	1.09E-05	39.9075	5.3855	-6.00E-07	12319.	3.68E+09	
-0.6097	336600.	0.00					
17.5000	7.46E-06	61.8970	2.2641	-5.18E-07	12320.	3.68E+09	
-0.4308	346500.	0.00					
18.0000	4.66E-06	68.2628	0.1420	-4.12E-07	12320.	3.68E+09	
-0.2766	356400.	0.00					
18.5000	2.52E-06	64.5438	-1.1495	-3.03E-07	12320.	3.68E+09	
-0.1539	366300.	0.00					
19.0000	1.02E-06	55.1642	-1.8023	-2.06E-07	12319.	3.68E+09	
-0.06370	376200.	0.00					
19.5000	5.04E-08	43.3883	-2.0031	-1.26E-07	12319.	3.68E+09	
-0.00325	386100.	0.00					

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20.0000	-4.91E-07	31.4145	-1.9156	-6.47E-08	12318.	3.68E+09
0.03241	396000.	0.00				
20.5000	-7.25E-07	20.5489	-1.6364	-2.23E-08	12318.	3.68E+09
0.06068	501840.	0.00				
21.0000	-7.59E-07	11.8293	-1.2592	4.04E-09	12317.	3.68E+09
0.06503	514080.	0.00				
21.5000	-6.77E-07	5.4289	-0.8860	1.81E-08	12317.	3.68E+09
0.05938	526320.	0.00				
22.0000	-5.42E-07	1.1560	-0.5619	2.35E-08	12317.	3.68E+09
0.04863	538560.	0.00				
22.5000	-3.95E-07	-1.3682	-0.3072	2.33E-08	12317.	3.68E+09
0.03630	550800.	0.00				
23.0000	-2.62E-07	-2.5833	-0.1244	2.01E-08	12317.	3.68E+09
0.02462	563040.	0.00				
23.5000	-1.54E-07	-2.9074	-0.00614	1.56E-08	12317.	3.68E+09
0.01481	575280.	0.00				
24.0000	-7.51E-08	-2.6927	0.06036	1.10E-08	12317.	3.68E+09
0.00735	587520.	0.00				
24.5000	-2.20E-08	-2.2083	0.08903	7.05E-09	12317.	3.68E+09
0.00220	599760.	0.00				
25.0000	9.45E-09	-1.6405	0.09275	3.91E-09	12317.	3.68E+09
-9.64E-04	612000.	0.00				
25.5000	2.49E-08	-1.1043	0.08208	1.68E-09	12317.	3.68E+09
-0.00259	624240.	0.00				
26.0000	2.96E-08	-0.6594	0.06490	2.39E-10	12317.	3.68E+09
-0.00314	636480.	0.00				
26.5000	2.78E-08	-0.3261	0.04648	-5.64E-10	12317.	3.68E+09
-0.00300	648720.	0.00				
27.0000	2.28E-08	-0.1003	0.02994	-9.11E-10	12317.	3.68E+09
-0.00251	660960.	0.00				
27.5000	1.68E-08	0.03523	0.01673	-9.64E-10	12317.	3.68E+09
-0.00189	673200.	0.00				
28.0000	1.12E-08	0.1027	0.00721	-8.52E-10	12317.	3.68E+09
-0.00128	685440.	0.00				
28.5000	6.63E-09	0.1237	0.00105	-6.67E-10	12317.	3.68E+09
-7.71E-04	697680.	0.00				
29.0000	3.23E-09	0.1167	-0.00241	-4.71E-10	12317.	3.68E+09
-3.82E-04	709920.	0.00				
29.5000	9.72E-10	0.09581	-0.00391	-2.98E-10	12317.	3.68E+09
-1.17E-04	722160.	0.00				
30.0000	-3.49E-10	0.07051	-0.00413	-1.63E-10	12317.	3.68E+09
4.28E-05	734400.	0.00				
30.5000	-9.81E-10	0.04661	-0.00364	-6.73E-11	12317.	3.68E+09
1.22E-04	746640.	0.00				
31.0000	-1.16E-09	0.02702	-0.00283	-7.37E-12	12317.	3.68E+09
1.46E-04	758880.	0.00				
31.5000	-1.07E-09	0.01265	-0.00198	2.49E-11	12317.	3.68E+09
1.37E-04	771120.	0.00				
32.0000	-8.58E-10	0.00321	-0.00123	3.79E-11	12317.	3.68E+09
1.12E-04	783360.	0.00				
32.5000	-6.16E-10	-0.00221	-6.50E-04	3.87E-11	12317.	3.68E+09
8.16E-05	795600.	0.00				
33.0000	-3.94E-10	-0.00468	-2.46E-04	3.30E-11	12317.	3.68E+09
5.31E-05	807840.	0.00				
33.5000	-2.19E-10	-0.00523	3.46E-06	2.50E-11	12317.	3.68E+09
2.99E-05	820080.	0.00				
34.0000	-9.48E-11	-0.00470	1.33E-04	1.69E-11	12317.	3.68E+09
1.31E-05	832320.	0.00				
34.5000	-1.64E-11	-0.00368	1.79E-04	1.01E-11	12317.	3.68E+09
2.31E-06	844560.	0.00				
35.0000	2.60E-11	-0.00257	1.75E-04	4.97E-12	12317.	3.68E+09
-3.71E-06	856800.	0.00				
35.5000	4.32E-11	-0.00159	1.45E-04	1.58E-12	12317.	3.68E+09



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-6. 26E-06	869040.	0. 00				
36. 0000	4. 49E-11	-8. 36E-04	1. 06E-04	0. 00	12317.	3. 68E+09
-6. 59E-06	881280.	0. 00				
36. 5000	3. 84E-11	-3. 14E-04	6. 96E-05	-1. 34E-12	12317.	3. 68E+09
-5. 71E-06	893520.	0. 00				
37. 0000	2. 88E-11	2. 20E-06	3. 94E-05	-1. 59E-12	12317.	3. 68E+09
-4. 35E-06	905760.	0. 00				
37. 5000	1. 92E-11	1. 62E-04	1. 75E-05	-1. 46E-12	12317.	3. 68E+09
-2. 94E-06	918000.	0. 00				
38. 0000	1. 13E-11	2. 16E-04	3. 45E-06	-1. 15E-12	12317.	3. 68E+09
-1. 75E-06	930240.	0. 00				
38. 5000	5. 41E-12	2. 06E-04	-4. 12E-06	0. 00	12317.	3. 68E+09
-7. 75E-07	859320.	0. 00				
39. 0000	1. 57E-12	1. 68E-04	-7. 13E-06	0. 00	12317.	3. 68E+09
-2. 28E-07	870480.	0. 00				
39. 5000	0. 00	1. 22E-04	-7. 54E-06	0. 00	12317.	3. 68E+09
9. 13E-08	881640.	0. 00				
40. 0000	-1. 63E-12	7. 84E-05	-6. 54E-06	0. 00	12317.	3. 68E+09
2. 42E-07	892800.	0. 00				
40. 5000	-1. 86E-12	4. 36E-05	-4. 97E-06	0. 00	12317.	3. 68E+09
2. 81E-07	903960.	0. 00				
41. 0000	-1. 67E-12	1. 88E-05	-3. 36E-06	0. 00	12317.	3. 68E+09
2. 55E-07	915120.	0. 00				
41. 5000	-1. 30E-12	3. 14E-06	-2. 00E-06	0. 00	12317.	3. 68E+09
2. 01E-07	926280.	0. 00				
42. 0000	0. 00	-5. 29E-06	-9. 72E-07	0. 00	12317.	3. 68E+09
1. 40E-07	937440.	0. 00				
42. 5000	0. 00	-8. 67E-06	-2. 93E-07	0. 00	12317.	3. 68E+09
8. 63E-08	948600.	0. 00				
43. 0000	0. 00	-8. 92E-06	9. 98E-08	0. 00	12317.	3. 68E+09
4. 46E-08	959760.	0. 00				
43. 5000	0. 00	-7. 55E-06	2. 82E-07	0. 00	12317.	3. 68E+09
1. 60E-08	970920.	0. 00				
44. 0000	0. 00	-5. 60E-06	3. 26E-07	0. 00	12317.	3. 68E+09
-1. 16E-09	982080.	0. 00				
44. 5000	0. 00	-3. 67E-06	2. 94E-07	0. 00	12317.	3. 68E+09
-9. 65E-09	993240.	0. 00				
45. 0000	0. 00	-2. 09E-06	2. 28E-07	0. 00	12317.	3. 68E+09
-1. 23E-08	1004400.	0. 00				
45. 5000	0. 00	-9. 42E-07	1. 56E-07	0. 00	12317.	3. 68E+09
-1. 16E-08	1015560.	0. 00				
46. 0000	0. 00	-2. 12E-07	9. 32E-08	0. 00	12317.	3. 68E+09
-9. 29E-09	1026720.	0. 00				
46. 5000	0. 00	1. 83E-07	4. 56E-08	0. 00	12317.	3. 68E+09
-6. 57E-09	1037880.	0. 00				
47. 0000	0. 00	3. 41E-07	1. 36E-08	0. 00	12317.	3. 68E+09
-4. 09E-09	1049040.	0. 00				
47. 5000	0. 00	3. 51E-07	-5. 09E-09	0. 00	12317.	3. 68E+09
-2. 15E-09	1060200.	0. 00				
48. 0000	0. 00	2. 83E-07	-1. 39E-08	0. 00	12317.	3. 68E+09
-7. 82E-10	1071360.	0. 00				
48. 5000	0. 00	1. 87E-07	-1. 59E-08	0. 00	12317.	3. 68E+09
1. 17E-10	1082520.	0. 00				
49. 0000	0. 00	9. 43E-08	-1. 34E-08	0. 00	12317.	3. 68E+09
7. 02E-10	1093680.	0. 00				
49. 5000	0. 00	2. 69E-08	-7. 93E-09	0. 00	12317.	3. 68E+09
1. 13E-09	1104840.	0. 00				
50. 0000	0. 00	0. 00	0. 00	0. 00	12317.	3. 68E+09
1. 51E-09	558000.	0. 00				

\* The above values of total stress are combined axial and bending stresses.

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Output Summary for Load Case No. 4:

Pile-head deflection = 0.02311195 inches  
 Computed slope at pile head = 0.000000 radians  
 Maximum bending moment = -117405. inch-lbs  
 Maximum shear force = 4600. lbs  
 Depth of maximum bending moment = 0.000000 feet below pile head  
 Depth of maximum shear force = 0.000000 feet below pile head  
 Number of iterations = 6  
 Number of zero deflection points = 9

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs  
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians  
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.  
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs  
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Load 1	Load 2	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max in lbs
1	V, lb	3200.	M, in-lb	0.00	128670.	0.05132	-0.00123
2	V, lb	3200.	S, rad	0.00	128670.	0.01551	0.00
3	V, lb	4600.	M, in-lb	0.00	190910.	0.09722	-0.00218
4	V, lb	4600.	S, rad	0.00	190910.	0.02311	0.00

Maximum pile-head deflection = 0.0972188688 inches  
 Maximum pile-head rotation = -0.0021821823 radians = -0.125030 deg.

The analysis ended normally.

## **Appendix E.      Slope Stability Results**

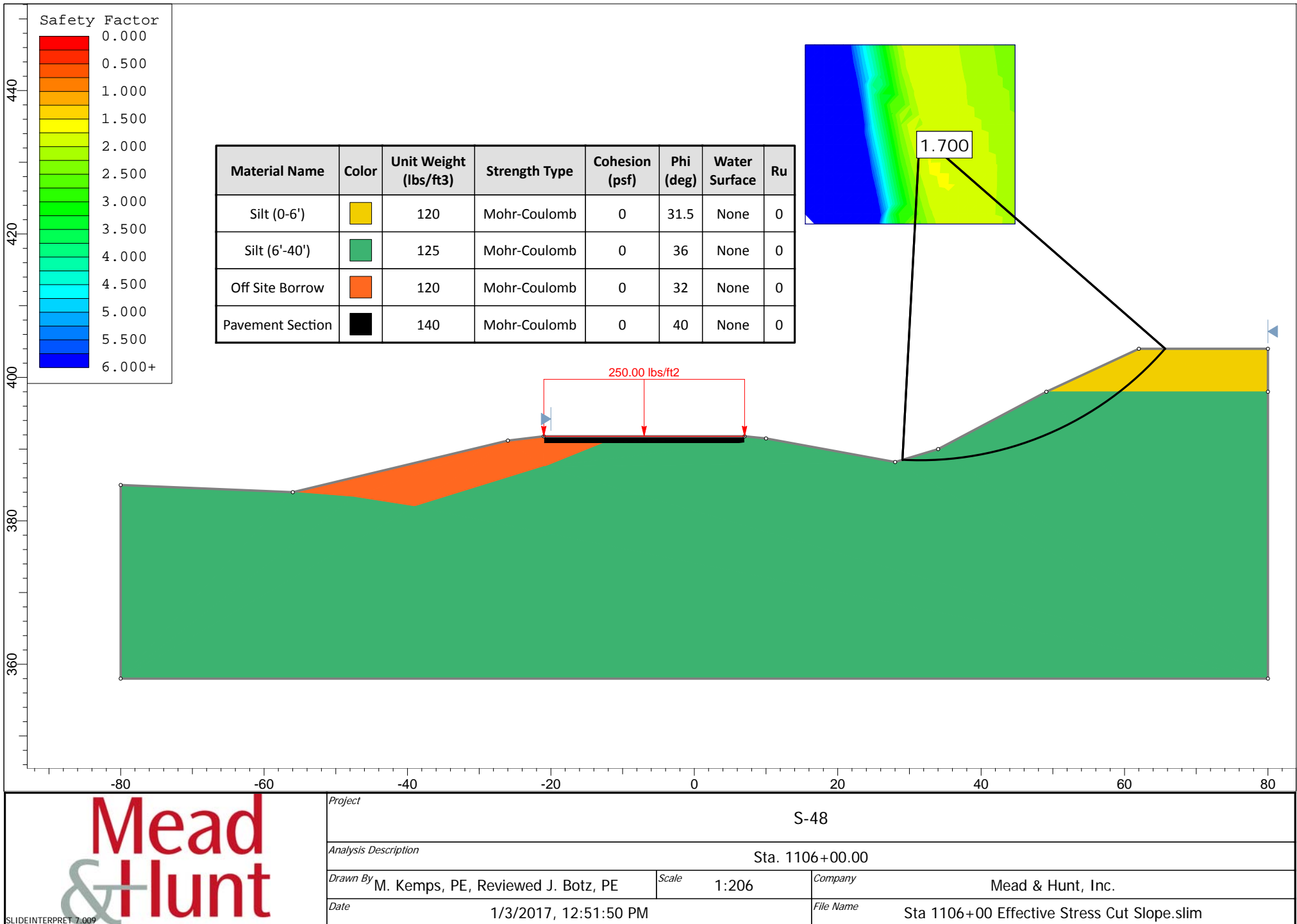


Figure D1

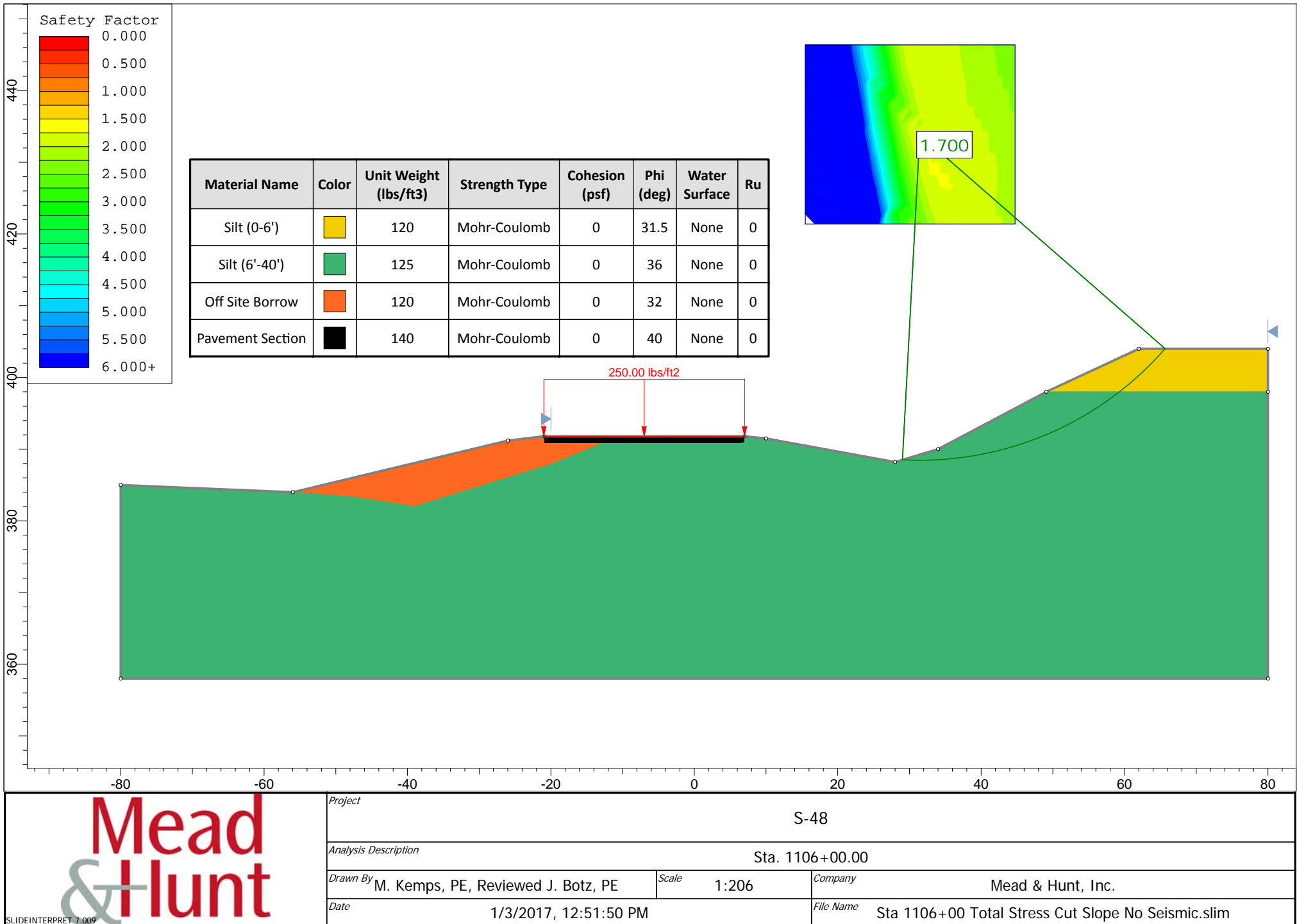


Figure D2

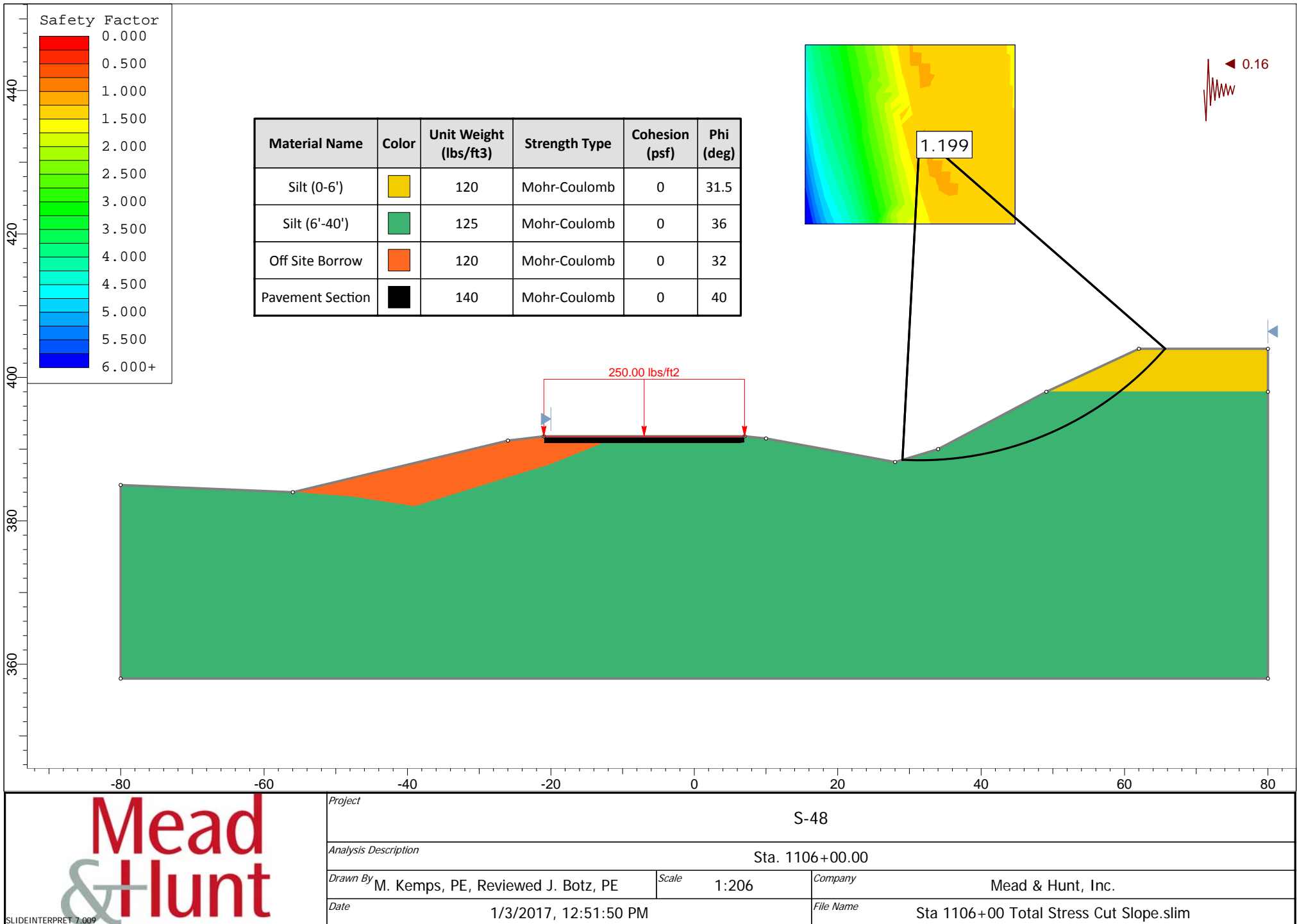


Figure D3

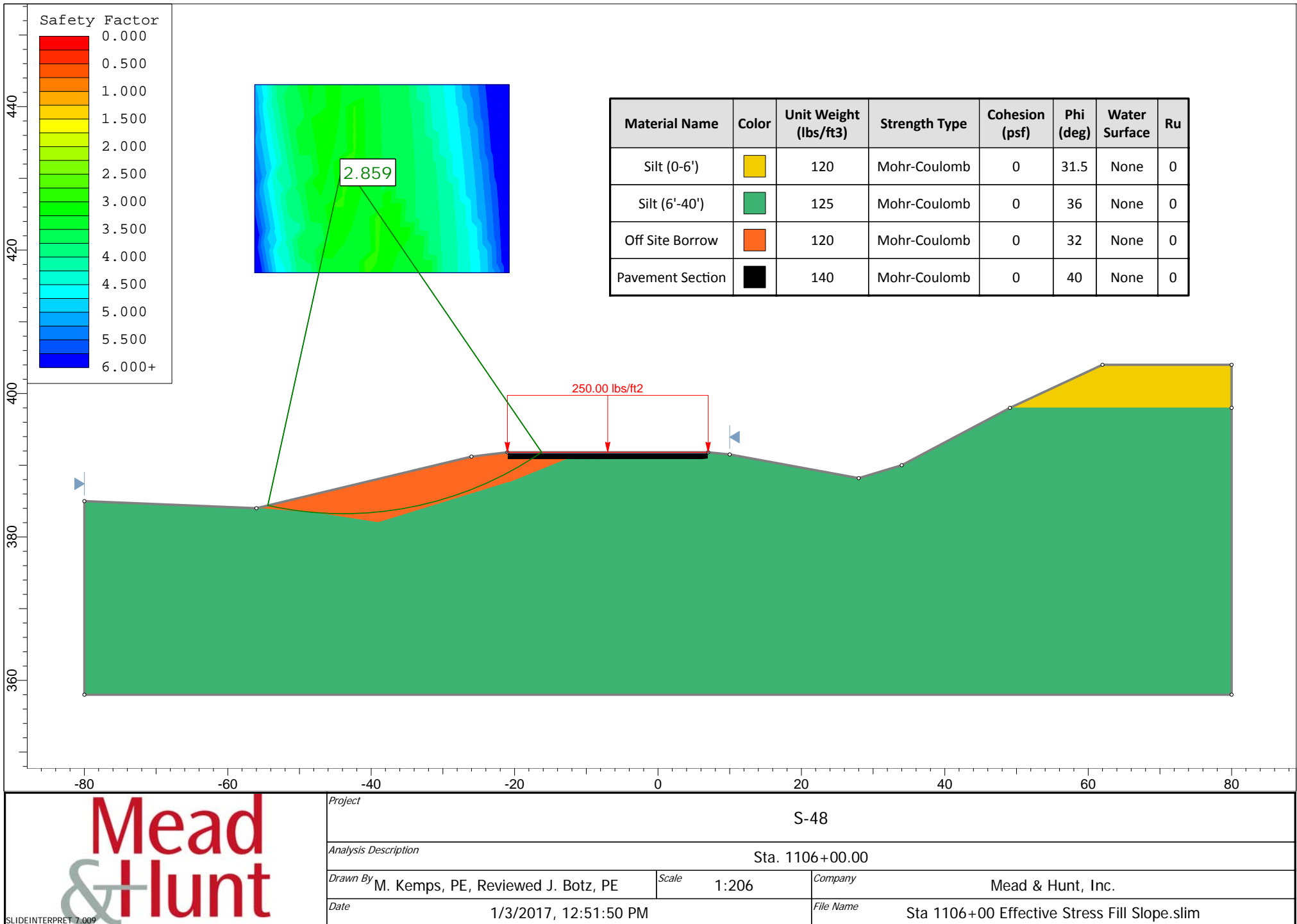
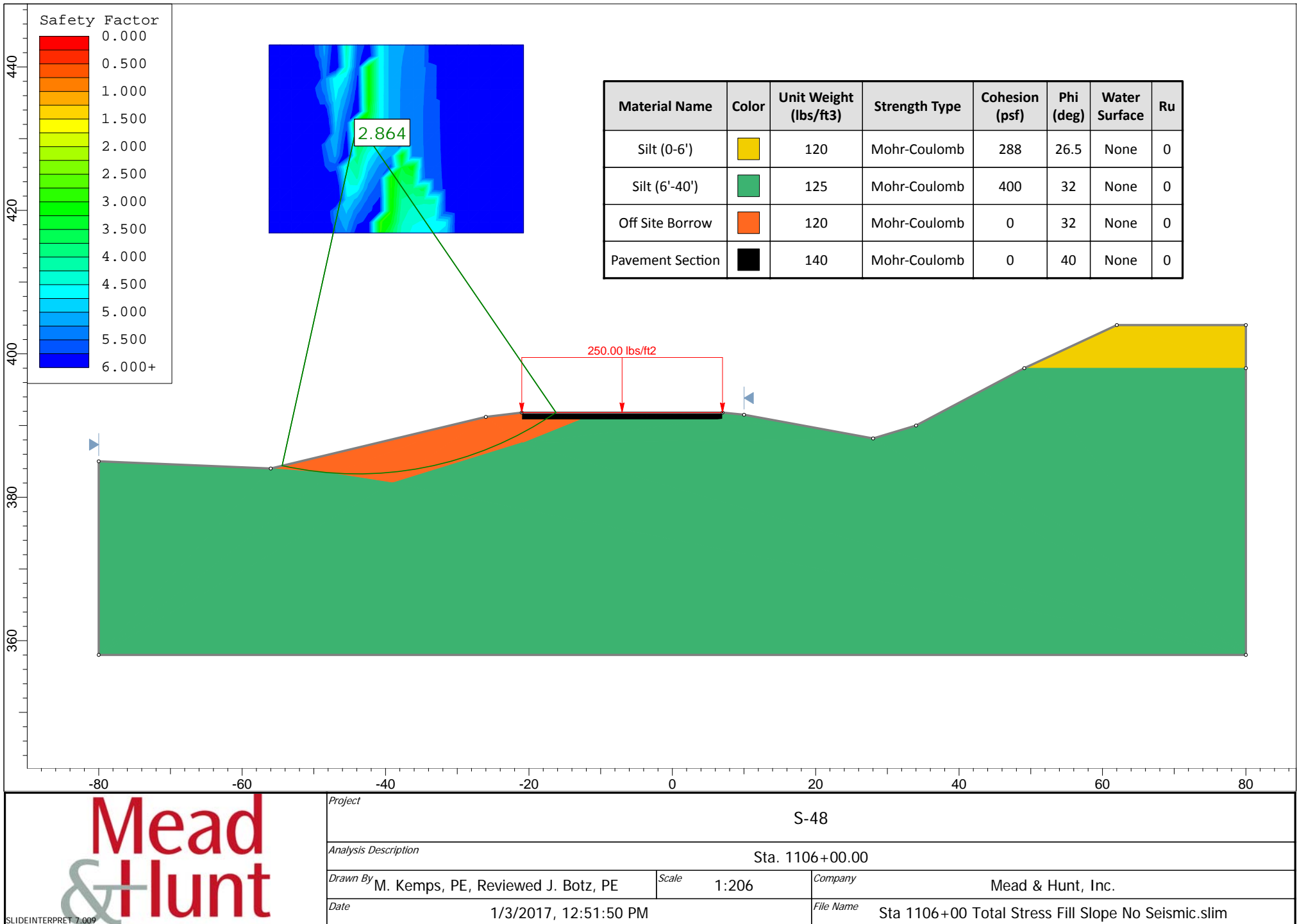


Figure D4





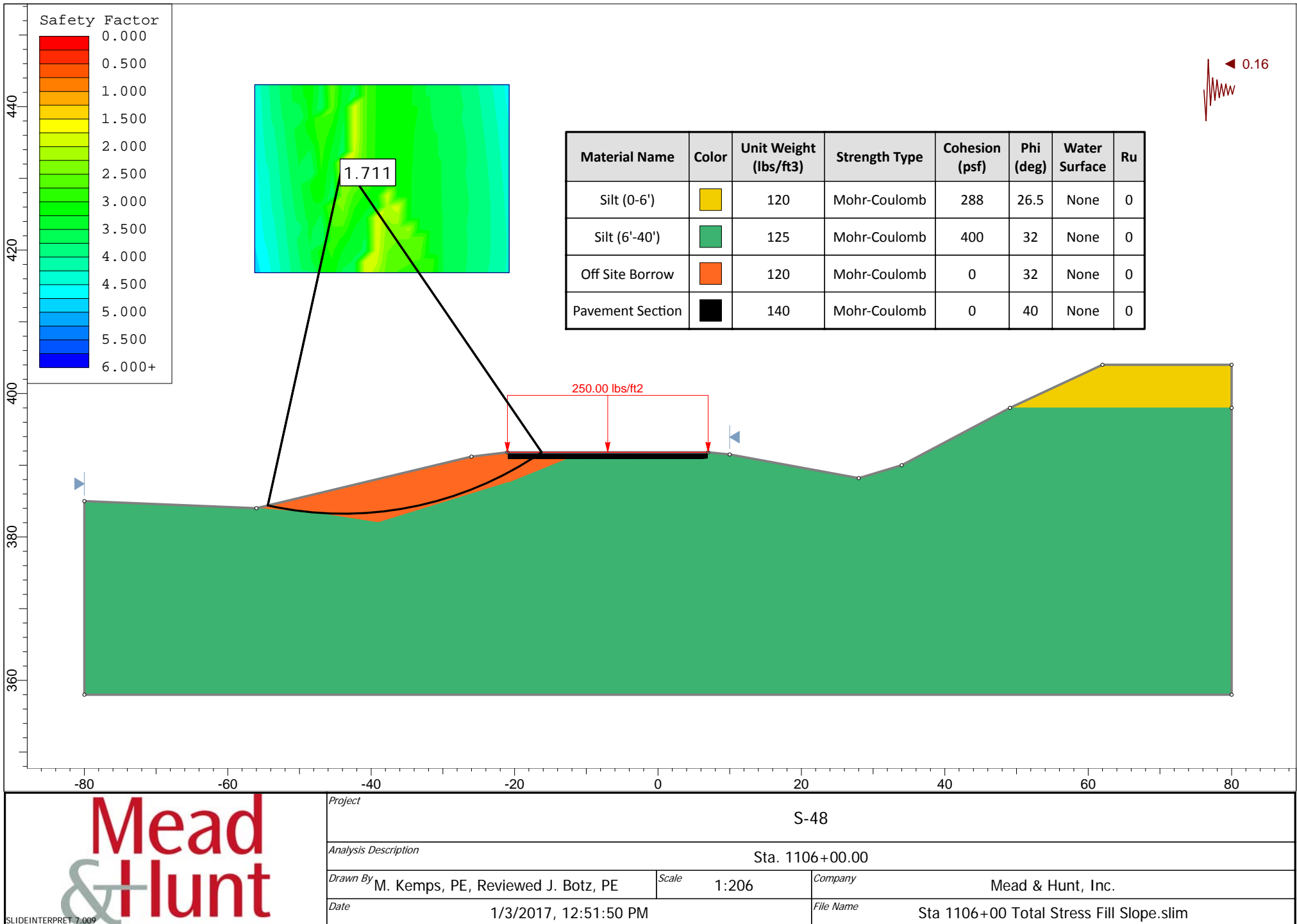


Figure D6

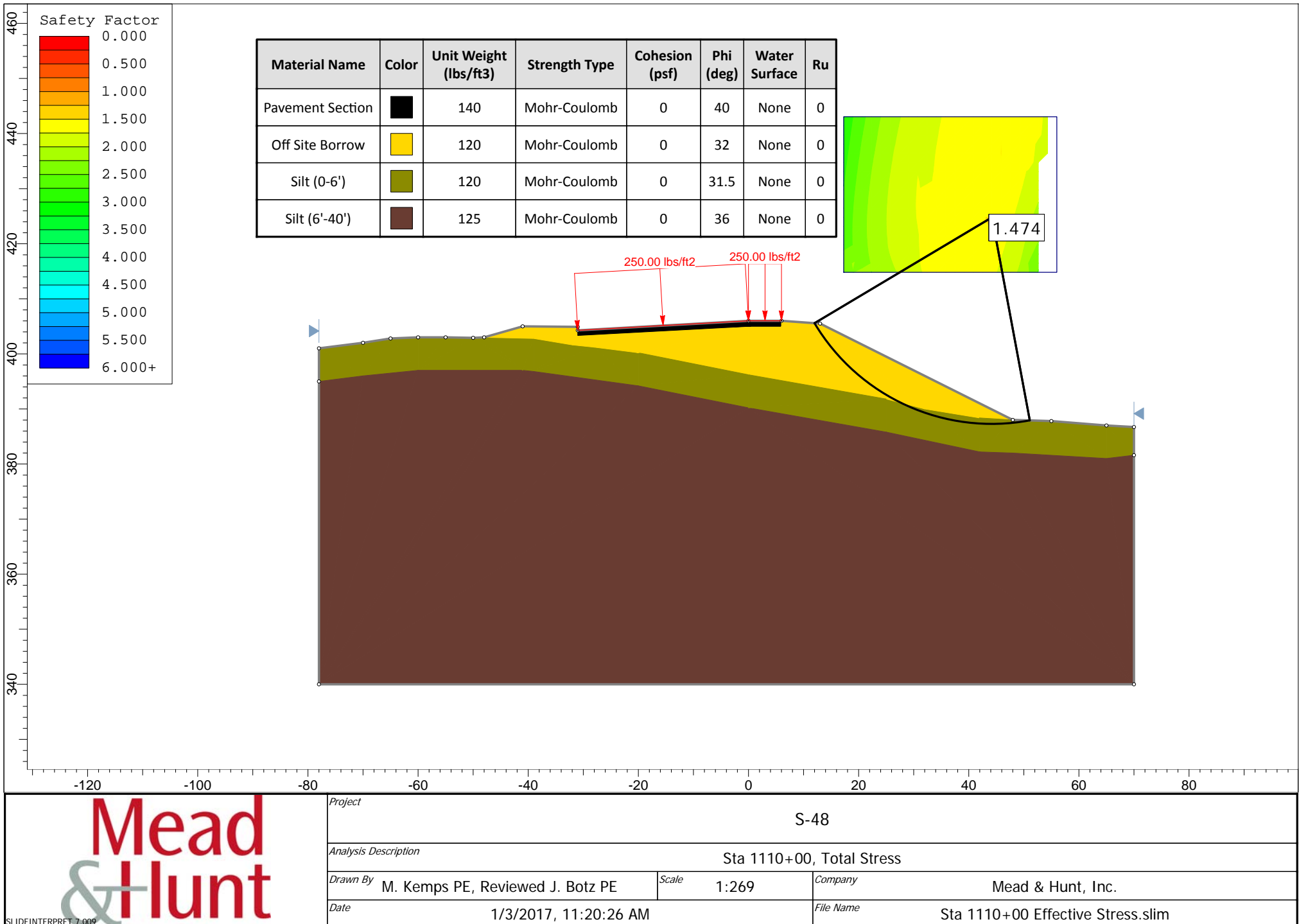


Figure D7

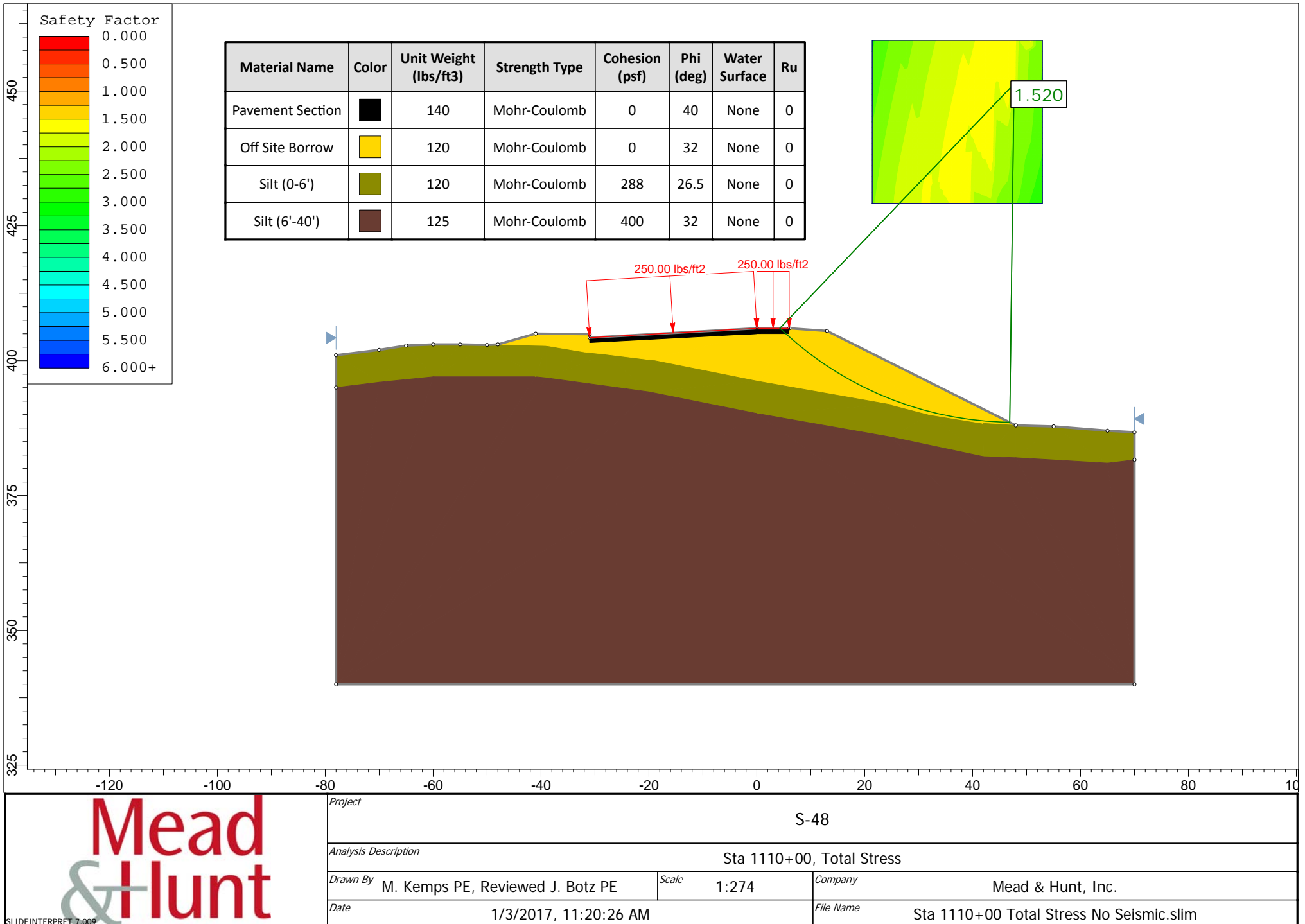


Figure D8

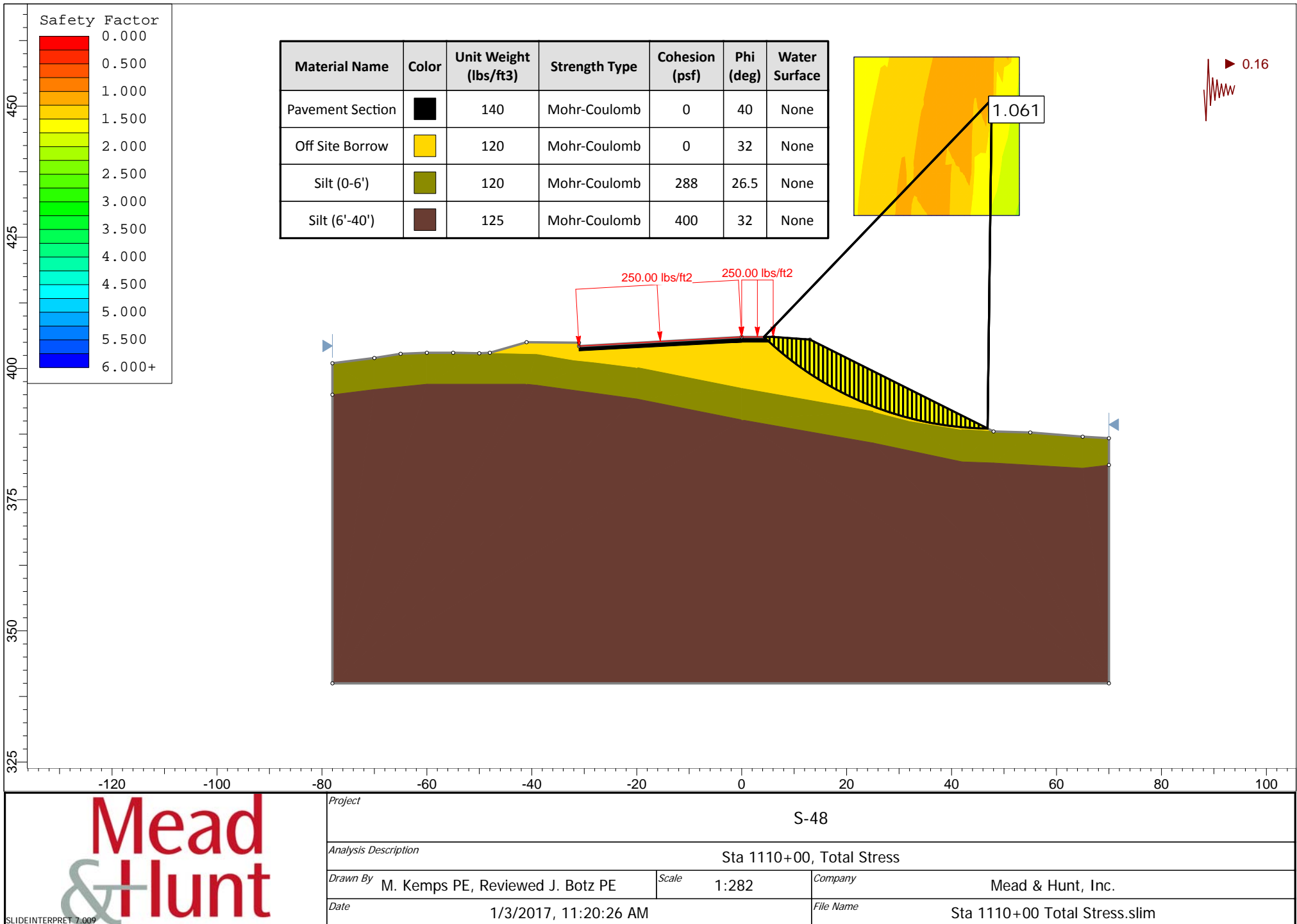


Figure D9

## **Appendix F.      Settlement Estimates**

## S-48 Roadway Improvements

### Embankment Settlement Summary

Ramp A  
10 feet of new fill

### Boring 36 Soil Profile

Half width of roadway (b), ft.	20
Embankment height (H), ft. =	10
Embankment fill unit weight, pcf =	120
Embankment loading, P, tsf	1200
Slope width (a), ft	35.00

Layer	Depth to midpoint of layer (z), ft.	Layer thickness (H) ft.	Corrected N value, bpf	Bearing Capacity Index, C'	Po, psf	b/z	a/z	Iz	Delta P	Settlement = $\frac{1}{C'} \times H \times \log \left( \frac{Po + \Delta P}{Po} \right)$ , ft.
1	1	2	11	30	120	20.00	35.00	1.00	1200	0.069
2	3	2	83	130	360	6.67	11.67	1.00	1200	0.010
3	8	8	100	160	960	2.50	4.38	0.95	1140	0.017
4	14.5	5	22	45	1740	1.38	2.41	0.93	1116	0.024
5	23.5	13	100	160	2820	0.85	1.49	0.9	1080	0.011
									Total	0.132
									Inches	1.6

Iz taken from NAVFAC DM 7.1 Fig. 17-12 in GDM

C' from Figure 17.16 in GDM

N60 corrected from automatic hammer used in Boring 36 which had an energy ratio of 81.9%. Blow counts increased by 36.5%.

Note: No groundwater level used in analysis to compute Po.

## S-48 Roadway Improvements

### Embankment Settlement Summary

#### New Road 1

#### 15 feet of new fill

Half width of roadway (b), ft.	35
Embankment height (H), ft. =	15
Embankment fill unit weight, pcf =	120
Embankment loading, P, tsf	1800
Slope width (a), ft	25.00

#### Boring 3 Soil Profile

Layer	Depth to midpoint of layer (z), ft.	Layer thickness (H) ft.	Corrected N value, bpf	Bearing Capacity Index, C'	Po, psf	b/z	a/z	Iz	Delta P	Settlement = $\frac{1}{C'} \times H \times \log \left( \frac{Po + \Delta P}{Po} \right)$ , ft.
1	2	4	14	34	240	17.50	12.50	1.00	1800	0.109
2	8	8	26	50	960	4.38	3.13	1.00	1800	0.073
3	16	8	55	92	1920	2.19	1.56	0.95	1710	0.024
4	30	20	66	105	3600	1.17	0.83	0.88	1584	0.030
Total										0.237
Inches										2.8

Iz taken from NAVFAC DM 7.1 Fig. 17-12 in GDM

C' from Figure 17.16 in GDM

N60 corrected from automatic hammer used in Boring 3 which had an energy ratio of 71.8%. Blow counts increased by 19.7%.

Note: No groundwater level used in analysis to compute Po.